PIPISTREL

PILOT'S OPERATING HANDBOOK

VELIS Electro Non Type Certified

Document No.: POH-X128-00-40-001
REVISION A01
Date of Issue: April 26th, 2022

Signature:

Registration: _____

Serial No.: _____

Pilot's Operating Handbook

Aircraft type:	Virus SW 121
Model:	Virus SW 128 (non type certified)

Type certificate holder:

PIPISTREL VERTICAL SOLUTIONS d.o.o.
Vipavska cesta 2
SI-5270 Ajdovščina
Slovenia
Tel: + 386 5 36 63 873
Fax: + 386 5 36 61 263
Email: info@pipistrel-aircraft.com

The airplane must be operated in compliance with information and limitations contained herein.

The manual is not meant to reflect the actual configuration or the system installed on the aircraft, it only establishes guidelines regarding limitations, normal and emergency procedures.

Table of contents

Online access to applicable publications

To access all publications that pertain to VELIS Electro Non Type Certified aircraft, including instructions for continued airworthiness, please visit www.pipistrel-aircraft.com and login to our technical publication portal using the following:

Username: owner1
Password: ab2008

USING THIS HANDBOOK

Special statements in the Pilot's Operating Handbook/Airplane Flight Manual concerning the safety or operation of the airplane are highlighted by being prefixed by one of the following terms:

WARNING: Means that the non-observance of the corresponding procedures lead to an immediate or significant degradation in flight safety.

CAUTION: Means that the non-observance of the corresponding procedures leads to a minor or to a long term degradation of the flight safety.

NOTE: Draws the attention to any special item not directly related to safety but which is important or unusual.

Revision tracking, filing and identifying

Pages to be removed or replaced in this pilot's operating handbook (POH) 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 affected pages is updated and the page number in the log is highlighted with bold font type. 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.

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 (e.g. radio, transponder, GPS, etc.).

Index of document revisions

Doc. Rev.	Reason for revision	Affected pages	Authority
A00	Initial	ALL	SLO.DOA.002 17.05.2021
A01	New battery type added, Section 3 and Section 5 separated for each battery type and moved into Sections 10-3A/B and Sections 10-5A/B, memory item identification for emergency procedures, spin recovery improved, pre-flight walkaround improved, flaperon deflections corrected, rigging procedure added, updated list of chargers, other minor improvements and corrections.	ALL	SLO.DOA.002 26.04.2022

List of effective pages

NOTE: since the last released revision A00, the content of this POH has undergone some significant changes. With the current revision A01 all the page revisions have been reset to 1. All the changes and amendments made in the current revision, have been marked by a vertical bar, so as to highlight the differences between document revisions A00 and A01.

PAGE NUMBER	PAGE REV.
Cover	-
ii	1
iii	1
iv	1
v	1
vi	1
vii	1
viii	1
ix	1
x	blank

PAGE NUMBER	PAGE REV.
1 - 1	1
1 - 2	1
1 - 3	1
1 - 4	1
1 - 5	1
1 - 6	1
1 - 7	1
1 - 8	1
1 - 9	1
1 - 10	1
1 - 11	1
1 - 12	1

PAGE NUMBER	PAGE REV.
2 - 1	1
2 - 2	1
2 - 3	1
2 - 4	1
2 - 5	1
2 - 6	1
2 - 7	1
2 - 8	1
2 - 9	1
2 - 10	1
2 - 11	1
2 - 12	1
2 - 13	1
2 - 14	1
2 - 15	1
2 - 16	blank

PAGE NUMBER	PAGE REV.
3 - 1	1
3 - 2	1
3 - 3	1
3 -4	blank

PAGE NUMBER	PAGE REV.
4 - 1	1
4 - 2	1
4 - 3	1
4 - 4	1
4 - 5	1
4 - 6	1
4 - 7	1
4 - 8	1
4 - 9	1
4 - 10	1
4 - 11	1
4 - 12	1
4 - 13	1
4 - 14	1
4 - 15	1
4 - 16	1
4 - 17	1
4 - 18	blank
4 - 19	1
4 - 20	blank
4 - 21	1

PAGE NUMBER	PAGE REV.
4 - 22	1
4 - 23	1
4 - 24	1
4 - 25	1
4 - 26	1
4 - 27	1
4 - 28	1
4 - 29	1
4 - 30	1
4 - 31	1
4 - 32	blank

PAGE NUMBER	PAGE REV.
5 - 1	1
5 - 2	1
5 - 3	1
5 - 4	blank

PAGE NUMBER	PAGE REV.
6 - 1	1
6 - 2	1
6 - 3	1
6 - 4	1
6 - 5	1
6 - 6	blank

PAGE NUMBER	PAGE REV.
7 - 1	1
7 - 2	1
7 - 3	1
7 - 4	blank
7 - 5	1
7 -6	1
7 - 7	1
7 - 8	1
7 - 9	1
7 - 10	1
7 - 11	1
7 - 12	1
7 - 13	1
7 - 14	1
7 - 15	1
7 - 16	1
7 -17	1
7 - 18	1
7 - 19	1
7 - 20	1
7 - 21	1
7 - 22	1
7 - 23	1
7 - 24	1
7 - 25	1
7 - 26	1
7 - 27	1
7 - 28	1
7 - 29	1
7 - 30	1
7 - 31	1
7 - 32	1
7 - 33	1
7 - 34	1
7 - 35	1
7 - 36	1

PAGE NUMBER	PAGE REV.
8 - 1	1
8 - 2	1
8 - 3	1
8 - 4	1
8 - 5	1
8 - 6	1
8 - 7	1
8 - 8	1
8 - 9	1
8 - 10	1
8 - 11	1
8 - 12	1
8 - 13	1
8 - 14	1
8 - 15	1
8 - 16	1
8 - 17	1
8 - 18	1
8 - 19	1
8 - 20	1
8 - 21	1
8 - 22	1
8 - 23	1
8 - 24	1

PAGE NUMBER	PAGE REV.
9-A0-1	1
9-A0-2	1
9-A1-1	1
9-A1-2	1
9-A1-3	1
9-A1-4	1
9-A1-5	1
9-A1-6	1
9-A1-7	1
9-A1-8	1
9-A1-9	1
9-A1-10	1
9-A1-11	1
9-A1-12	1
9-A1-13	1
9-A1-14	1
9-A1-15	1
9-A1-16	1
9-A1-17	1
9-A1-18	1

PAGE NUMBER	PAGE REV.
10-00-1	1
10-00-2	1
10-3A-1	1
10-3A-2	1
10-3A-3	1
10-3A-4	1
10-3A-5	1
10-3A-6	blank
10-3A-7	1
10-3A-8	1
10-3A-9	1
10-3A-10	1
10-3A-11	1
10-3A-12	1
10-3A-13	1
10-3A-14	1
10-3A-15	1
10-3A-16	1
10-3A-17	1
10-3A-18	1
10-3A-19	1
10-3A-20	1
10-3A-21	1
10-3A-22	1
10-3A-23	1
10-3A-24	1
10-3A-25	1
10-3A- 26	1
10-3A-27	1
10-3A-28	1
10-3A-29	1
10-3A-30	1
10-3A-31	1
10-3A-32	1
10-3A-33	1

PAGE NUMBER	PAGE REV.
10-3A-34	1
10-3A-35	1
10-3A-36	1
10-3A-37	1
10-3A-38	1
10-3A-39	1
10-3A-40	1
10-3A-41	1
10-3A-42	1
10-3A-43	1
10-3A-44	1
10-3A-45	1
10-3A-46	1
10-3A-47	1
10-3A-48	1
10-3A-49	1
10-3A-50	1
10-3A-51	1
10-3A-52	blank
10-3A-53	1
10-3A-54	1
10-3A-55	1
10-3A-56	1
10-3A-57	1
10-3A-58	1
10-3A-59	1
10-3A-60	1
10-3A-61	1
10-3A-62	1
10-3A-63	1
10-3A-64	1
10-3A-65	1
10-3A-66	1
10-3A-67	1
10-3A-68	1
10-3A-69	1
10-3A-70	1
10-3A-71	1
10-3A-72	1
10-3A-73	1
10-3A-74	blank
10-5A-1	1
10-5A-2	1
10-5A-3	1
10-5A-4	1
10-5A-5	1
10-5A-6	1
10-5A-7	1
10-5A-8	1
10-5A-9	1
10-5A-10	1
10-5A-11	1
10-5A-12	1
10-5A-13	1
10-5A-14	1
10-5A-15	1
10-5A-15	1
10-5A-17	1
10-5A-18	1
10-5A-19	1
10-5A-20	1
10-5A-21	1
10-5A-22	1
10-5A-23	1
10-5A-24	1
10-5A-25	1
10-5A- 26	1
10-5A-27	1
10-5A-28	1
10-3B-1	1
10-3B-2	1
10-3B-3	1
10-3B-4	1
10-3B-5	1
10-3B-6	blank
10-3B-7	1
10-3B-8	1
10-3B-9	1
10-3B-10	1
10-3B-11	1
10-3B-12	1
10-3B-13	1
10-3B-14	1
10-3B-15	1
10-3B-16	1
10-3B-17	1
10-3B-18	1
10-3B-19	1
10-3B-20	1
10-3B-21	1
10-3B-22	1
10-3B-23	1
10-3B-24	1
10-3B-25	1
10-3B- 26	1
10-3B-27	1
10-3B-28	1
10-3B-29	1
10-3B-30	1
10-3B-31	1
10-3B-32	1
10-3B-33	1
10-3B-34	1
10-3B-35	1
10-3B-36	1
10-3B-37	1
10-3B-38	1
10-3B-39	1
10-3B-40	1
10-3B-41	1
10-3B-42	1
10-3B-43	1
10-3B-44	1
10-3B-45	1
10-3B-46	1
10-3B-47	1
10-3B-48	1
10-3B-49	1
10-3B-50	1
10-3B-51	1
10-3B-52	blank
10-3B-53	1
10-3B-54	1
10-3B-55	1
10-3B-56	1
10-3B-57	1
10-3B-58	1
10-3B-59	1
10-3B-60	1
10-3B-61	1
10-3B-62	1
10-3B-63	1
10-3B-64	1
10-3B-65	1
10-3B-66	1
10-3B-67	1
10-3B-68	1
10-3B-69	1
10-3B-70	1

PAGE NUMBER	PAGE REV.	PAGE NUMBER	PAGE REV.	PAGE NUMBER	PAGE REV.	PAGE NUMBER	PAGE REV.
10-3B-71	1						
10-3B-72	1						
10-3B-73	1						
10-3B-74	1						
10-5B-1	1						
10-5B-2	1						
10-5B-3	1						
10-5B-4	1						
10-5B-5	1						
10-5B-6	1						
10-5B-7	1						
10-5B-8	1						
10-5B-9	2						
10-5B-10	1						
10-5B-11	1						
10-5A-12	1						
10-5B-13	1						
10-5B-14	1						
10-5B-15	1						
10-5A-15	1						
10-5B-17	1						
10-5B-18	1						
10-5B-19	1						
10-5B-20	1						
10-5B-21	1						
10-5B-22	1						
10-5B-23	1						
10-5B-24	1						
10-5B-25	1						
10-5B- 26	1						
10-5B-27	1						
10-5B-28	1						
10-5B-29	1						
10-5B-30	blank						
10-5B-31	blank						
back-cover	-						

This page is intentionally left blank.

SECTION 1

SECTION 1 – GENERAL

TABLE OF CONTENTS

1.1. INTRODUCTION

This section contains information of general interest to pilots and owners. You will find the information useful in acquainting yourself with the airplane, as well as in loading, sheltering, and handling the airplane during ground operations. Additionally, this section contains definitions or explanations of symbols, abbreviations, and terminology used throughout this handbook.

1.2. DESCRIPTION

The VELIS Electro Non Type Certified is a two-seat aircraft of composite construction. The aircraft is arranged as a high wing mono-plane with cantilevered wings and a conventional empennage with a T-tail. It is equipped with a Pipistrel electric engine E-811-268MVLC and a fixed pitch propeller Pipistrel P-812-164-F3A.

The seats are side-by-side with full dual flight controls and shared levers for power output and flaperon control. Access to the cockpit is via two large gull-wing doors. There is no baggage compartment on the aircraft.

The load-bearing structure of the airplane is made of carbon, glass and aramid fiber composite material, the components of which, epoxy resin as well as fiber materials, are in compliance with worldwide accepted aviation specifications. The proven, low-pressure wet lay-up method from the sailplane industry is used to build the airplane structure.

The airplane is not approved for intentional spins and glider-towing.

1.3. CERTIFICATION BASIS

The VELIS Electro Non Type Certified is an experimental aircraft and is not compliant with any particular certification basis. The design is based on CS-LSA category requirements.

1.4. THREE VIEW DRAWING

VELIS Electro Non Type Certified
3-view drawing

1.5. DIMENSIONS AND WEIGHTS

Basic Dimensions	
Length	6.47 m
Span	10.71 m
Height	1.90 m *
Wing	
Area	9.51 m^2
Span	10.71 m
Mean aerodynamic chord	0.898 m

Horizontal Tail	Metric
Area	1.39 m^2
Span	2.18 m
Vertical Tail	
Reference area	1.24 m^2
Height	1.11 m
Weights	
Maximum take off weight	600 kg
Design empty weight	428 kg
Design useful load	172 kg
Maximum baggage weight	No baggage

* In-operation measurement, aircraft not leveled as per WBR.

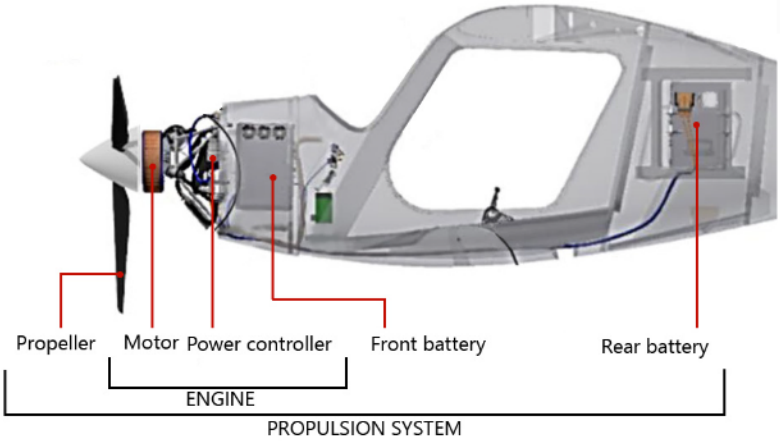
1.6. SYSTEMS

1.6.1. ENGINE

The aircraft's Pipistrel E-811-268MVLC engine consists of an electric motor, the Pipistrel 268 MVLC VHML, and a dedicated H300C controller, which provides a maximum rated take off power of 65 kW.

The motor is a liquid cooled, axial flux synchronous permanent magnet electric motor.

The aircraft's power electronics system is a liquid-cooled, high-voltage power controller, which provides three phase alternating supply (AC) to the motor. Maximum continuous current is 300A.



Propulsion system terminology

1.6.2. PROPELLER

VELIS Electro is equipped with a 3-blade fixed pitch, Pipistrel-designed P-812-164-F3A propeller. It has a diameter 1640 mm. Its blades are made from carbon fiber composite material and stainless steel. The blade root and propeller hub are machined aluminum parts.

1.6.3. BATTERY SYSTEM

The airplane features a high voltage electric power system. The primary energy source are two Pipistrel PB345V124E-L or two PB345V119E-L battery boxes, which are located fore and aft of the cabin. This ensures redundancy of the power-source. In case of battery failure, the faulty battery gets automatically disconnected from the system. A single battery is capable of standalone operation and has enough power output capability to support aircraft climb and continuation of flight. The batteries are controlled by a BMS, that continuously monitors and manages battery parameters and status to ensure safe operations.

1.6.4. LANDING GEAR

The airplane has as a tricycle type fixed landing gear. The nose wheel is steerable via rudder pedals. The main wheels are equipped with hydraulic disc brakes, which are independently operated via toe-pedals. A parking brake lever is also present.

1.7. SYMBOLS, ABBREVIATIONS AND TERMINOLOGY

1.7.1. GENERAL AIRSPEED TERMINOLOGY AND SYMBOLS

KCAS Knots Calibrated Airspeed is the indicated airspeed corrected for position and instrument error expressed in knots. Calibrated airspeed (CAS) is equal to true airspeed in standard atmosphere at sea level.

KIAS Knots Indicated Airspeed is the speed shown on the airspeed indicator (IAS) expressed in knots. The IAS values published in this handbook assume no instrument error.

KTAS Knots True Airspeed is the airspeed expressed in knots relative to undisturbed air which is KCAS corrected for altitude and temperature.

V_G Best Glide Speed is the speed at which the greatest flight distance is attained per unit of altitude lost with power off.

V_A Operating Maneuvering Speed is the maximum speed at which application of full control movement will not overstress the airplane.

V_{FE} Maximum Flap Extended Speed is the highest speed permissible with wing flaps in a prescribed extended position.

V_{NO} Maximum Structural Cruising Speed is the speed that should not be exceeded except in smooth air, and then only with caution.

V_{NE} Never Exceed Speed is the speed that may not be exceeded at any time.

V_{S0} Stalling Speed is the minimum steady flight speed at which the aircraft is controllable in the landing configuration (100% flaps) at the most unfavorable weight and balance.

V_X Best Angle of Climb Speed is the speed at which the airplane will obtain the highest altitude in a given horizontal distance. The best angle-of-climb speed normally increases slightly with altitude.

V_Y Best Rate of Climb Speed is the speed at which the airplane will obtain the maximum increase in altitude per unit of time. The best rate-of-climb speed decreases slightly with altitude.

V_H Maximum speed in level flight with maximum continuous power.

GS Ground Speed is the horizontal speed relative to the ground.

1.7.2. METEOROLOGICAL TERMINOLOGY

IMC Instrument Meteorological Conditions are meteorological conditions expressed in terms of visibility, distance from cloud, and ceiling less than the minimal for visual flight defined in FAR 91.155.

ISA International Standard Atmosphere (standard day) is an atmosphere where
(1) the air is a dry perfect gas,
(2) the temperature at sea level is 15 °C,
(3) the pressure at sea level is 1013.2 millibars (29.92 inHg), and
(4) the temperature gradient from sea level to the altitude at which the temperature is -56.5 °C is -0.00198 °C per foot and zero above that altitude.

