VERONTE
AUTOPILOTS

System Overview

Custom configurations are also available (OPV, ground vehicle control, onboard control station...).

Please ask our team for defining a configuration adapted to your system

VERONTE AUTOPILOTS

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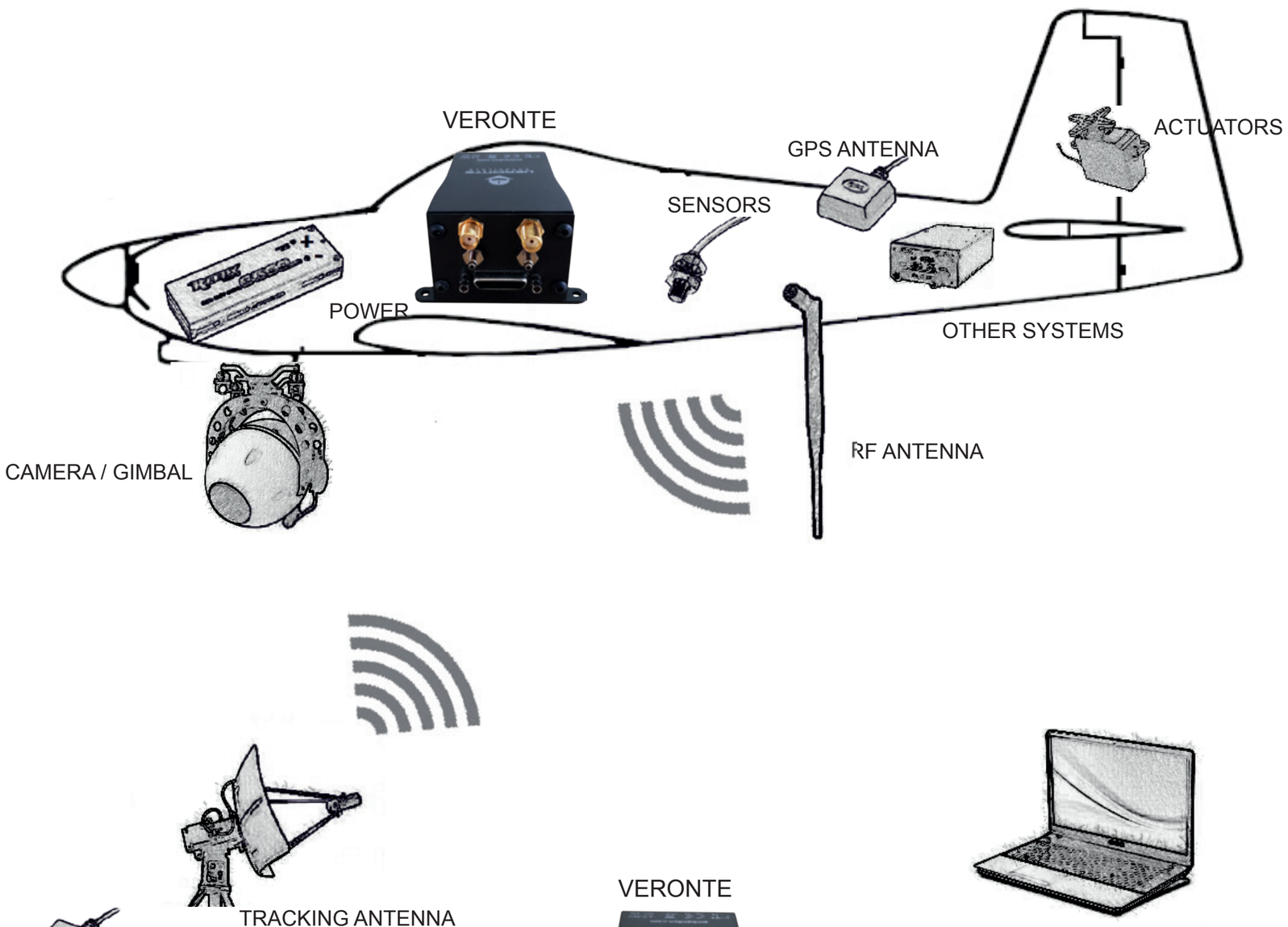
Veronte Autopilot System Layout

Veronte autopilot is a high reliability control system capable of controlling any unmanned vehicle. Its adaptable configuration permits to control the most diverse platform layouts (fixed wing, helicopter, multicopter, hibrid platforms, surface vehicles...).