MSL Mean Sea Level is the average height of the surface of the sea for all stages of tide. In this Handbook, altitude given as MSL is the altitude above the mean sea level. It is the altitude read from the altimeter when the altimeter's barometric adjustment has been set to the altimeter setting obtained from ground meteorological sources.

OAT Outside Air Temperature is the free air static temperature obtained from in-flight temperature indications or from ground meteorological sources. It is expressed in either degrees Celsius or degrees Fahrenheit.

PA Pressure Altitude (ft) is the altitude read from the altimeter when the altimeter's barometric adjustment has been set to 1013 mb (29.92 inHg) corrected for position and instrument error. In this Handbook, altimeter instrument errors are assumed to be zero.

DA Density Altitude (ft) is pressure altitude corrected for non-standard temperature. As temperature and altitude increase, air density decreases.

- Standard Temperature is the temperature that would be found at a given pressure altitude in the standard atmosphere. It is 15 °C at sea level pressure altitude and decreases approx. 2 °C for each 1000 feet of altitude increase.

AAL Above Aerodrome Level

1.7.3. PROPULSION SYSTEM TERMINOLOGY

BMS	Battery Management System
ENGINE	In this POH is defined as the system composed by electric motor and power controller.
HP	Horsepower is the power developed by the motor.
INTERLOCK	A system that detects power cable connection to the battery box. In case of disconnection, also interlock signal is lost and disconnection is detected.
kW	Kilowatt: it is unit that express the power developed by the motor.
MCP	Maximum Continuous Power is the maximum power that can be used continuously.
MPTOP	Minimum Performance Take off Power is the maximum power available for take off with batteries at the end of their service life and low SOC (SOH~0% and SOC=15%).
MTOP	Maximum Take Off Power is the maximum power available for take off, albeit for a limited time. This value can be reached when batteries are in good condition (high SOC/SOH).
PROPULSION SYSTEM	In this POH is defined as the system composed by electric motor, power controller, propeller and batteries.
RFT	Remaining Flight Time (displayed on EPSI, for information only)
RPM	Revolutions Per Minute is motor rotational speed.
SOC	State Of Charge (displayed on EPSI - Flight page) is the amount of energy stored in the battery, expressed as percentage of full capacity. Absolute full capacity is not constant, but can be affected by several factors (i.e. SOH, temperature).
SOH	State Of Health (displayed on EPSI - System page) indicates the "age" of the battery. End of life is SOH=0%. This parameter affects the absolute capacity of the battery (energy that can be stored), and the power that the battery can deliver.
TC	Power module of the charger.

1.7.4. PERFORMANCE TERMINOLOGY

g — One “g” is a quantity of acceleration equal to that of earth’s gravity.

- Demonstrated Crosswind Velocity is the velocity of the crosswind component for which adequate control of the airplane during taxi, take off, and landing was actually demonstrated during certification testing.
- Service Ceiling is the maximum altitude at which the aircraft at maximum weight has the capability of climbing at a 100 ft/min.

1.7.5. WEIGHT AND BALANCE TERMINOLOGY

MTOM	**Maximum Take Off Mass** is the maximum overall mass allowed at take off.
C.G. or CG	**Center of Gravity** is the point at which an airplane would balance if suspended. Its distance from the reference datum is found by dividing the total moment by the total weight of the airplane. All references to C.G. in this manual are references to the in-flight C.G.
-	**Arm** is the horizontal distance from the reference datum to the center of an item's gravity. The airplane's arm is obtained by adding the airplane's individual moments and dividing the sum by the total weight.
-	**Basic Empty Weight** is the actual weight of the airplane including all operating fix installed equipment of the airplane.
MAC	**Mean Aerodynamic Chord** is the chord drawn through the centroid of the wing plan area.
R or LEMAC	**Leading Edge of Mean Aerodynamic Chord** is the forward edge of MAC aft of the reference datum.
-	**Maximum Gross Weight** is the maximum permissible weight of the airplane and its contents as listed in the aircraft specifications.
-	**Moment** is the product of the item weight multiplied by its arm.
-	**Useful Load** is the basic empty weight subtracted from the maximum weight of the aircraft. It is the maximum allowable combined weight of pilot and passenger.
-	**Reference Datum** is an imaginary vertical plane from which all horizontal distances are measured for balance purposes.
-	**Tare** is the weight of all items used to hold the airplane on the scales for weighing. Tare includes blocks, shims, and chocks. Tare weight must be subtracted from the associated scale reading.
WBR	**Weight and Balance Report** is part of the aircraft documentation and is a record of aircraft empty weight and C.G. location.
MLE	**Minimum List of Equipment** is the list of instruments, systems and equipment that must be on board and functional for a kind of operation.
TOM	**Take Off Mass** is the aircraft mass at take off. On VELIS Electro Non Type Certified this value does not change during the entire flight.

1.7.6. ADDITIONAL ABBREVIATIONS

AH	Artificial Horizon
AHRS	Attitude and Heading Reference System
AOA	Angle Of Attack
BATT	Battery/Batteries
COM	Communication - Radio
EA	Electrical Aircraft
ELT	Emergency Locator Transmitter
HV	High Voltage
IFR	Instrumental Flight Rules
NVFR	Night-Visual Flight Rules
PVS	Pipistrel Vertical Solutions
VFR	Visual Flight Rules

1.8 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 inHg	1 inHg	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 hPa

1.9 LIST OF APPLICABLE DOCUMENTS

Reference	Document
[1]	WBR-128-08-10-XXX* Weight and Balance Report
[2]	ELT_345_Manual_Y1-03-0282J
[3]	EIM-811-00-60-7202 Engine Operator`s Manual
[4]	PIM-812-61-00-001 Propeller Instruction Manual
[5]	AMM-X128-00-60-001 Aircraft maintenance manual
[6]	Horis - Installation and User Manual (by Kanardia d.o.o.)
[7]	TN-X128-00-80-001 Flight_Data_Logging
[8]	SPOH-128-00-40-001 Leaflet ground risks
[9]	TN-X128-00-80-999 Software configuration overview
[10]	IM-801-00-40-001 Off-board Charger M20 Instruction manual

* Where XXX represents the last three digits of the aircraft's serial number

NOTE: Latest revision of listed documents has to be used.

SECTION 2

SECTION 2 – LIMITATIONS

TABLE OF CONTENTS

2.1 INTRODUCTION

This section provides operating limitations, instrument markings and basic placards necessary for the safe operation of the airplane and its standard systems and equipment.

2.2 AIRSPEED LIMITATIONS

All speeds in the table below are KIAS.

Speed	KIAS	Remarks
V_{NE}	**108**	**Never Exceed Speed** is the speed limit that may not be exceeded at any time. Maximum speed for all operations.
V_{NO}	98	**Maximum Structural Cruising Speed** is the speed that should not be exceeded except in smooth air.
V_A	100	**Operating Maneuvering Speed** is the maximum speed at which full control travel may be used.
V_{FE}	81	**Maximum Flap Extended Speed** is the highest speed permissible with wing flaps extended at (+1) stage, 65 KIAS for (+2) stage.
V_{S0}	47	**Stall speed in landing configuration.** Stall speed for flaps (+2) stage.
V_S	54	**Stall speed clean.** Stall speed for flaps (0) stage.

2.3 AIRSPEED INDICATOR MARKINGS

All speeds in the table below are KIAS.

MARKING	VALUE	REMARKS
White Arc	47 - 81	Flap Operating Range. Lower limit is the most adverse stall speed in the landing configuration. Upper limit is the maximum speed permissible with flaps extended at 1st stage.
White triangle	65, 81	Flap speed limitations for (+2) stage, (+1) stage.
Green Arc	54 - 98	Normal Operating Range. Lower limit is the maximum weight stall at most forward C.G. in clean configuration. Upper limit is the maximum structural cruising speed. **NOTE:** Clean configuration is regarded as Flaps in position (0).
Yellow Arc	98 - 108	Caution Range. Operations must be conducted with caution and only in smooth air.
Red Line	108	Never exceed speed. Maximum speed for all operations.

2.4 ENGINE AND PROPELLER LIMITATIONS

ENGINE	**Pipistrel electric engine E-811-268MVLC**
Maximum rated take off power (MTOP)	57.6 kW (limited to 90 sec)
Maximum rated continuous power (MCP)	49.2 kW
Maximum take off rpm	2500 RPM (electronically limited)
Maximum continuous rpm	2350 RPM
Motor temperature	min -20 °C, max +110 °C
Power controller temperature	min -20 °C, max +70 °C
PROPELLER	**Pipistrel propeller P-812-164-F3A**
Maximum rpm	2500 RPM
Maximum continuous rpm	2300 RPM

2.5 ENGINE INSTRUMENT MARKINGS (EPSI570C)

EPSI570C	RED LINE	GREEN ARC	YELLOW ARC	RED LINE
	MINIMUM	NORMAL	CAUTION	MAXIMUM
Tachometer (RPM)		0 / 2299	2300 / 2499	2500
Motor temp. (°C)		(-20) / 99	100 / 109	110
Power controller temp. (°C)		(-20) / 64	65 /69	70
Battery sys temp. (°C)	5	11 / 50	6 / 10 51 / 57	58
Motor Power (PWR) (kW)*		0 / 48	49 / 65	66

* **NOTE:** Additional markings for motor power indication on EPSI570C are: a) Single battery operation power setting - 40 kW - b) Minimum Performance Take Off Power - MPTOP - 50 kW (low battery SOH) - c) Negative value when recuperation is active, eg: -5 kW.

2.6 WEIGHT AND CENTER OF GRAVITY LIMITS

Maximum take off weight	600 kg
Maximum useful load	Typically 172 kg, or value detailed in [1]
Maximum landing weight	600 kg
Most forward CG (with crew)	25.2 % MAC / 269 mm
Most rearward CG (with crew)	32.6 % MAC / 336 mm

NOTE: The reference datum is wing's leading edge at root.

2.7 OCCUPANCY

Max. Occupancy	Pilot and 1 Passenger
Minimum weight solo pilot	34 kg
Maximum weight per seat	110 kg
Maximum pilot and occupant weight	see [1]
Maximum baggage weight	No baggage

2.8 COOLANT

Motor, power electronics and batteries are liquid cooled (distilled water/glycol).

Approved coolant	50% water + 50% glycol automotive grade G12+
Coolant level	Both expansion tank windows full of coolant and bubble free
Cooling system capacity	0.9 L for engine system 5.4 L for battery system

2.9 FLIGHT LOAD FACTOR LIMITS

Up to V_A	+ 4.0 g / - 2.0 g
Up to V_{NE}	+ 4.0 g / - 2.0 g

2.10 MANEUVER LIMITS

Aircraft is intended for “non-aerobatic” and for “VFR day” operation only. Non-aerobatic operation includes:

a) Any maneuver incidental to normal flying

b) Stalls (except whip stalls)

c) Eights, chandelles, and steep turns, in which the angle of bank is not more than 60°.

All spins are prohibited.

2.11 ALTITUDE LIMITS

Maximum operating altitude	12,000 ft MSL

2.12 TEMPERATURE LIMITS

Aircraft equipped with battery type PB345V124E-L:	can be operated only between -20 °C < OAT < +35 °C
Aircraft equipped with battery type PB345V119E-L:	can be operated only between -5 °C < OAT < +36 °C

Do not fly when the temperature of the aircraft's surface is at risk of exceeding 55 °C.
Batteries should be stored between 0 °C < OAT < +30 °C (recommended %SOC range 30-80 %SOC)
Minimum battery temperature before engine start is 0 °C (Protected by automatic self test at start up)
Maximum battery temperature at take off is +45 °C *
Charging temperature range is 0 °C < battery temperature < +45 °C

***CAUTION:** when battery temperatures are above 40 °C, prolonged high-power application (circuit patterns or prolonged climb at MCP) may lead to battery high temperature.

2.13 MINIMUM FLIGHT CREW

The minimum flight crew is one pilot.

2.14 KIND OF OPERATIONS

The airplane is approved for VFR-Day operations only.

NOTE: The airplane must be equipped according to the MLE for the planned kind of operation, see 2.14.1.

2.14.1 MINIMUM LIST OF EQUIPMENT

SYSTEM, INSTRUMENT, EQUIPMENT	MLE - REQUIRED FOR KIND OF OPERATION (item Qty)
	VFR Day
VHF COM / (NAV)	—
Transponder	—
Low Voltage Battery (aux battery)	1
Ammeter / Indication	1*
Emergency Locator Trans.	—
Pitch Trim Indicator	1
Pitch Trim Actuator	1
Airplane Flight Manual	1
Airspeed Indicator	1
Altimeter	1
Magnetic Compass	1
Pitot System	1
Static System	1
Kanardia Horis	—
Vertical Speed Indicator	—
EPSI570C	1
High Voltage Battery	2
Warning Panel/Annunciator	1
Batt Overtemp Warning Lights	2
Motor Power Indicator	1*
Battery SOC/SOH indicators	2*
RPM Indicator	1*
RPM/Power Indicator Backup (Kanardia)	—
Motor Temperature Indicator	1*
Power Controller Temperature Indicator	1*
Battery Temperature Indicators	2*
Stall Warning System	1

* The indication is integrated into the EPSI570C system/display.

2.15 OPERATIONAL RESTRICTIONS

Flight under Instrument Flight Rules (IFR) is not permitted.		
NVFR Flight is not permitted.		
Minimum SOC at take off = 50%.		
Standard mission planning must consider 30% SOC as minimum value at landing.		
Do not initiate a go-around procedure if SOC < 15%. (Remaining energy will not be sufficient for another safe circuit pattern)		
MTOP must be limited to 90 seconds.		
Flight into known icing conditions is prohibited.		
No flights in heavy rainfall or blizzard conditions.		
Areas with risk of thunderstorms should be avoided.		
Smoking is prohibited.		
Do not fly when the temperature of the aircraft's surface is at risk of exceeding 55 °C.		
Depending on battery type installed, the aircraft can be operated only when:	-20 °C < OAT < +35 °C	PB345V124E-L
	-5 °C < OAT < +36 °C	PB345V119E-L
Maximum battery temperature at take off is +45 °C *		
Avoid applying more than 75% rudder deflection during cruise/climb/approach as this may cause a pitch-down moment.		
The USB power outlets are not approved to supply power to flight-critical communication or navigation devices.		
No intentional spins.		
AHRS (Kanardia Horis) and GPS is for information only and should not be used for primary navigation as well as attitude and heading references.		

***CAUTION**: when battery temperatures are above 40 °C, prolonged high-power application (circuit patterns or prolonged climb at MCP) may lead to battery high temperature.

2.16 PLACARDS

2.16.1 PLACARDS (EXTERNAL)

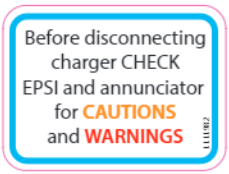
Next to nose wheel

Next to main wheels (2x)

Next to door handles

On charging port door
on the upper engine cowling

On the inner side
of charging port door



Covering the battery exhaust
outlets (2x)

Next to battery cooling inlet/outlet on the fuselage

Next to engine and battery cooling system coolant overflow hoses

Around the static ports (2x)

Around the drainage holes in fuselage, wings, control surfaces (16x)

2.16.2 PLACARDS (ENGINE AND BATT COMPARTMENTS)

On battery boxes:

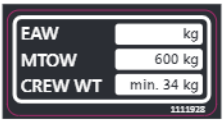
(6x each battery box)

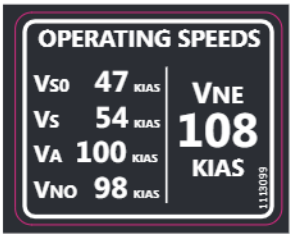
(6x each battery box)

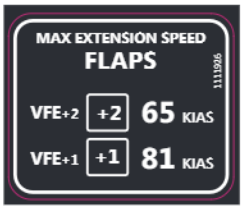
(1x each battery pack)

On coolant expansion tanks (2x)

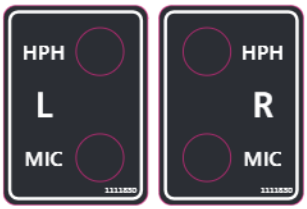
2.16.3 PLACARDS (INSTRUMENT PANEL)







Next to microphone/
headphone jacks



On the left and right side of the instrument panel

2.16.4 PLACARDS (CENTER CONSOLE)

Next to flap lever

Next to parking brake lever

Next to power lever

2.16.5 PLACARDS (CABIN)

In front of control sticks
rudder pedal adjustment (2x)

Below each door to depict door handle operation

On the cabin support strut in front of the pilot

Next to the compass

DATE:			Calibrated with radio ON OFF			
For	N	30	60	E	120	150
Steer						
For	S	210	240	W	300	330
Steer						

2.16.6 PLACARDS (EXTERNAL - HIGH VOLTAGE HAZARD)

On battery compartment access panels (3x)

On the aircraft belly (3x)

NOTE: Additional placards may be present if required by local regulations for experimental aircraft.

This page is intentionally left blank.

SECTION 3

SECTION 3 – EMERGENCY PROCEDURES

TABLE OF CONTENTS

3.1 INTRODUCTION

Depending on aircraft equipment, apply content from the following sections:

EQUIPMENT	POH SECTION
PB345V124E-L High Voltage Battery	10-3A
PB345V119E-L High Voltage Battery	10-3B

This page is intentionally left blank.

SECTION

4

SECTION 4 – NORMAL PROCEDURES

TABLE OF CONTENTS

4.1 INTRODUCTION

This section includes all procedures for normal operation.

4.2 AIRSPEEDS FOR NORMAL OPERATION

Unless otherwise noted, the following speeds are based on a maximum mass of 600 kg and may be used for any lower actual mass. However, to achieve the performance specified in Section 5 for take off and landing distance, the speed correction, adjusted to the particular mass, must be used.

TAKE OFF ROTATION		
Normal	Flaps +1	50 KIAS

CLIMB		
Normal	Flaps 0	75 KIAS
Best rate of climb (SL) - V_Y	Flaps 0	75 KIAS
Best angle of climb (SL) - V_X	Flaps 0	57 KIAS

LANDING APPROACH		
Normal approach	Flaps +1	65 KIAS
Normal approach	Flaps +2	60 KIAS

GO AROUND		
Full power	Flaps as practical	59 KIAS

Maximum demonstrated crosswind velocity	
Taxi, Take off and landing	15 kts (7.5 m/s)

4.3 PREFLIGHT INSPECTION

Before carrying out preflight inspections, ensure that all required maintenance has been performed. Review your flight plan and compute weight and balance.

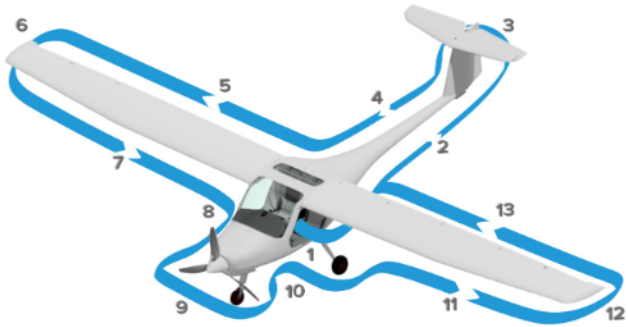
NOTE: Throughout the walk-around: check all visible hinges, hinge pins, and bolts for security; check skin for damage, condition, impact damage or bumps, paint separations and evidence of cracks or delamination, check all control surfaces for proper movement and excessive free play.

In cold weather, remove all frost, ice, or snow from fuselage, wing, stabilizers and control surfaces. Ensure that control surfaces are free of ice or debris. Check that wheels are free of snow and ice accumulation.

NOTE: It is important to remove the upper engine cowling and crew seats for a general inspection at least before the first flight of the day. Special attention should be paid to any signs of leakage. The coolant level of both the engine and battery should be checked by verifying that both expansion tank windows are full of coolant and contain no bubbles. The transparent system hoses that are accessible after removing the upper cowling and crew seats, should also be checked and the absence of air bubbles verified. All visible electric and control cable connections should be checked for wear. All drain holes shall be verified clean and unobstructed.

4.3.1 PREFLIGHT WALK-AROUND

Preflight walk-around should be performed according to the flow indicated in the following picture.



1) CABIN		
1	Doors	UNLOCK/OPEN/CLOSE/SECURE
2	ALL switches	CHECK OFF
3	Parking brake	ENGAGE
4	Main wing spars and connectors	CHECK
5	Instrument panel, EPSI570C and all other instruments	CHECK condition, displays OK, EPSI USB cap present
6	Headphones/microphones	Connected
7	Required documents	ON BOARD
8	ELT switches (remote switch and transmitter)	CHECK both in ARM/OFF position (armed)
9	Flight Controls and flap handle	CHECK free and correct
10	MASTER switch	ON
11	Batt overtemp warning lights - Annunciator - Haptic stall warning	CHECK SELFTEST (see section 7.6.7 for details)
12	AVIONICS switch	ON
13	Circuit breakers	CHECK ENGAGED
14	Instruments	CHECK functional
15	Elevator trim	Centered
16	Power lever	CUT OFF
17	BATT EN switch	ON
18	PWR EN switch	ON
19	EPSI570C display * / annunciator	Flight/System page available, CHECK no warnings/cautions
20	AUX BATT Voltage on EPSI570C	CHECK > 13V
21	HV Battery type on-board (system page)	VERIFY **
22	HV Battery %SOC, SOH, temp and status "ACTIVE"(system page)	CHECK
23	Engine (power controller and motor) temperatures	CHECK
24	PWR EN switch	OFF

25	BATT EN switch	OFF
26	AVIONICS switch	OFF
27	MASTER switch	OFF
28	Formatted USB drive (if required for data logging)	Insert

* **CAUTION:** Do not take off if normal FLIGHT/SYSTEM operation mode is not available and functional on EPSI570C display.

** **CAUTION:** When the aircraft is equipped with PB345V119E-L high voltage battery type, the battery designation is displayed on the EPSI570C - System page. The pilot must ensure that the correct limitations, emergency procedures and performance data are applied, according to the specific battery type installed. Battery boxes must always be of the same type/model.

2) LEFT FUSELAGE		
1	COM antenna (top)	Condition and attachment
2	XPDR antenna (underside)	Condition and attachment
3	Static pressure port	CHECK for blockage
4	Battery cooling system inlet/outlet	CHECK no obstructions
5	Rear battery compartment panel	CHECK closed

3) EMPENNAGE		
1	Tie down rope	Remove
2	Horizontal and vertical stabilizers	CHECK condition
3	Elevator and elevator U-piece	Condition and movement
4	Rudder	Condition and movement
5	Attachment bolts, hinges, nuts	CHECK condition - Secured

4) RIGHT FUSELAGE		
1	Static pressure port	Check for blockage
2	Door lock	CHECK Unlocked
3	Battery exhaust outlet	CHECK no thermal runaway
4	ELT antenna (top)	Condition and attachment

5) - 6) - 7) RIGHT WING		
1	Wing / fuselage seal	CHECK

2	Flaperon	Condition, security and movement
3	Flaperon gap seal	Security, no wrinkles
4	Hinges, nuts	CHECK condition - Secured
5	Tip	CHECK condition
6	Leading edge	CHECK condition
7	Pitot tube	Cover removed, attachment, tube clear

8) RIGHT MAIN LANDING GEAR		
1	Landing gear	General condition
2	Tire	Condition, inflation, and wear
3	Wheel and brakes	Fluid leaks, evidence of overheating, general condition and wear
4	Chocks and tie down rings/ropes	Remove

9) PROPELLER AND COWLINGS AREA		
1	Cowlings	Attachment secured
2	Propeller	CHECK condition
3	Hub and blades	CHECK condition and blade pitch marker paint at blade roots
4	Spinner	CHECK condition
5	Propeller/spinner bolts and screws	CHECK
6	Air inlets, outlets	Unobstructed
7	Charging port door	Closed and latched
8	Coolant inspection door	Closed and latched

WARNING: Keep clear of propeller rotation plane. Do not allow others to approach propeller.

NOTE: Detailed information about propeller can be found in the propeller operator's manual [4].

9) MOTOR AND NOSE LANDING GEAR AREA		
1	Strut	CHECK condition
2	Nose landing gear	CHECK condition
3	Wheel and tire	CHECK condition

4	Shock absorber	CHECK/TEST
5	Front battery compartment panels	CHECK closed
6	Battery exhaust outlet	CHECK no thermal runaway

10) LEFT MAIN LANDING GEAR		
1	Landing gear	General condition
2	Tire	Condition, inflation, and wear
3	Wheel and brakes	Fluid leaks, evidence of overheating, general condition and wear
4	Chocks and tie down rings/ ropes	Remove

11) - 12) - 13) LEFT WING		
1	Leading edge	CHECK condition
2	Tip	CHECK condition
4	Flaperon	Condition, attachment, movement
5	Flaperon gap seal	Condition, no wrinkles
6	Hinges, nuts	CHECK condition - Secured
7	Wing / fuselage seal	CHECK

4.4 STARTING MOTOR

4.4.1 BEFORE STARTING MOTOR

CAUTION: To ensure proper and safe use of the aircraft it is essential to familiarize yourself with the motor's limitations and motor manufacturer's safety warnings. Additional details and information can be found in Engine operator's manual [3].

Before motor start-up make sure the area in front of the aircraft is clear. Check SOC to make sure there is sufficient battery power for the planned duration of flight (in any case ≥50 %SOC) and landing with 30% residual SOC.

BEFORE START-UP		
1	MASTER switch	CHECK OFF
2	AVIONICS switch	CHECK OFF
3	BATT EN switch	CHECK OFF
4	PWR EN switch	CHECK OFF
5	Aircraft log book	FILLED
6	Doors	CHECK LATCHED AND SECURED
7	Position of rudder pedals	SET and LOCKED
8	Flight Controls	FULL, FREE AND CORRECT
9	Seat belts	ADJUSTED AND FASTENED
10	Power lever	CUT OFF
11	Parking brake	ENGAGE
12	Circuit breakers	CHECK ALL ENGAGED
13	ELT remote switch*	CHECK "ARM/OFF" position (armed)

* **NOTE:** Periodical testing of ELT operation is required (once a month advised, but not more than once per week). Please see OEM [2] for details about testing procedure.

4.4.2 STARTING THE MOTOR - BEFORE TAXIING

1	MASTER switch	ON
2	Batt overtemp warning lights - Annunciator - Haptic stall warning	CHECK SELFTEST (see section 7.6.7 for details)

NOTE: SELFTEST procedure and selftest pass criteria are described in Section 7.6.7. If selftest is not passed, do not take off and contact manufacturer.

3	AVIONICS switch	ON
4	Battery SOC on EPSI570C	CHECK sufficient for flight, and ≥50%

CAUTION: Do not take off if SOC is <50%! Recharge the batteries.

5	AUX Batt voltage on EPSI570C	CHECK > 13V
6	Batteries SOH on EPSI570C	CHECK > 0%

CAUTION: Do not take off if SOH=0%! Contact manufacturer.

7	Radio	TURN ON AND SET FREQUENCY
8	Transponder	TURN ON AND SET CODE
9	EPSI570C - system page:	CHECK BATTERIES *'READY'*
10	Power lever	CUT OFF
11	BATT EN switch	ON
12	PWR EN switch	ON
13	EPSI570C - system page:	CHECK BATTERIES *'ACTIVE'*
14	Time	NOTED
15	Parking brake	DISENGAGE
16	Power lever	INCREASE FOR TAXI

NOTE: If motor doesn't start running, check the position of the power lever. It will only start running after power is applied from the CUT OFF position.

4.4.3 TAXIING

When taxiing, directional control is accomplished with pedal deflection and with the use of toe activated brakes when necessary. Use only as much power as is necessary to achieve forward movement. Deceleration or taxi speed control using brakes, but without a reduction in power, will result in increased brake temperature and may, in extreme cases, cause fire. Taxi over loose gravel at low motor speed to avoid damage to the propeller tips. During the taxi, use minimum power for movement and proper braking procedures. If this is not observed, the brake system may overheat and result in brake damage or brake fire.

4.4.4 BEFORE TAKE OFF

WARNING: Do not take off with frost, ice, snow, or other contamination on the fuselage, wing, stabilizers and/or control surfaces.

BEFORE TAKE OFF		
1	Doors	CHECK latched and secured
2	Seat Belts	CHECK FASTENED

3	Pitot Cover	CHECK removed
4	Flaps	+1
5	Trim	SET NEUTRAL
6	Power lever	CUT OFF
7	Parking brake	DISENGAGE
8	MASTER switch	CHECK ON
9	AVIONICS switch	CHECK ON
10	BATT EN switch	CHECK ON
11	PWR EN switches	CHECK ON
12	Transponder	SET
13	EPSI570C	CHECK TEMPERATURES
14	Altimeters	SET TO QNH OR QFE
15	Annunciator/warning panel - EPSI570C	CHECK no cautions/warnings

POWER CHECK		
1	Parking brake	CHECK ENGAGED
2	Power lever	FULL
3	Power (EPSI570C - flight page)	CHECK ≥ 50 kW
4	Power lever	CUT OFF
5	EPSI570C - system page:	CHECK BATTERIES *'ACTIVE'*
6	EPSI570C - Engine and battery temperatures	CHECK *
7	Annunciator/warning panel - EPSI570C	CHECK no cautions/warnings

CAUTION: At full power the motor RPM should be between 2200 and 2500, while the motor power should be 50 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 is 45 °C at take off (see Limitations). Battery temperatures > 40 °C at take off may result in high in-flight battery temperatures when OAT is high or high power settings are applied. See also Section 3 - Emergency procedures.

4.5 TAKE OFF

4.5.1 TAKE OFF RUN AND FLAP SETTINGS

For take off over a gravel or grass surface, advance power lever slowly. This allows the airplane to start rolling before high RPM is developed and gravel will be blown behind the propeller rather than pulled into it.

During the take off run, pull the stick gently to lift the nose wheel from the ground and set positive incidence. The aircraft will lift-off as speed increases.

Normal and short field take offs are accomplished with flaps set at (+1). Take offs using flaps (0) are permissible, however, no performance data is available for take offs in the flaps up configuration.

Soft or rough field take offs are performed with (+1) or (+2) flaps by lifting the airplane off the ground as soon as practical in a tail-low attitude. If no obstacles are ahead, the airplane can be accelerated immediately to a higher climb speed, while considering the flap limit airspeed.

Take offs into strong crosswinds are normally performed with the flaps set at (+1). Start the take off run with the control column deflected into the wind. Maintain direction with rudder, decreasing the aileron deflection as speed increases. Rotate at a speed slightly higher than normal. When clear of the ground, make a coordinated turn into the wind to correct for drift.

TAKE OFF		
1	Power lever	FULL
2	Power indication	CHECK ≥ 50 kW
3	EPSI570C / annunciator	CHECK GREEN / NORMAL / no warnings or cautions
4	Airspeed	CHECK increasing
5	Rotate	SET slight positive pitch and lift off (50 KIAS)
6	Airspeed (initial climb)	57 - 60 KIAS

	At safe altitude (300 ft AAL)	
7	Flaps	0
8	Power lever	REDUCE TO MCP
9	Airspeed	INCREASE TO 75 KIAS (V_Y)

CAUTION: Add power gradually, as sudden bursts of power can cause airframe damage on certain runways due to stones and debris.

WARNING: If, during the take off run, the motor PWR is less than 50 kW with power lever in full position, abort the take off immediately, come to a standstill and verify systems.

4.6 CLIMBING

Normal climbs are performed with flaps (0) and with power up to MCP (48 kW), with constant monitoring of propulsion system temperatures.

CAUTION: in case of prolonged MCP applications (i.e. unusual continuous climb from take off to ceiling altitude), batt temperature may reach the caution range, depending on OAT. Avoiding continuous climbs at MCP setting when flying at high OAT is advisable. Alternating climb legs with short cruise phases at lower power settings is recommended.

NOTE: V_X: 57 KIAS [flaps (0)], V_Y: 75 KIAS [flaps (0)]

1	Climb Power	SET
2	Flaps	0
3	EPSI570C Parameters	CHECK/MONITOR

CAUTION: Prolonged use of higher power settings may increase engine system temperatures.

4.7 CRUISE

Normal cruising is performed with power setting between 20-36 KW.

1	Flaps	0
2	Cruise Power	SET
3	EPSI570C Parameters/SOC/RFT	CHECK/MONITOR

4.8 DESCENT/APPROACH

1	Altimeters	SET
2	EPSI570C Parameters/SOC/RFT	CHECK
3	Parking brake	CHECK DISENGAGED

NOTE: Due to the highly efficient design, descent rate in clean configuration and power lever idle may be lower than other airplanes of the same category. See Section 5 - Performance - for additional information.

4.9 LANDING

	Abeam threshold	
1	Power lever	REDUCE TO CUT OFF
2	Flaps (below 81 kts)	+1
3	Airspeed	MAINTAIN 65 KIAS
	Final	
4	Flaps (below 65 kts)	+2
5	Airspeed	MAINTAIN 60 KIAS

CAUTION: Landings should be made with full flaps. Glideslope should be controlled with power lever. Landings with less than full flaps are recommended in crosswinds, if the flaps fail to deploy or in order to extend the aircraft's glide distance due to motor malfunction.

NOTE: Due to the highly efficient design, descent rate in clean configuration and power lever idle may be lower than other airplanes of the same category. See Section 5 - Performance - for additional information.

Normal Landing

Normal landings are made with full flaps and with power on or off. Surface winds and air turbulence are usually the primary factors in determining the most comfortable approach speeds. When in recuperation mode (see appendix 9-A1), the airplane benefits from approximately 25% increase in sink rate, which allows for better control and handling over the descent and approach.

Actual touchdown should be made with power off and on the main wheels first to reduce the landing speed and subsequent need for braking. Gently lower the nose wheel to the runway after airplane speed has diminished. This is especially important for rough or soft field landings.

Short Field Landing

For a short field landing in smooth air conditions, make an approach at 60 KIAS with full flaps using enough power to control the glide path (slightly higher approach speeds should be used under turbulent air conditions). After all approach obstacles are cleared, progressively reduce power to reach idle just before touchdown and maintain the approach speed by lowering the nose of the airplane. Touchdown should be made with power-off and on the main wheels first. Immediately after touchdown, lower the nose wheel and apply braking as required. For maximum brake effectiveness, retract the flaps, hold the control stick full back, and apply maximum brake pressure without skidding.

Crosswind Landing

Normal crosswind landings are made with (+1) flaps. Avoid prolonged slips. After touchdown, hold a straight course with rudder and brakes as required. The maximum allowable crosswind velocity is dependent upon pilot capability as well as aircraft limitations. Operation in direct crosswinds of 15 kts (7.5 m/s) has been demonstrated.

4.10 BALKED LANDING/GO AROUND

In a balked landing (go around), apply full power and climb at 59 KIAS, then after clearing any obstacles, retract the flaps, accelerate to the normal climb speed and repeat the pattern.

CAUTION: Go around maneuver should not be initiated if SOC is lower than 15%!

1	Power Lever	FULL
2	Airspeed	59 KIAS
	After clear of obstacles:	
4	Flaps	0
5	Airspeed	As required
6	EPSI570C Parameters/SOC/RFT	CHECK

NOTE: To minimize pilot's workload during the maneuver, it is advisable to reconfigure the aircraft from flaps (+2) directly to flaps (0) once safe altitude is reached.

4.11 AFTER LANDING

1	Power Lever	as required for taxi
2	Flaps	0

4.12 SHUT DOWN

1	Power lever	CUT OFF
2	ELT	CHECK not transmitting
3	Time	Noted
4	Hobbs time (EPSI system page)	Noted
5	PWR EN switch	OFF
6	BATT EN switch	OFF

NOTE: After a hard landing, the ELT may activate (flashing red light on ELT remote switch). To reset it, set the remote switch to ON first and then back to ARM/OFF position. Please check OEM documentation [2] for additional information.

4.13 PARKING

1	Parking brake	ENGAGED (if necessary)
2	AVIONICS switch	OFF
3	MASTER switch	OFF

4	BATT EN switch	CHECK OFF
5	PWR EN switch	CHECK OFF
6	Aircraft log book	Filled
7	Formatted USB drive (if applicable)	Remove
8	Pitot cover	Apply
9	Wheel chocks	Apply

4.14 SOFT FIELD OPERATIONS

Soft fields are runways that have rough or soft surfaces, such as sand, snow, mud, or tall grass. Take off and landing procedures for soft field operations are described in 4.5.1. and 4.9.

4.15 STALL

The stall recovery procedure is standard and recovery can be performed by normal use of controls:

1	Control stick	Forward, to reduce angle of attack
2	Power lever	Add power
3	Horizontal flight	Resume

Stall recovery is performed with average pilot skills, with less than 20° of yaw or roll. The recovery maneuver generally requires less than 250 ft of altitude drop.

The aircraft is equipped with a haptic stall warning system in control stick handles that are activated as aerodynamic stall condition is imminent. An aural warning is emitted by the EPSI570C speaker and is also heard in the headsets.