Two main elements on standard system configuration are: platform and control station, each of them containing one Veronte unit and linked trough the radio data-link.

Veronte Pipe is the user interface for controlling the system, operated from a PC or tablet, connected to Veronte on the control station. This Veronte will be in charge of controlling any device on the control station (tracking antenna, lights, weather station....) and performing communications with onboard Veronte Autopilot.

On the platform side, Veronte embeds IMU and sensors needed for controlling the aircraft, besides the radio module. Pitot tube and antennas for GPS and data-link must also be installed onboard, together with aircraft actuators and any device to be controlled from the autopilot (gimbal, camera shooter, sensors...)



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Configurable Modules

Veronte Autopilot

It is a highly configurable product, admitting a wide variety of setup configurations for mating the most demanding requirements. This versatility permits to configure software and hardware modules on demand, acquiring just the functionalities required for the application.

Hardware Modules

There are a wide variety of hardware modules that can be stacked in order to configure the control system:

- **Veronte Base**

  It is the core of the system, including all elements needed in order to operate the platform (IMU, sensors, GPS, processor...).

  Within this module it is possible to select the airspeed sensor, according to the platform speed, and the I/O configuration:

  - **ECAP:** 11 PWM/GPIO outputs, 2 digital & 1 analog inputs, CAN, RS-232
  - **PWM:** 12 PWM/GPIO outputs, 1 digital & 1 analog inputs, CAN, RS-232
  - **JTAG:** 8 PWM/GPIO outputs, 1 digital & 1 analog inputs, RS-232, JTAG (developer version)

- **Veronte Vision**

  It adds onboard video processing capabilities to the system. The dedicated DSP can control multiple cameras simultaneously, at the time it runs real time applications for: target tracking, video stabilization... and any custom software running in Linux. It also includes WIFI communications and a composite video output for real time video streaming.

- **Veronte 4G** (Veronte Vision required)

  It has been developed for increasing aircraft range by using 3G and 4G communications network. It is compatible with embedded radios available within the system and permits to transmit both; video and telemetry data.

- **Ethernet**

  It is mainly used on the control station hardware by adding an Ethernet port to the system to communicate it with the PC on the control station.

- **Veronte I/O Expander**

  Some applications require extra I/O ports besides the ones included within Veronte Base. It is possible to add to the system as many I/O expander boards as needed, each one adding: PWM/GPIO outputs, analog and digital inputs, ARINC & RS232 ports.

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- **Veronte I/O Pyro**

  Veronte Pyro permits to control high current loads form the autopilot. This expansion board can manage up to 12 devices (depending on the required power) and is frequently used for controlling: pyrotechnics, lights, device power...

- **Veronte I/O Valve**

  This expansion module permits to precisely control valve position, mainly used for hydraulic systems control.

- **Radio Modules**

  Telemetry communications can be performed by using the embedded radio or any external radio module. Embeddable radio modules available are 900MHz or 2.4 GHz. For external radio connection an extra RS232 port if no embedded radio is installed.

  Please refer to each expansion module documentation for further information on hardware module performance.

Software Modules

Software on Veronte includes most advanced functionalities available on the unmanned system sector. It has been configured in modules so the operator can only acquire the functionalities needed for its application, permitting to upgrade these functionalities at any time after the purchase.

- **Gimbal / Tracker Stabilization & Pointing**

  This functionality enables gimbal and tracking antenna capabilities on the system. The autopilot will permit to automatically control a gimbal or a tracking antenna for pointing it to: a fixed point, a fixed attitude, tracking another Veronte system...

- **Simultaneous Unmanned Vehicles**

  In order to simultaneously operate with multiple aircraft using the same control station, this functionality must be activated on the control station Veronte.

- **Advanced Communications**

  This module enables advanced communications features for using: CAN, RS232 or ARINC interfaces. It can be used as a tunnel to transmit data between the control station and the platform or for controlling custom devices from Veronte.

- **Flight Mode**

  There are three flight mode options available on the system:

  - **Standard:** automatic and manual control modes.
  - **Advanced:** automatic, manual and arcade (assisted piloting mode) flight modes.
  - **Premium:** includes advanced configuration plus custom control modes.

Software modules can be remotely enabled at any time after the purchase.