Two stall types can be encountered when stalling the aircraft.

A-type stall: uncontrollable downward pitching motion (fully developed stall, usually accompanied by wing drop).

C-type stall: the control stick reaches the rear stop position.

Depending on a combination of several factors like aircraft mass, flaps setting, CG position, G-load, power setting and tempo of AOA increase/speed reduction, the stall can be A-type or C-type.

This page is intentionally left blank.

CHECKLISTS

NORMAL PROCEDURES

NOTE: Use of the following checklists is not obligatory and at the discretion of the owner/operator.

This page is intentionally left blank.

PREFLIGHT WALK-AROUND

(Check POH for inspections to be carried out before the first flight of the day)

CABIN	
Doors	UNLOCK/OPEN/ CLOSE/SECURE
ALL switches	CHECK OFF
Parking brake	ENGAGE
Wing spars and connectors	CHECK
Instrument panel, EPSI and all other instruments	CHECK condition, displays OK, EPSI USB cap present
Headphones/microphones	Connected
Required documents	ON BOARD
ELT switches (remote sw. and transmitter)	CHECK both switches in ARM/OFF position (armed)
Flight Controls and flap handle	CHECK free and correct
MASTER switch	ON
Batt overtemp warning lights - Annunciator - Haptic stall warning	CHECK SELFTEST
AVIONICS switch	ON
Circuit breakers	CHECK ENGAGED
Instruments	CHECK functional
Elevator trim	Centered
Power lever	CUT OFF
BATT EN switch	ON
PWR EN switch	ON
EPSI570C display / annunciator	Flight/System page ok, CHECK no warn/cautions

Continue →

CABIN (continue)	
AUX BATT Voltage on EPSI570C	CHECK > 13V
HV Battery type on-board (system page)	VERIFY
HV Battery %SOC, SOH, temp, status "ACTIVE" (system page)	CHECK
Engine temperatures	CHECK
PWR EN switch	OFF
BATT EN switch	OFF
AVIONICS switch	OFF
MASTER switch	OFF
Formatted USB drive (if required for data logging)	Insert
LEFT FUSELAGE	
COM antenna (top)	Condition and attachment
XPDR antenna (underside)	Condition and attachment
Static pressure port	CHECK for blockage
Battery cooling system inlet and outlet	CHECK no obstructions
Rear battery compartment access panel	CHECK closed

EMPENNAGE	
Tie down rope	remove
Horizontal and vertical stabilizers	CHECK condition
Elevator and elevator U-piece	Condition and movement
Rudder	Condition and movement
Attachment bolts, hinges, nuts	CHECK condition - Secured
RIGHT FUSELAGE	
Static pressure port	Check for blockage
Door lock	CHECK Unlocked
Battery exhaust outlet	CHECK no thermal runaway
ELT antenna (top)	Condition and attachment
RIGHT WING	
Wing / fuselage seal	CHECK
Flaperon	Condition, security and movement
Flaperon gap seal	Security, no wrinkles
Hinges, nuts	CHECK condition - Secured
Tip	CHECK condition
Leading edge	CHECK condition
Pitot tube	Cover removed, attachment, tube clear

RIGHT MAIN LANDING GEAR	
Landing gear	General condition
Tire	Condition, inflation, and wear
Wheel and brakes	Fluid leaks, evidence of overheating, general condition and wear
Chocks and tie down rings/ropes	Remove
PROPELLER AND COWLINGS AREA	
Cowlings	Attachment secured
Propeller	CHECK condition
Hub and blades	CHECK condition and blade pitch marker paint at blade roots
Spinner	CHECK condition
Propeller/spinner bolts and screws	CHECK
Air inlets, outlets	Unobstructed
Charging port door	Closed and latched
Coolant inspection door	Closed and latched

MOTOR and NOSE LANDING GEAR AREA	
Strut	CHECK condition
Nose landing gear	CHECK condition
Wheel and tire	CHECK condition
Shock absorber	CHECK/TEST
Front battery compartment access panels	CHECK closed
Battery exhaust outlet	CHECK no thermal runaway

LEFT MAIN LANDING GEAR	
Landing gear	General condition
Tire	Condition, inflation, and wear
Wheel and brakes	Fluid leaks, evidence of overheating, general condition and wear
Chocks and tie down rings/ropes	Remove

LEFT WING	
Leading edge	CHECK condition
Tip	CHECK condition
Flaperon	Condition, attachment, movement
Flaperon gap seal	Condition, no wrinkles
Hinges, nuts	CHECK condition - Secured
Wing / fuselage seal	CHECK

STARTING MOTOR

BEFORE START-UP	
MASTER switch	CHECK OFF
AVIONICS switch	CHECK OFF
BATT EN switch	CHECK OFF
PWR EN switch	CHECK OFF
Aircraft log book	FILLED
Doors	CHECK LATCHED AND SECURED
Position of rudder pedals	SET and LOCKED
Flight Controls	FULL, FREE AND CORRECT
Seat belts	ADJUSTED AND FASTENED
Power lever	CUT OFF
Parking brake	ENGAGE
Circuit breakers	CHECK ALL ENGAGED
ELT remote switch	CHECK "ARM/OFF" position (armed)
STARTING MOTOR - BEFORE Taxiing	
MASTER switch	ON
Batt overtemp warning lights - Annunciator - Haptic stall warning	CHECK SELFTEST
AVIONICS switch	ON
Battery SOC on EPSI570C	CHECK ≥ 50% and sufficient for the flight

Continue →

STARTING MOTOR - BEFORE Taxiing (continue)	
AUX Batt voltage on EPSI570C	CHECK > 13V
Batteries SOH on EPSI570C	CHECK > 0%
Radio	TURN ON AND SET FREQ
Transponder	TURN ON AND SET CODE
EPSI570C - system page:	CHECK BATTERIES 'READY'
Power lever	CUT OFF
BATT EN switch	ON
PWR EN switch	ON
EPSI570C - system page:	CHECK BATTERIES 'ACTIVE'
Time	NOTED
Parking brake	DISENGAGE
Power lever	INCREASE FOR TAXI
POWER CHECK	
Parking brake	CHECK ENGAGED
Power lever	FULL
Power (EPSI570C - flight page)	CHECK ≥ 50 kW
Power lever	CUT OFF
EPSI570C - system page:	CHECK BATTERIES 'ACTIVE'
EPSI570C - Engine and battery temperatures	CHECK
Annunciator/warning panel - EPSI570C	CHECK no cautions/ warnings

BEFORE TAKE OFF	
Doors	CHECK latched and secured
Seat Belts	CHECK FASTENED
Pitot cover	CHECK removed
Flaps	+1
Trim	SET NEUTRAL
Power lever	CUT OFF
Parking brake	DISENGAGE
MASTER switch	CHECK ON
AVIONICS switch	CHECK ON
BATT EN switch	CHECK ON
PWR EN switches	CHECK ON
Transponder	SET
EPSI570C	CHECK TEMPERATURES
Altimeters	SET TO QNH OR QFE
Annunciator/warning panel - EPSI570C	CHECK no cautions/ warnings

TAKE OFF

TAKE OFF	
Power lever	FULL
Power indication	CHECK ≥ 50 kW
EPSI570C / annunciator	CHECK GREEN / NORMAL / no warnings or cautions
Airspeed	CHECK increasing
Rotate	SET slight positive pitch and lift off (50 KIAS)
Airspeed (initial climb)	57-60 KIAS
At safe altitude (300 ft AAL)	
Flaps	0
Power lever	REDUCE TO MCP (48 kW)
Airspeed	INCREASE TO 75 KIAS (V_Y)

CLIMBING	
Climb Power	Set
Flaps	0
EPSI570C Parameters	CHECK/MONITOR

CRUISE	
Flaps	0
Cruise Power	SET (20-36 kW)
EPSI570C Parameters/ SOC/RFT	CHECK/MONITOR

DESCENT / APPROACH	
Altimeters	SET
EPSI570C Parameters/ SOC/RFT	CHECK
Parking brake	CHECK DISENGAGED

LANDING	
Abeam threshold	
Power lever	REDUCE TO CUT OFF
Flaps (below 81 kts)	+1
Airspeed	MAINTAIN 65 KIAS
Final	
Flaps (below 65 kts)	+2
Airspeed	MAINTAIN 60 KIAS

BALKED LANDING / GO AROUND	
Power Lever	FULL
Airspeed	59 KIAS
After clear of obstacles:	
Flaps	0
Airspeed	As required
EPSI570C Parameters/ SOC/RFT	CHECK

STALL	
Control stick	Forward, to reduce AOA
Power lever	Add power
Horizontal flight	Resume

AFTER LANDING	
Power Lever	as required for taxi
Flaps	0

SHUT DOWN	
Power lever	CUT OFF
ELT	CHECK not transmitting
Time	Noted
Hobbs time (EPSI system page)	Noted
PWR EN switch	OFF
BATT EN switch	OFF

PARKING	
Parking brake	ENGAGED (if necessary)
AVIONICS switch	OFF
MASTER switch	OFF
BATT EN switch	CHECK OFF
PWR EN switch	CHECK OFF
Aircraft log book	Filled
Formatted USB drive (if applicable)	Remove
Pitot cover	Apply
Wheel chocks	Apply

This page is intentionally left blank.

SECTION

5

SECTION 5 – PERFORMANCE DATA

TABLE OF CONTENTS

5.1 INTRODUCTION

Depending on aircraft equipment, apply content from the following sections:

EQUIPMENT	POH SECTION
PB345V124E-L High Voltage Battery	10-5A
PB345V119E-L High Voltage Battery	10-5B

This page is intentionally left blank.

SECTION 6

SECTION 6 – WEIGHT AND BALANCE

TABLE OF CONTENTS

6.1 INTRODUCTION

This section provides information about how to calculate the take off weight and C.G. of the aircraft. Once calculated, these two values can be used to find a point on the weight and balance chart (see section 6.3) and thus determine whether aircraft is within the flight limits (see section 2.6). A sample calculation is provided for reference.

WARNING: It is the owner and/or operator's responsibility to ensure the aircraft's take off weight and C.G. are within the envelope presented in the weight and balance chart (see section 6.3).

NOTE: The aircraft's empty weight and empty weight C.G. are the starting point for all take off calculations. Please refer to the aircraft's weight and balance report [1] for the current empty weight data.

6.2 C.G. - CALCULATION- SAMPLE

The calculation below is an example of how to calculate the aircraft's take off weight and C.G.. Except for the arm values in *italic* font, the values do not apply to any particular aircraft and are for illustration purposes only. The arm values in *italic* font are accurate and shall be used for any preflight calculations. The calculation results (i.e. Total weight and C.G.) shall be entered into the weight and balance chart in section 6.4, to determine whether the aircraft is within the flight limits prescribed in section 2.6.

NOTE: Calculate the moment for each item by multiplying its weight by its arm. Add up the moments to get the total moment and then divide by the total weight to get the C.G.

	WEIGHT [kg]	ARM [mm]	MOMENT [kgmm]
Aircraft empty weight	420*	270*	113400
Pilot	70	*370*	25900
Co-pilot	75	*370*	27750
Total weight / Moment	565	-	167050
Center of Gravity	-	296	-

*Example value. The actual values are to be obtained from the applicable aircraft's weight and balance report [1].

Max. take off weight: 600 kg

Most forward CG (with crew): 269 mm / 25.2 % MAC
Most rearward CG (with crew): 336 mm / 32.6 % MAC

NOTE: distances in mm are measured from datum, leading edge at wing root.

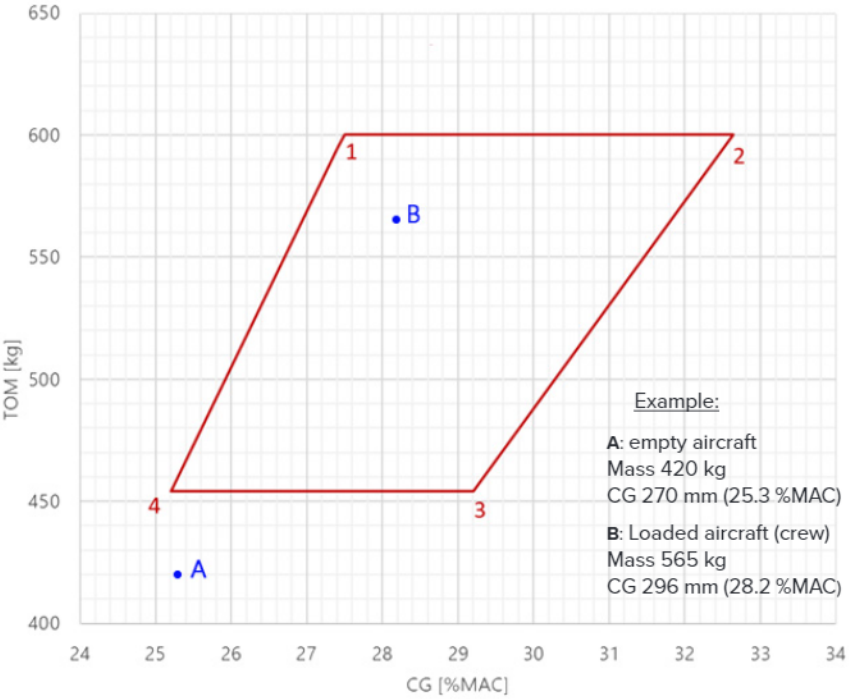
Example Center of Gravity at 296 mm is 28.2 % MAC, which is within the given range. CG expressed as %MAC can be calculated using the following:

$$CG_{\%MAC} = 100 \times \frac{CG_{(mm)} - 43}{898} = 100 \times \frac{296 - 43}{898} = 28.2\ \%MAC$$

To perform and log weight and balance please use VELIS Electro Weight & Balance Report [1].

6.3 WEIGHT AND BALANCE CHART

The chart below shows the VELIS Electro mass-CG envelope. Once the aircraft's take off weight and C.G. have been calculated, they can be used to find a point in the chart and determine whether or not the aircraft is within the flight limits. Points A and B in the chart are taken from the sample calculation in section 6.2.



POINT	MASS [kg]	CG [% MAC]	CG [mm]
1	600	27.5	290
2	600	32.6	336
3	454	29.2	305
4	454	25.2	269

NOTE: on VELIS Electro the CG position is influenced only by crew weight. Mass and CG position are constant during the entire flight.

This page is intentionally left blank.

SECTION 7

SECTION 7 – AIRPLANE DESCRIPTION

TABLE OF CONTENTS

This page is intentionally left blank.

7.1 INTRODUCTION

This section provides a basic description and operation of the standard airplane and its systems.

7.2 AIRCRAFT STRUCTURE

7.2.1 FUSELAGE

VELIS Electro's fuselage and structural components are primarily made of carbon and glass fiber reinforced polymer (CFRP and GFRP), using aramid as inner laminate in the cockpit area. The undercarriage is fabricated using mostly GFRP and rovings for flexibility, and is attached directly to the fuselage, while the firewall is made of CFRP and has a ceramic insulation with 0.05 mm stainless steel on top. There is no baggage compartment in the fuselage. The rear battery pack compartment is located behind the cabin. It is accessible via the rear battery compartment door located on the left-hand side of fuselage. The fuselage nose is designed to accommodate the front battery pack in the front battery compartment, which is positioned in front of the cabin. It is accessible via two access doors on each side of the fuselage. The cabin backrest is made of CFRP. The cabin floor along with the lower seat structure are made of mostly of CFRP and aramid because of it's impact absorption properties.

7.2.2 WINGS

The detachable wing is a single spar cantilever wing. Two bolts fasten the left and right wing together at the spar ends. The wing structure is made mostly of CFRP. The main spar shear web and root ribs are made from GFRP. This is for visual inspection and easier damage detection reasons. The spar caps are produced using STS 40 carbon roving, while the wing shell is designed as a 2-cell CFRP sandwich shell, which is closed by a rear shear web where the flaperons are fitted. A so-called blind jointing edge is what allows for the wing shells to be bonded to the wing nose. The wing spar is designed as a double-T-type spar. Lateral loads and twisting moments are conventionally transferred to the fuselage through root ribs and shear pins.

There is also the third middle bolt to provide torsion stiffness, mating the wings to the cabin support strut. The wings are attached with shear pins to bushings in the fuselage root ribs. The VELIS Electro wing does not have airbrakes installed.

7.2.3 EMPENNAGE

The empennage consists of a horizontal stabilizer, a single piece elevator, a vertical fin and a rudder. All of the empennage components are conventional spar (shear web), rib, and skin construction.

The horizontal stabilizer is attached to an aluminum bracket that is pivoted to the vertical stabilizer and can be removed. The shell of the horizontal tail is designed as CFRP sandwich. The horizontal tail is attached to an aluminum bracket at the back C-spar and a self locking bolt at the location of the front C-spar.

The elevator is designed as a bottom surface supported hinged flap. The elevator is actuated through a pushrod connected to the elevator control bracket. The elevator shell is designed as a 1-cell CFRP sandwich shell. The elevator is hinged in maintenance-free bushings mounted on stainless steel brackets at the stabilizer rear spar and bottom shell. Counterbalance weights are integrated into the elevator tips.

The vertical fin is designed to be one part with the tail fuselage, made of carbon honeycomb sandwich with carbon spars. The bending moment is carried by one C-type spar which is reinforced by CFRP tapes at the flanges.

The rudder is designed as a centrally supported hinged flap. The rudder shell is designed as single-cell GFRP sandwich shell. The rudder is hinged in two maintenance-free spherical plain bearings. Balancing weights are mounted at the front end of the rudder.

7.3 FLIGHT CONTROL SYSTEM

The aircraft uses conventional flight controls for ailerons, elevator and rudder. The control surfaces are pilot controlled through either of two control sticks positioned centrally in front of each pilot. The location and design of the control sticks allow easy, natural use by the pilots. The control system uses a combination of push rods, cables and bell cranks for control of the surfaces. Pitch trim are available through an electric button located on the central console.

7.3.1 ELEVATOR CONTROL SYSTEM

The sticks are mounted on a common lateral rod which actuates the elevator longitudinal pushrod, running the length of the fuselage behind the cockpit control levers. A bell-crank is located on the bottom side of the vertical fin and can be inspected through a provision in the vertical stabilizer end-rib. The hook-up to the elevator is via a U-member which conforms to the shape of the elevator. In case the horizontal tail plane is removed the U-member remains attached to the fuselage whereas the elevator remains attached to the horizontal stabilizer. There are no cables in the pitch control system. Control stops are integral to the transverse torque tube. Bob-weights are installed in order to provide adequate stick forces.

7.3.2 AILERON CONTROL SYSTEM

Roll control is achieved by torsional activation of flaperon control surfaces via an all-pushrod mechanisms. A conventional center control stick is available to each pilot. The sticks are mounted on a common lateral rod which actuates the elevator longitudinal pushrod. There is a bell-crank located on the bottom of the fuselage behind the seats which provides differential motion. The flap handle is connected to this bell-crank, allowing for symmetric displacement of flaperons. All elements of the roll control mechanism are attached to the fuselage, with the connection to the flaperon achieved via a self-fitting coupling attached to the flaperon axis directly. Roll Control stops are integral to the transverse torque tube.

7.3.4 RUDDER CONTROL SYSTEM

Rudder pedals are available to each pilot and are adjustable in-flight in a fore-aft sense. Metal cables in polyamide bowdens run from the individual pedal to bellcranks located behind the seats. Single cables run from the bellcranks backwards and are attached directly to the rudder.

The tension of the cables is adjusted with cable tensioners and rudder neutralization is achieved by means of two retaining springs attached to the cable junctions. The nose wheel is part of the yaw control system and is moved whenever the pedal is pressed. Cables for nose wheel steering run from the bellcranks behind the seats forward to the nose wheel hinge element, where a anti-shimmy damper is also connected to.

7.3.5 WING FLAPS CONTROL SYSTEM

There are no separate flap control surfaces in place. Operating the flaps is achieved through symmetric deflections of the flaperons. They are hand activated using control sticks available to both pilots, located in front of each seat. The flap handle can be spring locked in 3 positions, corresponding to flap deflections 0°, +9.5° and +20°. The positions are denominated, (0), (+1), (+2) respectively. The thumb-lock button prevents inadvertent handle movement. The aft end of flap handle connects to main flaperon bell-crank.

7.3.6 ELEVATOR TRIM SYSTEM

A spring type elevator trim is operated using a linear servo motor assembly located behind the rear battery compartment. Motion of the linear servo is controlled through a cockpit switch and an integral position sensor. The trim position is indicated with discrete steps on a dedicated LED display adjacent to the trim switch.

7.4 LANDING GEAR

7.4.1 MAIN GEAR

The landing gear is a conventional, fixed tricycle type. The main landing gear consists of a single composite landing gear strut made of GFRP. The strut is composed of two parallel elements producing a semi-redundant structure and allowing for predictable locations of stress points. Two supportive bridge struts are installed to reinforce the landing gear main strut attachment to the fuselage. The tube-less type wheel tire is 4.00 - 6'', with a wheel track of 1.60 m and base of 1.58 m. Inflate it to 2.8 bar.

7.4.2 NOSE GEAR

The nose landing gear is fastened to the fuselage and firewall. It is steerable, connected to the rudder pedal control system and incorporates an oil-spring, shimmy-reducing damper element. The nose wheel tire is 4.00 - 4''. The nose gear shock absorber is a spring-type oleo-strut that has an aluminum fork attached to the end of it. Inflate the nose wheel to 1.8 bar.

7.4.3 BRAKE SYSTEM

The main wheels are equipped with hydraulic disc brakes. Right and left brake are independent and activated by toe brakes on each set of rudder pedals. A parking brake, in the form of a center console lever, is accessible to both pilots.

The brake system consists of a master cylinder for each rudder pedal, two hydraulic fluid reservoirs, a parking brake valve, a single disc brake assembly on each main landing gear wheel and associated hydraulic plumbing. Braking pressure is initiated by pressing the lever on the top of the rudder pedal (toe brake). The brakes are designed so that pressing either of the pilot's or copilot's left or right toe brake will result in respective (left or right) main wheel braking. The reservoir is serviced with DOT-4 hydraulic fluid.

Brake system malfunction or impending brake failure may be indicated by a gradual decrease in braking action after brake application, noisy or dragging brakes, soft or spongy pedals, excessive travel, and/or weak braking action. Should any of these symptoms occur, immediate maintenance is required. If, during taxi or landing roll, braking action decreases, let up on the toe brakes and then reapply the brakes with heavy pressure. If the brakes are spongy or pedal travel increases, pumping the pedals may build braking pressure.

CAUTION: Do not pull the PARK BRAKE lever in flight. If a landing is made with the parking brake valve set, the brakes will maintain any pressure applied after touchdown.

The main wheel brakes are set for parking by using the PARK BRAKE lever on the left side of the console near the pilot's right ankle. Brake lines from the toe brakes to the main wheel brake calipers are plumbed through a parking brake valve. For normal operation, the lever is pushed forward. With the knob pushed forward, poppets in the valve are mechanically held open allowing normal brake operation. When the handle is pulled back, the parking brake valve holds applied brake pressure, locking the brakes. To apply the parking brake, set the brakes with the rudder-pedal toe brakes, and then pull the PARK BRAKE lever back.

7.5 AIRPLANE CABIN

7.5.1 CABIN DOORS

The windshield, upper window and doors'-windows are made from Lexan shatter-resistant polycarbonate. The fuselage has two cabin doors made out of CFRP, which are locked in the closed position via 3 locking pins operated simultaneously by rotating a common central handle.

7.5.2 VENTILATION

The system's primary source of fresh air is a set of sliding windows and adjustable vents that direct fresh ram air into the cabin. There is a sliding window door on the starboard side, an adjustable circular vent in the door on the port side and another adjustable circular cabin air exhaust in the sun roof.

7.5.3 SEATS

The seating arrangement consists of two seats, comprising of a bottom cushion and hard padded back panel. The back panel rests on the cockpit aft bulkhead. The seats are not adjustable and do not recline, however the back panel can be removed/reclined to access the rear battery compartment. The back panel features a manual pneumatic pump to adjust the size of the lumbar bladder and thus lumbar support.

7.5.4 HV BATTERY COMPARTMENT ACCESS PANELS

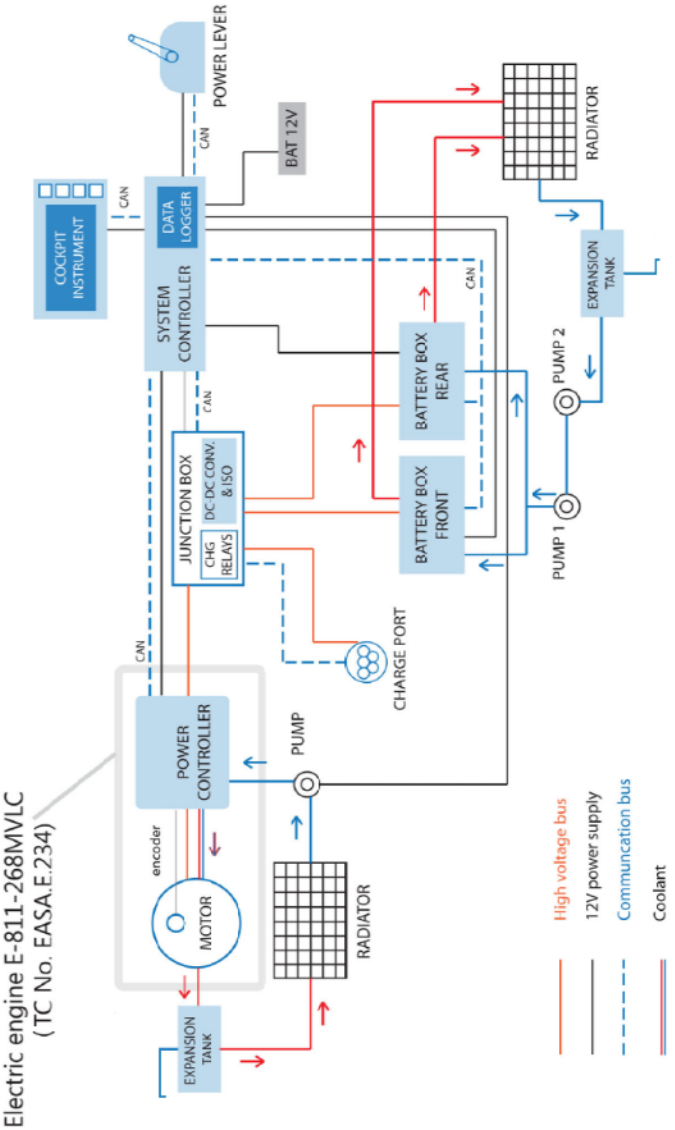
There are 3 high voltage battery compartment access panels: 2 in the front, on both sides of the fuselage and 1 in the back, behind the cabin on the left side. They are fastened to the fuselage by screws. The battery cooling intake is incorporated into the rear panel.

7.5.5 CABIN SAFETY EQUIPMENT

Passenger Restraints

The seatbelt harness is a 4 point restraint system with aviation style quick release buckle. The lap belts are attached to points in the cabin floor that are locally reinforced. The shoulder belts are attached to the top of the battery compartment bulkhead with an M8 bolt. These attachment points are reinforced with a composite rib.

7.6 PROPULSION SYSTEM



Propulsion system diagram

7.6.1 ELECTRIC ENGINE

The aircraft is powered by the Pipistrel E-811-268MVLC electric engine that houses the 268 MV LC VHML electric motor and Pipistrel's H300C power controller.

- Maximum rated continuous power 48 kW
- Maximum rated take off power 65 kW

MOTOR

The motor installed is the Pipistrel 268 MV LC VHML. It is an axial flux, synchronous permanent magnet electric motor, powered by three-phase alternating current, supplied by H300C power electronics. It is fitted with a temperature sensor and is liquid cooled.

Pipistrel electric motor 268 MV LC VHML characteristics:

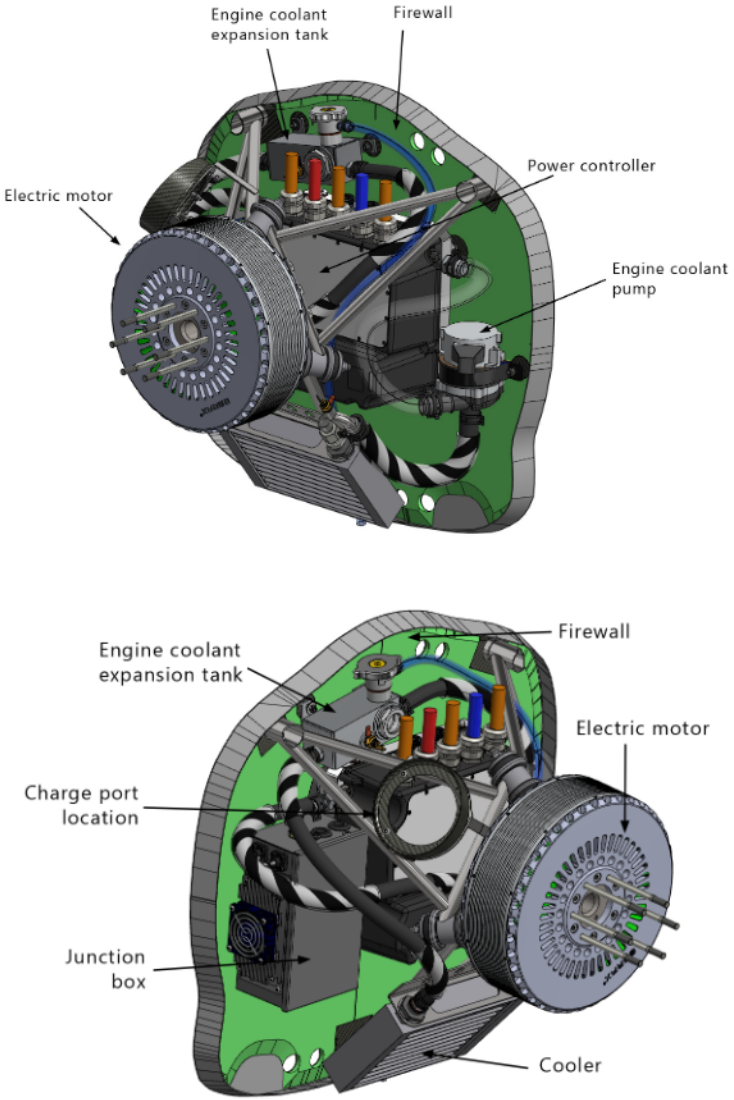
- Maximal shaft speed 2500 RPM (electronically limited)
- Peak torque 220 Nm (0 – 2000 rpm)
- Motor efficiency 89%
- Temperature operating range between -20° C and +110° C
- Weight 23 kg
- Liquid-cooled (50% distilled water – 50% glycol G12+)

POWER CONTROLLER

The H300C power-electronics is a high voltage power controller, that converts direct current (DC) to a three-phase alternating current (AC) and supplies the motor with it.

Pipistrel H300C power controller characteristics:

- Operating temperature between -20° C and +70 °C
- Dimensions 230 x 245 x 126 mm, weight 8.1 kg (with cables)
- IP65 protection
- Liquid-cooled (50% distilled water – 50% glycol G12+)



Engine system installation

7.6.2 HIGH VOLTAGE BATTERY SYSTEM

VELIS Electro has a high voltage electric power system. The primary energy sources are two Pipistrel PB345V124E-L or two PB345V119E-L batteries. This ensures redundancy of the power-source. In case of battery failure, the faulty battery gets disconnected from the system. A single battery is capable of standalone operation and has enough power output capability to support climbing of the aircraft and continuation of flight (single battery operation is not considered normal procedure). Batteries can be charged via an on-board charging port. The electric charger is not part of the aircraft. The low voltage power system of the aircraft is powered by DC-DC converter. The high voltage power is distributed between the systems through a junction box. The main computer (system controller) controls and oversees operation of high and low voltage power system. Status of the system is displayed on the Pipistrel EPSI570C.

PARAMETER	VALUE (per pack)	VALUE (per pack)
Battery pack type	PB345V124E-L	PB345V119E-L
Cell type	INR18650-33G	INR-18650-P28A-BV
Minimum voltage	260 V	260 V
Nominal voltage	345 V	345 V
Maximum voltage	398 V	402 V
Maximum discharge current	120 A	120 A
Maximum cont. discharge power	40 kW	40 kW
Maximum charging current	40 A per pack	40 A per pack
Operating temp. range (discharge)	0°C - 58°C	0°C - 58°C
Operating temp. range (charge)	0°C - 45°C	0°C - 45°C
Allowable temp. range for storage	0°C - 30°C	0°C - 30°C
Rated capacity (@ 50°C, 20A discharge current)	35 Ah, 12 kWh	29.4 Ah, 10.1 kWh
Rated capacity (@ 23°C, 20A discharge current)	33 Ah, 11 kWh	29.0 Ah, 10.0 kWh
Rated capacity (@ 0°C, 20A discharge current)	32 Ah, 10.5 kWh	28.0 Ah, 9.6 kWh
Configuration	96S12P	96S12P

The high voltage battery is composed by the following major components:

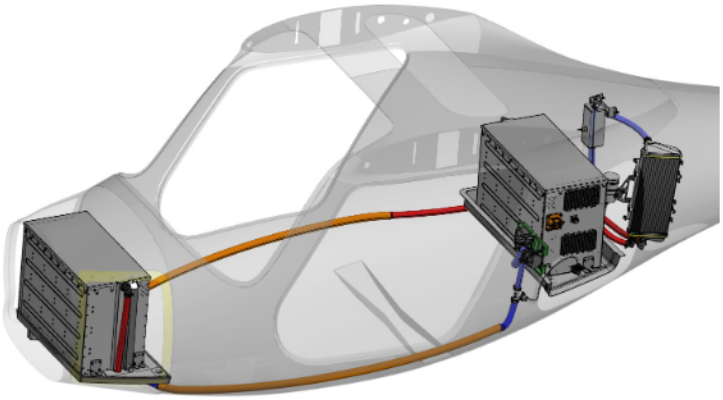
- Aluminum enclosure

- Battery cell modules
- Battery Management System (BMS)
- Electrical interfaces (power and data connectors)
- Coolant interface

High voltage battery system installation

The aft battery pack compartment is located behind the cabin. It is accessible via the rear battery inspection panel, bolted on the left side of the fuselage. The fore battery pack compartment is positioned in front of the cabin. It is accessible via the front inspection panels bolted on both sides of the fuselage. The batteries are liquid-cooled (50% water - 50% glycol G12+). The liquid-cooling system consists of a radiator and two electrically driven pumps, located behind the aft battery pack compartment.

CAUTION: Battery boxes installed on the aircraft shall always be of the same type/model. Do not operate the aircraft if battery boxes of different type have been installed. Ground the aircraft and contact manufacturer.



High voltage battery system installation

BATTERY MANAGEMENT SYSTEM (BMS)

The high voltage battery includes a BMS, which monitors and controls various parts of the battery. It's built on a single PCB (Printed Circuit Board) assembly and is mounted on the front side of the battery's enclosure.

The BMS performs the following functions:

- Communication with the system controller (see section 7.6.5)
- Control of HV contactors and pre-charge circuitry
- Cooling system control and monitoring
- Monitoring of HV lines and current
- Battery cell voltage measurement and balancing functions
- SOC/SOH calculation
- Data logging
- Overvoltage, overcurrent, overtemperature protection

The BMS calculates the battery State Of Charge (SOC) and the State Of Health (SOH). The SOH calculation takes into account the decrease of battery capacity and increase of internal resistance, as a consequence of battery aging. CAN (Controlled Area Network) bus communication running at 500kBit/s is used for exchanging data with the system controller.

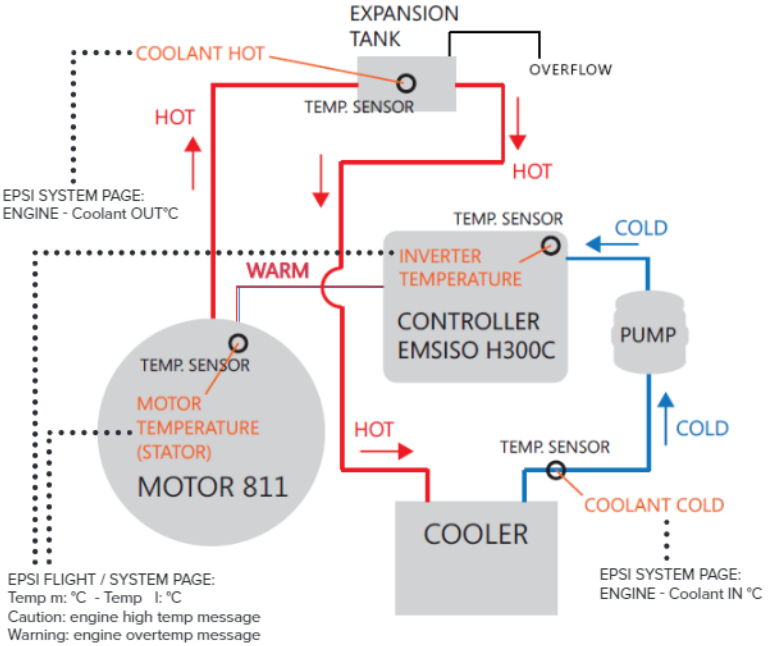
At all times, the BMS sends system status and various information to the system controller. Battery SOC, SOH, cell voltages, battery current and temperatures are reported at a rate of 5 Hz. Should any failure condition be detected, the BMS takes appropriate action and sends an error message to the system controller. Should the BMS master detect an overtemperature, overcurrent or overvoltage event, the master disconnects the main contactors, effectively protecting the system.