Meanwhile hardware modules must be upgraded at Embention.

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Flight Phases

These are the different segments on the mission where the platform has an specific behaviour operating on an automatic mode. As many custom phases as needed can be configured, most standard ones are:

- **Take Off:** automatic take off: runway, catapult, hand launch...
- **Climbing:** ascend at a fixed climbing rate.
- **Waypoint Route:** perform a route following mission waypoints.
- **Loiter:** fly following a circular trajectory at a given radios.
- **Hover:** maintain the platform in a fixed position and attitude.
- **Hold:** maintain a certain system variable on a fixed value: speed, attitude...
- **Descending:** loose altitude at a fixed descending rate.
- **Landing:** automatic landing: belly, net , runway, parachute, linear landing...
- **Flare:** manoeuvre for reducing aircraft speed to 0 on landing.

Radar-altimeter fusion

For large platforms, it is recommended to use a radar-altimeter in order to improve the altitude measure, essential for performing automatic landing. This module permits to merge the data captured from the radar-altimeter with the control system data.

RTK fusion

Some RPAS missions like mapping or topography require an accurate position precision. RTK module uses differential GPS (DGPS) technology in order to improve platform position measurement. Satellite data captured on the platform is compared with the data acquired on the control station for this purpose.

Control Actuator

Number of control actuators required to be controlled by the autopilot may vary depending on the aircraft type and the devices installed (gimbal, cameras...).

Adaptive Control

Standard configuration uses fixed PIDs for the platform control which may not be enough for applications where the platform layout vary during the operation. By using the adaptive control, the control system will automatically adjust the control parameters by sensing the aircraft status and “learning” on the actuator influence within the aircraft for each situation.

Video Streaming and Recording (Veronte Vision required)

Enables WIFI communications interface on Veronte Vision for real time video streaming, together with the onboard video recording on the embedded memory.

Video Stabilization (Veronte Vision required)

Stabilizes video onboard, prior to the transmission.

Target Tracking (Veronte Vision required)

Object tracking and gimbal pointing using data captured from the camera.

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Specifications

Mechanical	
Enclosure	Anodized Aluminium
Weight (including radio module)	130g / 70g (no enclosure)
Size (LxWxH) (No flange or connector)	68.38x48x36.5 mm / 65x37x35 mm (no enclosure)
Protection Rating	IP54 (IP67 available with no connector)
Mounting	M4 screws
Temperature range (no convection)	-40 to 65 ºC
Pressure port diameter	2.4 mm
RF connectors (radio / GPS / WIFI)	SMA jack female
Vibration isolation	Recommended use of 5-30Hz bushings

Compatible Platforms	
Aircraft type	Fixed wing, VTOL, aerial targets, hybrid systems, multi-copters, parafoil, paraglider, surface vehicles…
Control surfaces	Aileron, flap, elevator, rudder, gas, v-tail, x-tail, elevon, flaperon, ruddervator, cyclic, collective, throttle, custom servo mixing...
Engine	Electric & combustion, multiple engine support

Sensors	
Static pressure	15-115kPa
Dynamic Pressure	4kPa (156kt 290km/h sea level) / 10kPa (247kt 459km/h sea level) / 50kPa (550kt 1028 km/h sea level)
Accelerometers (3 axes)	±6 g on maintained maneouvre (all axes redundancy)
Rate-gyroscopes (3 axes)	±300 deg/s
Magnetometers (3 axes)	±6 Gauss (compensated) Optional external magnetometer fusion
GPS	4Hz receiver, 12 channels, SBAS DGPS, LADGPS / RTK RTK – Like differential GPS with no additional hardware
Voltage	Input voltage sensor
Temperature	Internal temperature sensor

I / O (On base hardware)	
Electrical	6.5-36V. Power 4W including 900MHz radio
EPWM/GPIO	Up to 12 (configurable refresh rate 50Hz to 350Hz)
FTS	Deadman output
ECAP	up to 2
ADC	1 (0-36V, 12 bits)
Serial port	1 RS232
CAN	1

Data Link	
900 MHz	902-928MHz / 115kbit/s
2.4 GHz	2400-2483 MHz / 115kbit/s
External	Any external radio module via RS232

Veronte Autopilot does not manage power for aircraft devices itself. Veronte Pyro expansion board is available for this purpose.