The BMS controls the main HV contactors and the pre-charge circuitry and the axial fans of the cooling system during ground operations (charge).

7.6.3 PROPULSION SYSTEM COOLING

Engine cooling

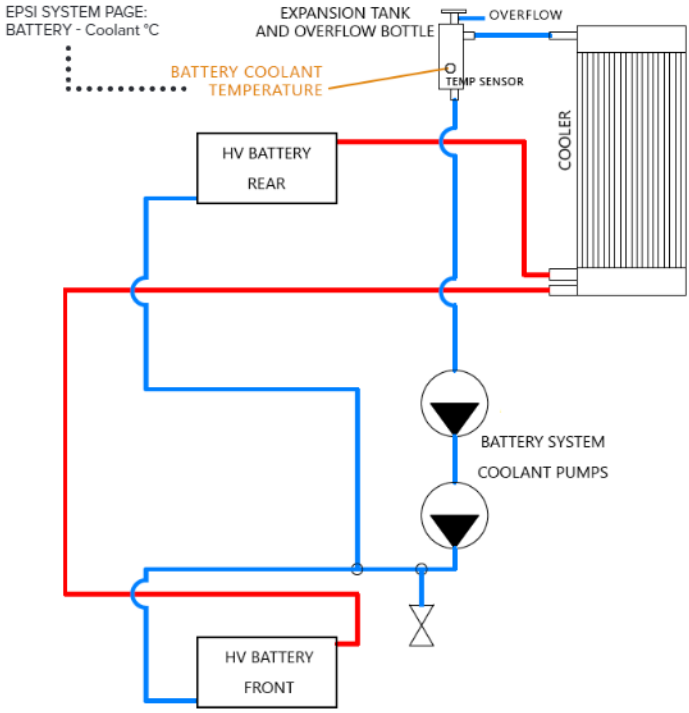
The electric motor and power controller are liquid-cooled (50% distilled water – 50% glycol automotive grade G12+). The liquid-cooling system consists of a radiator and one electrically driven pump. The system is in common for the motor and power controller.



Engine cooling system diagram

Battery system cooling

The batteries are liquid-cooled (50% distilled water – 50% glycol automotive grade G12+). The liquid-cooling system consists of a radiator and two electrically driven pumps, located behind the aft battery pack compartment. The air inlet for the radiator is located on the left side of the fuselage, integrated into the battery compartment access panel, whereas the hot exhaust is expelled from the bottom of the fuselage through on exhaust outlet. Small fans are installed behind the radiator in order to allow battery cooling during ground operations, such as charging.



Battery cooling system diagram

Cooling system for ground operations

Two high power axial fans mounted on the cooler are used to improve battery system cooling during the recharge. The fans are controlled and monitored by the BMS master. The fans start spinning when the charger is connected, batteries are in active state and at least one battery temperature rises above 20°C. Fans reach full speed at 40°C. Cooling fan malfunction triggers a caution message on EPSI570C display (see Battery coolant fan failure 3.4.6) and charging procedure (8.5).

7.6.4 ENGINE OPERATING CONTROLS

The engine controls on VELIS Electro are designed for an electric motor. A single power control lever with magnetic position sensor controls the motor power and is located in the central console. Power lever angular movement is about 90°, with full power position forward and cut off position aft.

Pulling the power lever to cut off midflight will result in engine recuperation. This functionality is experimental and replaces the need for airbrakes. The activation of the recuperation provides for an additional sink rate of 150ft/min in both configurations (flaps 1 or 2) and an angle of descent decrement of at least 1°. The use of engine recuperation is not limited by configuration or speed and it is a function of the propeller RPM, The higher the RPM the higher the braking capability and vice versa. Even if power is cut-off quickly, the recuperation activation is smooth and the transition does not lead to any significant event. The stop position corresponds to the maximum recuperation request. To control the recuperation, the pilot can adjust the position of the power lever.

The engine is designed so that it can't be started until the power lever is put in the cut-off position. This safety feature prevents accidental motor activation on the ground.

Power derating

During normal operation, the power delivered by the motor is proportional to the lever position. However, during emergency operation (see also Engine

overtemperature 3.5.10), when engine temperature enters warning range (power controller temperature ≥70 °C or motor temperature ≥110 °C), the system controller automatically reduces the maximum available power proportionally to overtemperature level. In this case power is reduced to preserve engine components and to limit further temperature increase. During this phase, the last portion of power lever travel might be ineffective, or power might be automatically reduced with no lever movement. Expect possible power fluctuations due to derating if high power is requested. The power lever should be used carefully and gradually. Full power will be available again after the temperatures have dropped out of the warning range. Expect imminent power cut to zero in case of high power usage!

7.6.5 SYSTEM CONTROLLER

The system controller performs the tasks of a Vehicle Management Computer (VMC). It is located on the electric panel, inside the instrument panel. Most of the functions are controlled by an on-board single core micro-controller, which handles all system communications in the aircraft as well as other analog/digital IO (Input-Output) functions.

The system controller performs the following functions:

- Master, Avionics and Drive SSR (Solid State Relay) control
- Auxiliary battery monitoring
- DC/DC converter interface
- Power controller / cooling system control and monitoring
- BMS / cooling system control and monitoring
- Power lever interface
- Switch panel interface
- Annunciator/Warning panel driver
- EPSI 570C Interface
- Charging port interface
- Garmin Aera 660 Interface
- Datalogger interface.

The system controller is responsible for coordinating operation of all the propulsion system components. Upon power-up, the system controller routes the 14V power supply from the auxiliary battery to all loads on the master and avionics DC-buses. After the BATT EN switch is turned ON, the system controller orders the high voltage batteries to go into the active state. Once the batteries have executed the activation sequence, the system controller enables the DC/DC converter to start charging the 14V auxiliary battery. Once the pilot activates the PWR EN switch, the system controller enables the power controller and sends the power lever settings to it. The system controller also executes the system shutdown in reverse order.

The system controller is also responsible for battery charging. Once the pilot connects the charging plug to the aircraft's charging socket, the system controller tries to establish communication with the charger. If the communication is established successfully, the system controller exchanges information with the charger about the type of battery on-board. After the pilot orders the charger to start charging, the system controller locks the charging plug, turns ON the charging relays and orders the batteries to go into active state. Charging may then begin. While charging, the system controller is responsible for all data interchange between the batteries and the charger.

7.6.6 DATA LOGGER

The aircraft is equipped with a data logger, which can be assimilated to a flight data recorder. It is an electronic board connected directly to the system controller, located behind the aircraft's instrument panel. The data logger records data from propulsion system, navigation system and other instruments. Data is always recorded to an internal micro SD card. The data-logger also has a USB host port, positioned on the right side of the instrument panel. Whenever a USB flash drive is inserted into the USB port, data can be logged into it in addition to the micro SD card. Please refer to Service document [7] for additional information about data-logger and data downloading procedure.

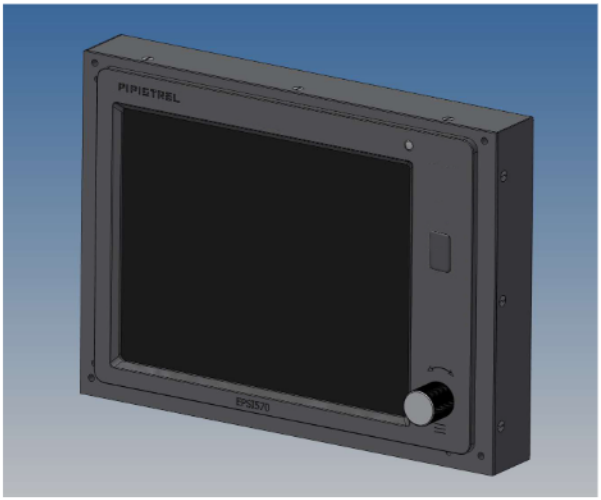
7.6.7 PROPULSION SYSTEM MONITORING INSTRUMENTS

The system controller collects data from the motor, power controller, high voltage batteries and other electrical systems and presents them on the EPSI570C display. 12 VDC for EPSI570C operation is supplied through the EPSI circuit breaker.

EPSI570C DISPLAY

The EPSI570C (Electric Propulsion System Instrument) is the main source of information for the pilot about the operational state of the electric propulsion system in the aircraft. It presents various operational parameters and values of individual components in the system via a 5.7 inch color LCD display.

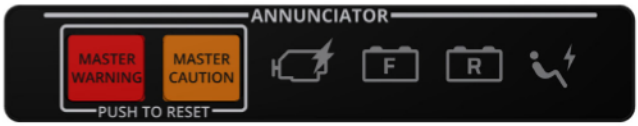
NOTE: For additional information on the EPSI570C see APPENDIX 9-A1 EPSI570C SYSTEM DESCRIPTION.



EPSI570C display

ANNUNCIATOR PANEL

The annunciator warning panel is mounted on the instrument panel. It alerts the pilot about propulsion system faults/issues and provides redundancy if the EPSI570C fails. The panel is managed by the BMS software and replicates warning/cautions that are displayed on EPSI570C. See Appendix 9-A1 EPSI570C SYSTEM DESCRIPTION for additional information.



Annunciator panel

NOTE: Annunciator panel lights (buttons and icons) are subjected to a self test at system start-up (MASTER switch ON). See self test description in this section for details.

FRONT/REAR BATTERY OVERTEMPERATURE WARNING LIGHT

The two red LED lights installed on the left side of the annunciator panel are connected to overtemperature sensors inside the battery boxes. The system operates independently from the BMS software. In case of battery overtemperature (> 58 °C) the LED light of the affected battery turns ON (see Section 3 - Emergency procedures - for details).

NOTE: Battery overtemperature analog warning lights are independent from the EPSI and do not directly trigger any annunciator light nor warning message.

Battery overtemperature warning lights are subjected to a self test at system start-up, when MASTER switch is set ON. See self test description in this section for details.

Battery overtemperature warning lights

SELF TEST DESCRIPTION

A self test is activated every time the MASTER switch is set ON. This typically happens during the pre-flight check and at start-up. The self test gives the pilot the opportunity to verify that annunciator lights, battery overtemperature panel lights and haptic stall warning are functional.

As MASTER switch is turned ON, the following systems are tested at the same time, for few seconds:

- BATT OVERTEMP panel: LED lights (2x) are activated for few seconds, then go off.
- ANNUNCIATOR panel: MASTER CAUTION and MASTER WARNING buttons are illuminated for few seconds, then go off.
- ANNUNCIATOR panel: system icon lights (4x) are illuminated for few seconds, then go off.
- CONTROL STICK HANDLES: haptic stall warning is activated for few seconds with intermittent pulses.

Items subjected to selftest

Immediately after the MASTER switch is turned ON, the Pilot has to verify that ALL the annunciator and battery overtemperature panel lights are active during the self test, and that haptic stall warning in the control stick handles is functional.

If any of these items is not illuminated/activated during the self test, it indicates a malfunction (e.g. LED light or stall warning damage) and self test has FAILED. DO NOT TAKE OFF: abort mission and contact manufacturer.

7.6.8 PROPELLER

VELIS Electro is equipped with the 3-blade, fixed pitch Pipistrel P-812-164-F3A propeller. Its diameter is 1640 mm. The blades are made from carbon fiber composite material and stainless steel. The blade root and propeller hub are machined aluminum parts.

7.7 ELECTRICAL SYSTEM

7.7.1 ELECTRICAL SYSTEM

The airplane is equipped with a high and low voltage system. The high voltage electrical system, powered by the two high voltage batteries, is used for propulsion (see section 7.6.2 High voltage battery system). The low voltage battery system is used to power avionics and system controllers on the aircraft. Low voltage power is generated from high voltage batteries by a DC/DC converter. An auxiliary 12V battery is also present, installed on the cabin bulkhead behind the switch panel.

A junction box, installed in the engine compartment, houses the DC/DC converter, charging relays and fuses, and merges the high voltage cables from the batteries, charging port and power controller.

7.7.2 LOW VOLTAGE POWER GENERATION

The avionics electrical system is a 12-14 V DC system. Power is supplied through a DC/DC converter that converts the 345 V DC from the high voltage batteries to the 14 Volt for the avionics and for recharging the auxiliary battery (13.2V, 12,4 Ah). The DC/DC converter is located in the junction box, in the engine compartment of the aircraft. In case of emergency and loss of power from both propulsion batteries, the auxiliary battery can power the systems for at least 30 minutes. The electrical system is controlled by means of switches/fuses that are located on the switch panel. The circuit breakers (CB) are located under the switch panel. Ammeter and Voltmeter indications are integrated into the EPSI570C display.

7.7.3 POWER DISTRIBUTION

The system is controlled by means of switches and circuit breakers. The main 345 V DC power bus is converted to 14 V DC before entering the cabin, so there are no high voltage buses going through the cabin. The 14 V bus keeps the battery charged and the avionics working. If power is lost, the auxiliary battery keeps the avionics system working, The 14 V DC bus is split into different buses, each with a separate master switch or breaker, with each element then subsequently equipped with its own circuit breaker with an appropriate rating.

BREAKER	DESCRIPTION	BUS	RATING
AUX BATT	Auxiliary battery	BAT	35 A
DC/DC CONV	DC/DC converter	DC CONV	30 A
BATT FRONT	High voltage battery - Front	ENGINE	7.5 A
BATT REAR	High voltage battery - Rear	ENGINE	7.5 A
BATT FAN	Battery cooling fan (ground op.)	ENGINE	15 A
BATT PUMP F	Battery coolant pump - first	ENGINE	3 A
BATT PUMP R	Battery coolant pump - second	ENGINE	3 A
PWR CTRL	Power controller	ENGINE	4 A
INV PUMP	Engine coolant pump	ENGINE	10 A
COM	COM - Radio	AVIONICS	4 A
CHG	Charging port	ENGINE	3 A
XPDR	XPDR - Transponder	AVIONICS	3 A
GPS	GPS - Aera 660	AVIONICS	3 A
EPSI	EPSI570C display	ENGINE	2 A
INSTR	Instruments	AVIONICS	2 A
SYS CTRL	System Controller	BAT	1 A
TRIM	Electric trim system	MASTER	1 A

7.7.4 SWITCHES

Switch panel - main switches

MASTER Switch

The MASTER toggle Switch activates the relay to connect the 14V battery with main bus. The main bus supplies the avionics relay, which delivers the power to the switch panel and circuit breakers. To check or use avionics equipment or radios while on the ground, the AVIONICS power switch must also be turned on.

AVIONICS Switch

A toggle switch, labeled AVIONICS, controls electrical power from the main bus to the Avionics Bus.

Typically, the switch is used to energize or de-energize all avionics on the Avionics Bus simultaneously. With the switch in the OFF position, no electrical power will be applied to the avionics equipment, regardless of the position of the master switch or the individual equipment switches.

For normal operations, the AVIONICS switch should be placed in the OFF position prior to activating the MASTER switch.

BATT EN Switch

This switch connects the high voltage batteries to the electrical system, activates the DC/DC controller and routes HV power into the power controller.

PWR EN Switch

This switch activates the power controller output and the power lever.

7.7.5 MISCELLANEOUS COMPONENTS

Convenience Outlets

A 5V USB dual socket is installed on the left side of instrument panel. The receptacles accept standard USB plugs. The outlet may be used to power portable equipment non essential to flight. Amperage draw through the outlet must not exceed 2 A. Power to the convenience outlet is activated by the MASTER switch.

7.8 LIGHTING

7.8.1 EXTERIOR LIGHTING

The aircraft is not equipped with external lights.

7.9 ENVIRONMENTAL SYSTEM

Cabin passive ventilation

The primary source of fresh air is a set of sliding windows and adjustable vents that direct fresh ram air into the cabin. There is a sliding window door on the starboard side, an adjustable circular vent in the door on the port side and another adjustable circular outlet in the sunroof. There is no cabin heating system on the aircraft.

7.10 PITOT SYSTEM AND STALL WARNING

The pitot-static system consists of a single pitot tube mounted on the starboard wing, approximately 3 meters from the fuselage and dual static ports mounted on the fuselage, just below the aft battery compartment. The pitot tube drives total pressure to both to the Kanardia Horis (AH), the transponder and the altitude/airspeed indicators. The pitot tube also has a AOA sensing port. The aircraft is equipped with a stall warning system that activates a control stick vibration and aural warning when the critical AOA is approached. An aural warning is emitted by the EPSI570C speaker and is also heard in the headsets. The haptic system functionality is tested during initial self-test (initiated when master switch is set to ON), see section 7.6.7 for details.

7.11 FLIGHT DECK ARRANGEMENT

Instrument Panel

A mechanical altimeter and airspeed indicator are in the top segment of the instrument panel and serve as the main indicators.

Instrument panel

Switch Panel

The following depicts the switch panel and the table below indicates which switches/circuit breakers it incorporates:

MASTER	Enable system - switch
AVIONICS	Enable instruments - switch
BATT EN	Battery enable - switch
PWR EN	Power enable - switch
DC/DC CONV	DC/DC Converter circuit breaker
AUX BATT	Auxiliary battery circuit breaker
TRIM	Trim actuator circuit breaker
EPSI	EPSI570C display circuit breaker
COM	Radio COM circuit breaker
XPDR	Transponder circuit breaker
INSTR	Other instruments circuit breaker
GPS	Navigation Aera 660 system circuit breaker
BATT FRONT	Front HV Battery circuit breaker
BATT REAR	Rear HV Battery circuit breaker
BATT FAN	Battery fans circuit breaker
BAT PUMP F	HV battery coolant pump 1 circuit breaker
BAT PUMP R	HV battery coolant pump 2 circuit breaker
PWR CTRL	Power controller circuit breaker
SYS CTRL	System controller circuit breaker
INV PUMP	Engine coolant pump circuit breaker
CHG	Charging port circuit breaker

Switch panel

Center Console

The center console contains (front-to-back) the parking brake lever, power lever, elevator trim switch/indicator and the flap lever. On the back wall, above the flap handle, there is the cabin flood light.

7.12 FLIGHT INSTRUMENTS AND SYSTEMS

The standard instruments/avionics configuration consists of:

1	RPM Indicator Kanardia
2	AH (Artificial Horizon - attitude indicator) Kanardia Horis
3	GPS Garmin Aera 660
4	Vertical speed indicator Kanardia
5	Propulsion System Information EPSI570C
6	Warning panel (annunciator) and battery overtemperature warning lights by Pipistrel
7	Altimeter Mikrotechna LUN1128 (Mechanical Altimeter) - PRIMARY FLIGHT INSTRUMENT
8	Airspeed Indicator Mikrotechna LUN1116 (Mechanical ASI) - PRIMARY FLIGHT INSTRUMENT
9	Radio COM Funke ATR833
10	Transponder Funke TRT800H
11	ELT Artex ELT 345 + remote panel
12	Mechanical Compass
13	Turn coordinator - Slipball Winter
15	Switches and breakers

7.12.1 ATTITUDE INDICATOR

The attitude indicator/artificial horizon (AH) Kanardia Horis gives a visual indication of flight attitude. It consists of a set of sensors and an LCD display. The majority of sensors are built into its compact housing. One push/rotate knob is used to operate it. The user interface is optimized so only minimal interaction is required to operate the instrument. Please refer to [6] for additional information about use and settings.

7.12.2 MECHANICAL AIRSPEED INDICATOR (ASI)

The airspeed indicator (ASI) is TSO'd and is regarded as a primary flight instrument and located on the pilot's instrument panel. The instrument senses difference in static and Pitot pressures and displays the result in knots on an airspeed scale. It's a mechanical instrument and does not require electrical power to function.

7.12.3 MECHANICAL ALTIMETER (ALT)

The altimeter (ALT) is TSO'd and is regarded as a primary flight instrument. Airplane altitude is depicted on a conventional, three-point, barometric altimeter. The instrument senses the local barometric pressure adjusted for altimeter setting and displays the result on the instrument in feet and does not require electrical power to function. Barometric windows on the instrument's face allow barometric calibrations in either inches of mercury (inHg) or millibars (mb). The barometric altimeter settings are input through the barometric adjustment knob at the lower left of the instrument.

7.12.4 MAGNETIC COMPASS

A conventional, liquid filled magnetic compass is installed on the metal frame above the instrument panel. A compass correction card is installed with the compass.

7.12.5 RPM/POWER INDICATOR

The RPM/power indicator is s 57 mm (2¼") unit which displays the current RPM with both a familiar mechanical needle as well as a large OLED digital display. Motor power is also indicated on the display. Digit colors are white, but turn yellow or red when parameters are in caution or warning range. The information is also available on the EPSI570C display as primary info.

CAUTION: When engine recuperation is in use, the digit colors flash red and display a negative power value indication, informing the pilot that recuperation is active

7.12.6 VERTICAL SPEED INDICATOR (VSI)

The variometer is a 57 mm (2¼") unit and consists of a familiar needle and OLED digital display. The needle shows if the aircraft is climbing or descending.

7.12.7 COMMUNICATION TRANSCEIVER (COM)

A VHF communication (COM) transceiver is installed to provide VHF communication. The transceiver and integrated controls are mounted in the Funke ATR833S-II-OLED unit. The Funke ATR833S-II-OLED is designated as COM. COM provides transceiver active and standby frequency indication, frequency memory storage, and knob operated frequency selection. The COM transceiver provides either 25 kHz spacing or 8.33 kHz spacing operation. The COM antenna is located on top of fuselage behind the cabin. 12 VDC for COM transceiver operation is controlled through the avionics switch and supplied through the COM circuit breaker on the switch panel.

7.12.8 TRANSPONDER (XPDR)

The airplane is equipped with a single Funke TRT800H-OLED Mode S transponder with squawk capability. The transponder system consists of the integrated receiver/transmitter control unit, an antenna and an integrated altitude encoder. The transponder and integrated controls are mounted on the instrument panel. 12 VDC for transponder operation is controlled through the Avionics Switch. 12 VDC for XPDR operation is supplied through the XPDR circuit breaker on the switch panel.

7.12.9 AUDIO SYSTEM

The airplane is equipped with an intercom system as part of the COM unit. A separate designated intercom ON/OFF switch is installed on the instrument panel.

Headset/Microphone Installation

The airplane is equipped with provisions for two headsets with integrated microphones. The microphone-headsets use remote Push-To-Talk (PTT) switches located on the top of the associated control stick grip. The microphone (MIC) and headset jacks for the pilots are located on the instrument panel. The volume is controlled via the COM unit and intercom function via the dedicated intercom switch.

7.12.10 GPS

The airplane is equipped with a Garmin Aera 660 display. it is a portable navigator with a 5-inch touch display. It comes preloaded with flight mapping, terrain and obstacle alerting.

7.13 EMERGENCY LOCATOR TRANSMITTER

The airplane is equipped with a self-contained emergency locator transmitter (ELT) Artex 345. The transmitter is installed on the fuselage's internal side behind the pilot's seat and is accessible by folding the left seat. A remote switch and indicator panel is installed on the instrument panel and provides manual activation, testing and monitoring functions for the ELT.

If rapid deceleration, such as an impact or crash landing, is detected, the transmitter will repeatedly transmit VHF band audio sweeps at 121.5 MHz and 406 MHz for 24 hours or until manual deactivation.

The main transmitter and the remote switches have three positions labeled ON, ARM/OFF, TEST. A red LED light on the transmitter and on the remote switch panel flashes when the ELT is transmitting, or to signal functional abnormalities.

The TEST button is used to periodically test the unit in accordance with OEM [2] procedures.

	Remote switch position		ELT transmitter switch position
Normal operation (automatic activation):	ARM/OFF	and	ARM/OFF
Manual activation:	ON	or	ON
Periodical test:	TEST	or	TEST
End transmission:	ON >> ARM/OFF	or	ON >> ARM/OFF

- In the event of imminent emergency landing:

1 Start ELT transmission manually: remote switch "ON".
Status LED on the remote switch will start flashing.

- In the event of an accident, crash landing or hard landing:

1 ELT transmission is automatically activated by the G-force detector.
Status LED on the remote switch will start flashing.

Consult OEM [2] for additional information about ELT use.

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).

ELT transmitter location

SECTION

8

SECTION 8 – HANDLING AND SERVICING

TABLE OF CONTENTS

8.1 INTRODUCTION

The airplane owner should establish contact with a Pipistrel dealer or certified service station for service and information. All correspondence regarding the airplane must include its serial number (see tail-mounted type data plate). A maintenance manual with revision service may be procured by the manufacturer.

8.2 AIRPLANE INSPECTION PERIODS

As required by national operating rules all airplanes must pass a complete annual inspection every twelve calendar months. In addition to the annual inspection airplanes must pass a complete inspection after every 100 hours.

The airworthiness authority may require other inspections by the issuance of airworthiness directives applicable to the aircraft, motor, propeller and components. The owner is responsible for compliance with all applicable airworthiness directives and periodical inspections.

8.3 PILOT CONDUCTED MAINTENANCE

Pilots operating the airplane should refer to the regulations of the country of certification for information about preventative maintenance that may be performed by pilots. This maintenance may be performed only on an aircraft that the pilot owns or operates and which is not used in air carrier service. All other maintenance required on the airplane is to be accomplished by appropriately licensed personnel. A licensed maintenance company should be contacted for further information. Preventative maintenance should be accomplished with the appropriate service manual.

8.4 CHANGES AND REPAIRS

Only licensed personnel is permitted to perform changes or repairs. Changes to the aircraft must be performed in coordination with the manufacturer and the authority, with the intention of protecting the aircraft's airworthiness state. More detailed information regarding repairs can be found in the maintenance manual.

8.5 RECHARGING

NOTE: Please refer to [8] for detailed charging procedure safety information and guidelines.

WARNING: During charging, crew and ground personnel must stay at a safe distance from the aircraft! Being on board while charging is prohibited!

WARNING: Monitor the aircraft while charging, do not leave it unattended, unless alternative means are in place.

WARNING: Keep a water hose close to the aircraft during charging (or equivalent equipment).

WARNING: Do not start battery recharging process if the battery temperature is <+0 °C or >+45 °C (See also chapter 2 - Limitations).

WARNING: Do not start recharging a battery in undervoltage condition (e.g. battery disconnected due to undervoltage during the previous flight), or if batteries sustained damage, crash or impacts with external objects.

CAUTION: If the aircraft is under the sunlight and/or OAT is close to the highest allowed, selecting a low charger input current is recommended. This ensures less thermal stress on the battery cells (longer battery life) and more safety margin for the next flight.

8.5.1 APPROVED CHARGERS

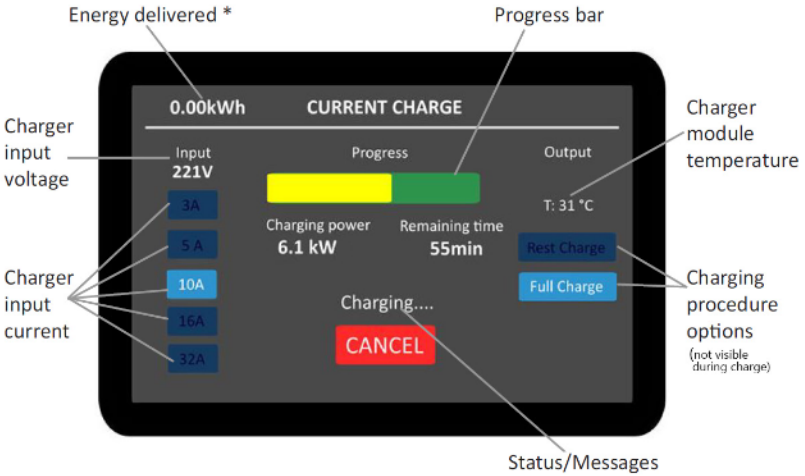
The following chargers are approved:

P/N	DESIGNATION	TYPE	MANUFACTURER
7020100000	Off-board Charger M20	Portable charger	Pipistrel d.o.o.
GM190010	Skycharge Solo 22	Mobile	Green Motion SA
GM190000	Skycharge Solo 22	Fixed	Green Motion SA

WARNING: Only use approved chargers!

NOTE: Please refer to [10] for Off-board Charger M20 instruction manual.

8.5.2 CHARGER FUNCTIONS



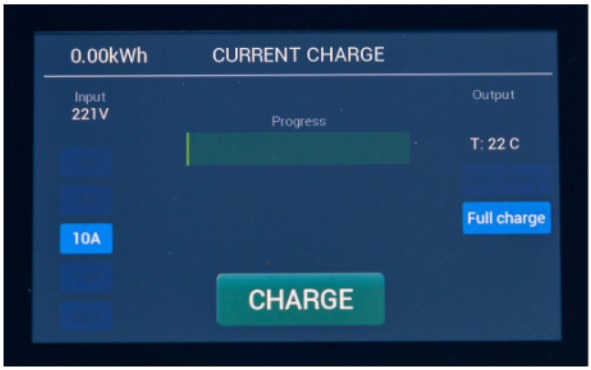
*NOTE: the "Energy delivered" parameter indicates the amount of energy transferred since the beginning of the current charging process. It does not represent the total amount of energy in the batteries. For this parameter refer to %SOC.

8.5.3 FULL CHARGE PROCEDURE

Full charge is the standard charging procedure performed before the flight.

1	Park the aircraft and engage parking brake
2	Connect charger to the grid
3	Power-up the charger switching the charger's rocker switch ON
4	Open charging port door on the upper motor cowling of the aircraft
5	Connect charger to the aircraft charging port *
6	Select "FULL CHARGE" option on charger display
7	Select desired charging current input from the left-side list (low charging current increases charging time, but reduces battery stress and heating)
8	Start charge by pressing "CHARGE" on charger display

* NOTE: the connection of the charger to the aircraft charging port is confirmed also by intermittent pulses of the haptic stall warning, which can be heard as a distinct buzzing sound.



Once the charging procedure has started, the battery coolant pumps will turn ON. Depending on battery temperature, also the cooling fans are activated. Charging options (full charge or rest charge) will disappear from the charger display once the process has started, and "CHARGE page" will appear on EPSI570C display.

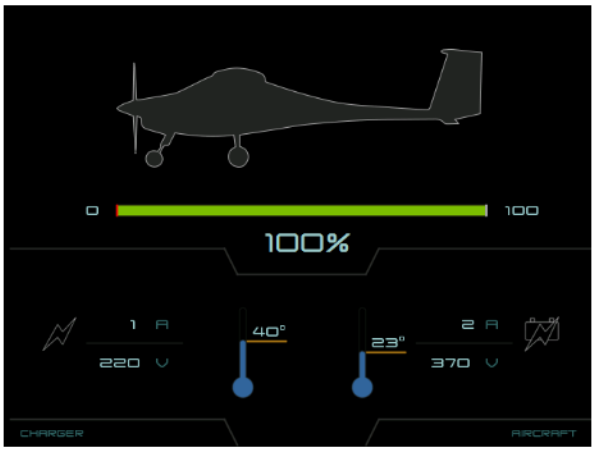
Charger display during charging process

NOTE: charging power is automatically derated (reduced) if battery temperature rises above +45 °C, or falls below +20 °C during the charging process.

9	* When recharging is completed ("CONFIRM" button visible on charger display and 100% progress bar on EPSI570C): end charging process by pressing "CONFIRM" on charger display.

* **NOTE:** when Software Package 13.0 or higher is installed, the charger's display does not show the "CONFIRM" button at the end of the charge, but it shows the message "(Re)connect the aircraft", instead. Proceed to next step.

Charger display at the end of charging process



EPSI570C display during charge process - example: charge 100% (completed)

10	CHECK EPSI570C display for presence of caution/warning messages*
11	Disconnect charging plug from aircraft charging port
12	Close charging port door on the aircraft motor cowling
13	Turn the charger off by switching the rocker switch OFF
14	Disconnect the charger from the grid

***CAUTION:** In case of malfunctions during the charging process, the "CHARGE page" on the EPSI570C is temporarily replaced by the "FLIGHT page", with caution or warning message/s displayed. The annunciator is illuminated as well, and the message is accompanied by an aural warning. The "FLIGHT page" will remain until message acknowledgment (see appendix 9-A1 for details about EPSI570C messages).

In case of battery coolant pump and/or fan malfunction or battery overtemperature during charge, the charging power is set to 0 kW and charging process is interrupted. In case of other malfunctions the full charge will be completed. Write down the caution/warning messages presented on EPSI570C before acknowledging them and before unplugging the charger from the aircraft charging port.

WARNING: Do not take off if any caution/warning messages appear during charging phase. Contact manufacturer.

CAUTION: Make sure that EPSI570C display is returned to normal FLIGHT/SYSTEM page mode after the charging process is completed successfully. Do not take off if CHARGE page is still active. Try to re-start the system to correct the problem. If the issue persists, contact manufacturer.

8.5.4 REST CHARGE PROCEDURE

Rest charge is used to prepare the batteries for a period of inactivity. Rest charge is an option to "full charge", on the charger display. This process will charge the batteries to a optimum level for aircraft storage (SOC 40-45% at the end of the rest charge process. SOC range for battery storage is 30-80 %SOC). The procedure should be repeated every 90 days, during storage period, to maintain the batteries in optimal conditions.

To perform "REST CHARGE" procedure, follow the same procedure as "FULL CHARGE", but press "REST CHARGE" option at the beginning of the charging process.

Safety notes related to battery recharging procedure

Emergencies: FIRE

WARNING: Be aware that lithium battery fires are extremely dangerous because they are self-sustaining! They are the result of chemical reactions and can't be extinguished! Smoke produced during the combustion is dangerous.

1	Remove any source of heat and stop the recharging process immediately
2	Vacate the area around the aircraft
3	Douse the fire with as much water as possible in order to delay fire propagation

Emergencies: SMOKE

WARNING: Stay away from the aircraft because the batteries may self-ignite!

1	Remove any source of heat and stop the recharging process immediately
2	Vacate the area around the aircraft

General notes:

Keep flammable liquids away from the aircraft
Position the aircraft so that the charger cables do not interfere with other airport or hangar operations
Have a long range water-type fire extinguisher nearby
Stay in the vicinity of the aircraft. Never leave it completely unattended
Verify charging status before removing charging cables

8.6 SERVICING

8.6.1 TIRE SERVICING

The main landing gear wheel assemblies use 4.00 x 6 tires. The nose wheel assembly uses a 4.00 x 4 tire. For maximum service from the tires, keep them inflated to the proper pressure.

Nose wheel tire:	Inflate to 1.8 bar
Main wheel tires:	Inflate to 2.8 bar

When checking tire pressure, examine the tires for wear, cuts, nicks, bruises and excessive wear.

8.6.2 BRAKE SERVICING

Brake Hydraulic Fluid Replenishing

The brake system is filled with DOT-4 hydraulic brake fluid. The fluid level should be checked at every oil change and at the annual / 100 h inspections, replenishing the system when necessary.

To replenish brake fluid:

1	Chock tires and release parking brake
2	Clean area on rudder pedals around cap before opening reservoir cap itself
3	Remove cap and add DOT-4 hydraulic fluid
4	Perform brake lines bleeding procedure *
5	Install cap, check brakes, inspect area for leaks

* **NOTE:** Brake lines bleeding procedure can be found in Aircraft Maintenance Manual [5].

8.6.3 PROPELLER SERVICING

The spinner and backing plate should be cleaned and inspected for cracks frequently. Before each flight the propeller should be inspected for dents, scratches, as well as corrosion on visible metal parts. If found, they should be repaired as soon as possible by a rated mechanic, since a nick or scratch causes an area of increased stress which can lead to serious cracks or the loss of a propeller tip. Refer to Propeller Manual [4] for detailed information.

8.7 GROUND HANDLING

8.7.1 TOWING / GROUND MOVEMENTS

Towing is not approved. For ground movements the following applies.

CAUTION: While pushing the aircraft backward, the nose-wheel must be off the ground to keep the nose wheel from turning abruptly. Do not use the tail vertical or horizontal control surfaces or stabilizers to move the airplane. Grab the tail cone in front of the vertical fin to push and maneuver. Wing roots can be used as push points. Do not push or pull on wing control surfaces or propeller to maneuver the airplane. Do not move the airplane when the main gear is obstructed with mud or snow.

Observe:

1	Be especially cognizant of hangar door clearances
2	Release parking brake and remove chocks
3	Move airplane to desired location by grabbing on the tail cone
4	When moving backward, lower the tail to keep nose wheel off the ground
5	Install chocks when repositioning complete

To obtain a minimum radius turn during ground handling, the airplane may be rotated around either main landing gear by pressing down on a fuselage just forward of the horizontal stabilizer to raise the nose wheel off the ground.

8.7.2 TAXIING / GROUND MOVEMENTS

Before attempting to taxi the airplane, ground personnel should be instructed and authorized by the owner to taxi the airplane. Instruction should include motor starting and shutdown procedures in addition to taxi and steering techniques. All Normal procedures apply.

CAUTION: Verify that taxi and propeller blast areas are clear before beginning taxi.

Do not operate the motor at high RPM when running up or taxiing over ground containing loose stones, gravel, or any loose material that may cause damage to the propeller blades. Taxi with minimum power needed for forward movement. Excessive braking may result in overheated or damaged brakes and/or fire. Observe wing clearance when taxiing near buildings or other stationary objects. If possible, station an observer outside the airplane. Avoid holes when taxiing over uneven ground.

1	Remove chocks
2	Start motor in accordance with Starting Motor procedure
3	Release parking brake
4	Advance power lever to initiate taxi. Immediately after initiating taxi, apply the brakes to determine their effectiveness
5	Taxi airplane to desired location
6	Shut down airplane and install chocks and tie-downs

8.7.3 PARKING

For parking:

1	Head airplane into the wind if possible
2	Retract flaps to (0)
3	Set parking brake by first applying brake pressure using the toe-brakes and then pulling the PARKING BRAKE knob aft
4	Chock both main gear wheels
5	Tie down airplane
6	Install a pitot head cover
7	Fold the bottom part of the seat up (vertically) to prevent any moisture from accumulating below the seat
8	Cabin doors should be locked. Lock doors at own discretion

CAUTION: Care should be taken when setting overheated brakes or during cold weather when accumulated moisture may freeze a brake.

8.7.4 TIE-DOWN

1	Head the airplane into the wind if possible.
2	Retract flaps to (0)
3	Chock the wheels
4	Attach tie-down rings
5	Install propeller holding device
6	Secure tie-down ropes to the wing tie-down rings and to the tail ring at approximately 45° angles to the ground

CAUTION: The tie down anchor points should not be more than 5 m apart to prevent tie down ring damage in heavy winds.

8.7.5 HOISTING

Hoisting the aircraft is only necessary in a few instances, such as when the landing gear has failed or the aircraft's fuselage is badly damaged.

CAUTION: Before lifting/hoisting the airframe always clear the immediate area of people and equipment.

To lift the aircraft:

1	Position the hoisting/lifting system over the aircraft
2	Remove the wing-fuselage joint seal
3	Lift and rotate vertically the 4 hoisting brackets (2 each side) mounted at the wing root, in the wing-fuselage joint gap
4	Connect hoisting system to the four hoisting brackets and lift the aircraft carefully

NOTE: the lifting point should be positioned in correspondence to aircraft empty C.G. position. See Weight & Balance Report [1]. Try to reposition the lifting point if the aircraft tilts while being lifted.

To lower the aircraft:

1	Lower the aircraft carefully to the ground
2	Disconnect and remove the hoisting system from the hoisting brackets
3	Fold the 4 hoisting brackets inside the wing-fuselage joint gap
4	Apply wing-fuselage joint seal

8.8 CLEANING

8.8.1. CLEANING EXTERIOR SURFACES

The airplane should be washed with a mild soap and water. Harsh abrasives or alkaline soaps or detergents could make scratches on painted or plastic surfaces. Cover static ports and other areas where cleaning solution could cause damage. Be sure to remove the static port covers before flight.

NOTE: Prior to cleaning, place the airplane in a shaded area to allow the surfaces to cool.

To wash the airplane, use the following procedure:

1	Flush away loose dirt with water
2	Apply cleaning solution with a soft cloth, a sponge or a soft bristle
3	To remove exhaust stains, allow the solution to remain on the surface
4	To remove stubborn grease, use a cloth dampened with degreaser or naphtha
5	Rinse all surfaces thoroughly

Any good silicone free automotive wax may be used to preserve painted surfaces. Soft cleaning cloths or a chamois should be used to prevent scratches when cleaning or polishing. A heavier coating of wax on the leading surfaces will reduce the abrasion problems in these areas. Pledge spray is recommended to be applied once the surface is clean and can be used instead of waxing.

Windscreen and Windows

Before cleaning lexan surfaces, rinse away all dirt particles before applying cloth or chamois. Never rub dry lexan. Do not attempt to polish lexan.

CAUTION: Clean windshield and windows only with a solvent free, none abrasive, anti-static cleaner. Do not use gasoline, alcohol, benzene, carbon tetrachloride, thinner, acetone, or glass window cleaning sprays. Use only a nonabrasive cotton cloth or genuine chamois to clean acrylic windows. Pledge spray is, however, recommended to be applied once the windshield is clean.

NOTE: Wiping with a circular motion can cause glare rings. Use an up and down wiping motion to prevent this. To prevent scratching from dirt that has accumulated on the cloth, fold cloth to expose a clean area after each pass.

1	Remove grease or oil using a soft cloth saturated mild detergent, then rinse with clean, fresh water
2	Using a moist cloth or chamois, gently wipe the windows clean of all contaminates
3	Dry the windows using a dry nonabrasive cotton cloth or chamois

8.8.2. CLEANING INTERIOR SURFACES

Windshield and Windows

Never rub dry lexan. Do not attempt to polish lexan.

CAUTION: Clean lexan windows with a solvent free, none abrasive, anti-static acrylic cleaner. Do not use gasoline, alcohol, benzene, carbon tetra-chloride, thinner, acetone, or glass window cleaning sprays. Use only a non-abrasive cotton cloth or genuine chamois to clean acrylic windows. Paper towel or newspaper are highly abrasive and will cause hairline scratches.

NOTE: Wiping with a circular motion can cause glare rings. Use an up and down wiping motion to prevent this. To prevent scratching from dirt that has accumulated on the cloth, fold cloth to expose a clean area after each pass.

1	Wipe the windows clean with a moist cloth or chamois
2	Dry the windows using a dry nonabrasive cotton cloth or chamois

Instrument Panel and Electronic Display Screens

The instrument panel, control knobs, and plastic trim need only to be wiped clean with a soft damp cloth. The multifunction display, primary flight display, and other electronic display screens should be cleaned with LCD Screen Cleaning Solution.

CAUTION: To avoid solution dripping onto display and possibly migrating into component, apply the cleaning solution to cloth first, not directly to the display screen. Use only a lens cloth or nonabrasive cotton cloth to clean

display screens. Paper towels, tissue, or camera lens paper may scratch the display screen. Clean display screen with power OFF.

1	Gently wipe the display with a clean, dry, cotton cloth
2	Moisten clean, cotton cloth with cleaning solution
3	Wipe the soft cotton cloth across the display in one direction, moving from the top of the display to the bottom. Do not rub harshly
4	Gently wipe the display with a clean, dry, cotton cloth

The airplane interior can be cleaned with a mild detergent or soap and water. Harsh abrasives or alkaline soaps or detergents should be avoided. Solvents and alcohols may damage or discolor vinyl or urethane parts. Cover areas where cleaning solution could cause damage. Use the following procedure:

1	Clean headliner, and side panels, with a stiff bristle brush, and vacuum where necessary
2	Soiled upholstery, may be cleaned with a good upholstery cleaner suitable for the material. Carefully follow the manufacturer's instructions. Avoid soaking or harsh rubbing

CAUTION: Solvent cleaners and alcohol should not be used on interior parts. If cleaning solvents are used on cloth, cover areas where cleaning solvents could cause damage.

Leather Upholstery and Seats

Wipe leather upholstery with a soft, damp cloth. For deeper cleaning, use a mix of mild detergent and water. Do not use soaps as they contain alkaline which will cause the leather to age prematurely. Cover areas where cleaning solution could cause damage. Solvent cleaners and alcohol should not be used on leather upholstery.

1	Clean leather upholstery with a soft bristle brush and vacuum it
2	Wipe leather upholstery with a soft, damp cloth
3	Soiled upholstery, may be cleaned with approved products. Avoid soaking or harsh rubbing

Carpets

To clean carpets, first remove loose dirt with a whiskbroom or vacuum. For soiled spots and stubborn stains use a non-flammable, dry cleaning fluid. Floor carpets may be cleaned like any household carpet.

8.9 RIGGING

8.9.1. WINGS REMOVAL AND INSTALLATION

Wings removal

NOTE: A minimum of three people are required to carry out this task.

Required parts, materials and tools:
- Metric ratchet and socket set
- T-Handle hex head screwdriver set

Step	Action
1	Engage the parking brake.
2	Place wheel chocks under main landing gear wheels.
3	Remove white wing-fuselage joint seal.
4	Remove pitot tube.
5	Enter the cabin and disconnect static/pitot lines and electrical cables from the wing roots.
6	Support each wing at the wingtip.
7	Remove central wing spar bolt.
8	With both wings supported at their ends, remove the two spar pins.
NOTE: Moving the wingtips up and down slightly makes spar pin removal easier.	
9	With one person at each end of the wing, slowly remove one of the wings from the fuselage.
10	Place it in wing cart or on any dry, padded surface.
11	With one person at each end of the wing, slowly remove the other wing from the fuselage.
12	Place it in wing cart or on any dry, padded surface.

Step	Action
13	Disengage parking brake.
14	Remove wheel chocks.
15	Carry out visual inspection of the wings.

Wings installation

NOTE: A minimum of three people are required to carry out this task.

Required parts, materials and tools:
- Metric ratchet and socket set
- T-Handle hex head screwdriver set
- Paper towel
- White wing-fuselage joint seal (P/N 5230014)

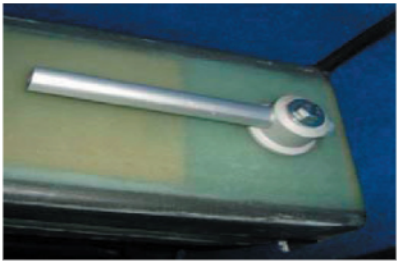
Step	Action
1	Clean spar pins, wing positioning pins/bushings and wing spar bushings with a piece of paper towel and lubricate them.
2	Engage the parking brake.
3	Place wheel chocks under main landing gear wheels.
4	Support one wing at both ends and slide its spar into the fuselage. When the wing root is about 10 cm away from the fuselage put all/any electrical cables through their respective openings in the fuselage. Slide the wing into its final position using the wing positioning pins as a guide. Continue to support the wingtip as the spar rests against the fuselage.
5	Support the other wing at both ends and slide its spar into the fuselage. When the wing root is about 10 cm away from the fuselage put all/any electrical cables through their respective openings in the fuselage. Slide the wing into its final position using the wing positioning pins as a guide. Continue to support the wingtip as the spar rests against the fuselage.

CAUTION: While pushing the wings into their final position make sure that the flaperon controls have engaged properly.

Step	Action
6	With the wings supported at their wingtips, slide the spar pins through the wing spar bushings and fasten them in place.
	CAUTION: If, at this point, the spar pins are properly inserted and the wings are secured, it is no longer necessary to support the wingtips.
7	Secure spar pins with fastening material, tighten bolts to torque 23 Nm.
8	Insert and tighten the central spar bolt to torque 15 Nm.
9	Carry out operational check of the flaperon control system.
10	Connect all electrical cables and pitot/static lines.
	CAUTION: The pitot and AOA lines are marked in the cabin and on the lines themselves with a P and AOA respectively.
11	Install pitot tube.
12	Apply white wing-fuselage joint seal.

Wing root positioning pins

Wing spar joints



Spar pin - installed

Central spar bolt and two spar pins

8.9.2. PITOT TUBE REMOVAL AND INSTALLATION

Pitot tube removal

Required parts, materials and tools:
- T-Handle hex head screwdriver set

Step	Action
1	Locate the pitot tube fastened to the bottom surface of the starboard wing.
2	Unscrew/remove the screws securing the Pitot tube to the wing.
3	Pull the Pitot tube away from the wing slightly to access the hose ports.
4	Disconnect the Pitot and AOA hoses from the tube.
5	Remove the Pitot tube.
6	Carry out visual inspection of the pitot tube and hoses.

Pitot tube installation

Required parts, materials and tools:
- T-Handle hex head screwdriver set

Step	Action
1	Attach the Pitot and AOA hoses to the Pitot tube.
2	Position the Pitot tube on the wing's bottom surface.
3	Fasten the Pitot tube to the wing.

CAUTION: Install the Pitot tube so that it's parallel to the aircraft`s longitudinal axis, therefore, pointing in the direction of flight. The readings given by navigation instruments on the VELIS Electro will not be accurate if it's installed at an angle.

WARNING: Do not blow into the Pitot tubes entry ports as this could easily damage the instruments.

8.9.3. HORIZONTAL STABILIZER REMOVAL AND INSTALLATION

Horizontal stabilizer removal

Required parts, materials and tools:
- 14 mm spark plug socket wrench (P/N 1190003),
- Flathead screwdriver

Step	Action
1	Weigh the tail cone down to access the horizontal stabilizer.
2	Remove the attachment bolt's black cap.
3	Slide screwdriver perpendicularly through 14 mm socket wrench and use it to unscrew/remove the horizontal stabilizers' attachment bolt assembly.
4	Lightly jolt the elevator's trailing edge, so that the horizontal stabilizer pops out of place.
5	Remove it and set it on a dry, padded surface.
6	Remove tail cone counterweight.

Horizontal stabilizer installation

Required parts, materials and tools:
- 14 mm spark plug socket wrench (P/N 1190003),
- Flathead screwdriver

Step	Action
1	Weigh the tail cone down to access the horizontal stabilizer.
2	Lubricate horizontal stabilizer pins and bushings.
3	Lubricate horizontal stabilizer attachment bolt assembly
4	Position the horizontal stabilizer so that it's pins slide into their respective bushings.
5	Use 14 mm socket wrench to fasten the horizontal stabilizer to the aircraft while simultaneously pushing down on the bolt with the screwdriver.
6	Orient the bolt's head so that slides into the spring-loaded locking mechanism (see figure).
7	Shake stabilizer a little to ensure it is secured to the aircraft.
8	Install the attachment bolt assembly's black cap.
9	Carry out operational inspection of the elevator.
10	Check elevator deflection angles.

Attachement bolt installation

Attachment bolt head orientation

SECTION

9

SECTION 9 – APPENDIX

LIST OF APPENDICES

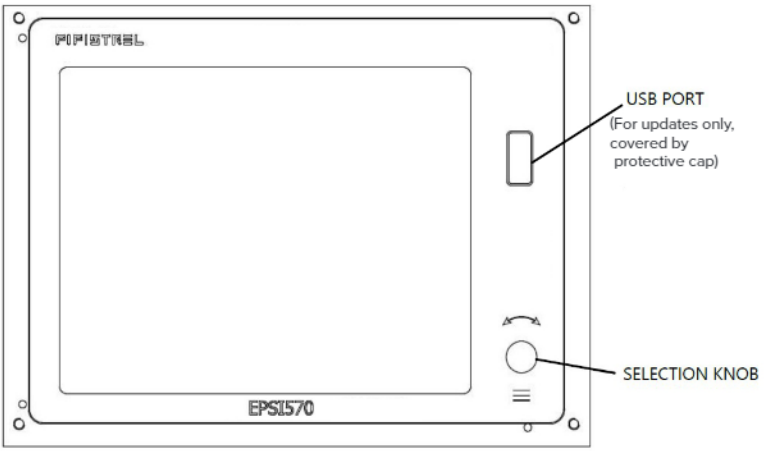
APPENDIX NO.	APPENDIX
9-A1	EPSI570C SYSTEM DESCRIPTION

APPENDIX
9-A1

SECTION 9 – APPENDIX 9-A1

EPSI570C SYSTEM DESCRIPTION

The EPSI570C is an integrated avionics device which monitors several propulsion system operational parameters on the VELIS Electro. The display informs the user about system status and shows RPM, power controller temperature, motor temperature, coolant temperature, state of charge, battery temperature and state of health. EPSI570C device is installed on the instrument panel of the aircraft. The device is composed of a main display, a selection knob, and a USB port for software updates. The device is operative when the MASTER switch is engaged. Rotation of the selection knob allows the user to move from page to page on the display.



The EPSI570C also contains a small audio speaker, used for audio feedback and alarms. In addition to the speaker, an audio output is also implemented which is connected to the aircraft's audio panel (or radio). EPSI570C communicates with the propulsion system of the VELIS Electro via three CAN-bus interfaces running at 500kBit. It is powered via a standard 10-15V supply rail, which in the VELIS Electro is supplied by the system controller.

Table below gives basic specifications of the EPSI570C instrument.

PARAMETER	VALUE
Size	160 mm × 120 mm × 25 mm
Weight	450 g
IP Class	IP 54
Display	5.7 inch, 640 X 480 (VGA) full color TFT LCD
Communication	3x CAN-bus @ 500kbit/sec
Audio	Built-in speaker + 1 Vpp audio out
USB	1X USB 2.0 full speed compliant USB host
Connector	1x 15-Pin D-Sub
Operating temperature range	-20°C – 75°C
Power supply	10V-15V, 8W max.

The main task of EPSI is to provide essential information of the electric propulsion system to the pilot, which includes:

- Motor operating status, RPM, power and temperature
- Power controller operating status, temperature
- Battery system operating status, temperature, SOC (State of Charge) and SOH (State of Health)
- Remaining Flight Time (RFT) - for information only
- System error, caution and warning messages
- Auxiliary (14V) battery status and voltage

EPSI570C also includes a USB host port on the front side. The USB port is used for aircraft's firmware updates and is covered/protected during normal operations. USB cover removal and software updates are a maintenance tasks are should not be performed by the pilot.

Display Modes

EPSI570C has three different display modes/pages: Flight mode and System mode are used in flight, Charge mode is used on the ground during battery recharge. The transition from a mode to another is done by the selection knob rotation.

NOTE: Values shown in the following pictures are for demonstrative purposes only and do not apply to any specific real operational situation.

FLIGHT page

FLIGHT page 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 temperatures, battery voltage and warning messages as well. See the picture below for a description of FLIGHT mode page.