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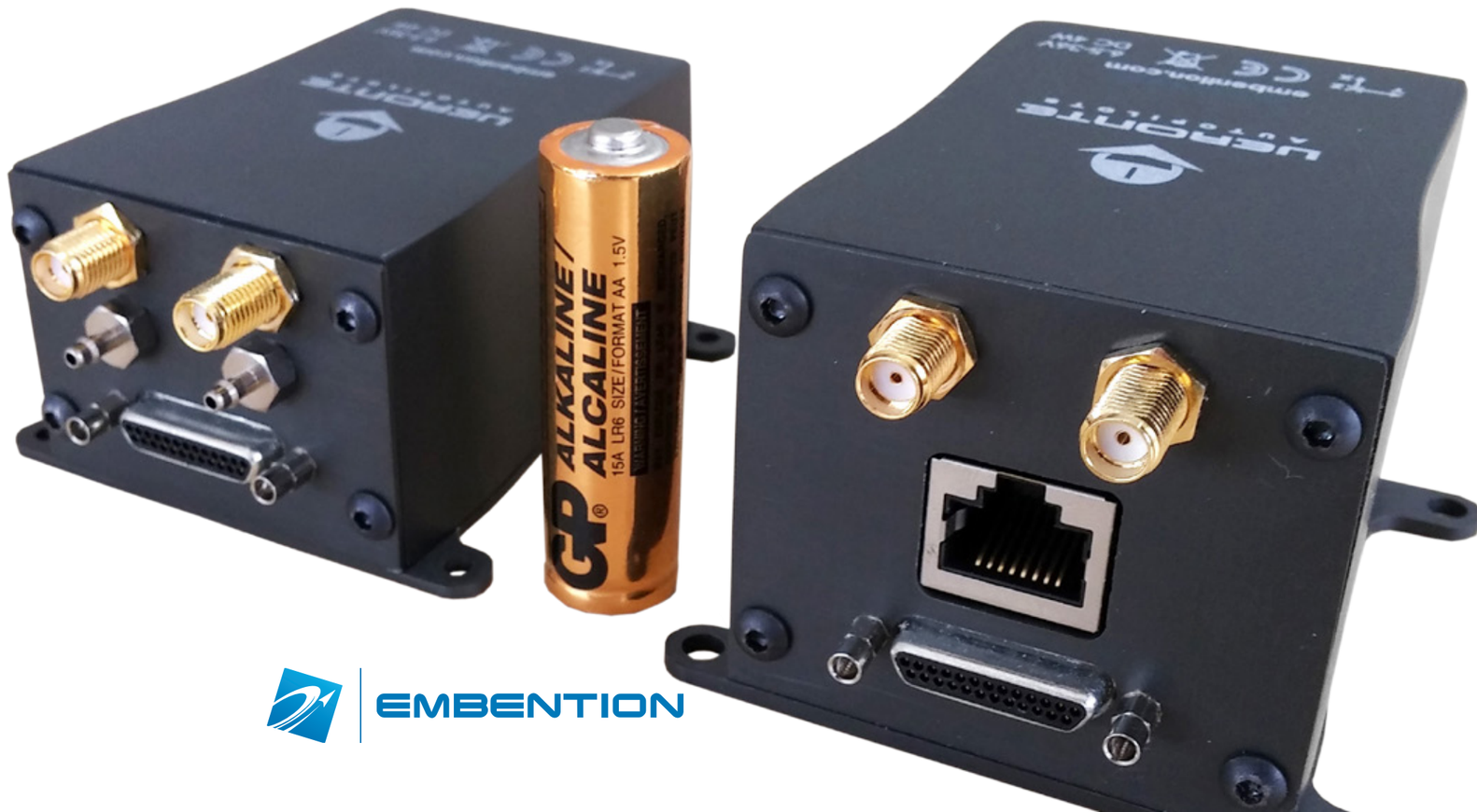
Operation	
User access level	Unlimited user creation with selectable functionalities
Selectable units	Selectable units or custom unit creation
Workspace	Drag and drop telemetry displays (LCD, text, gauge, LED…) with configurable colors and sizes
Map view	Selectable form main map sources (google maps, mac, open maps...) or customizable using JPG/PNG images
Control	Configurable phases and control channels. Cascade PID control or adaptive control.
Advanced maneuvres	**Veronte Pursuit:** follow another Veronte equipped aircraft **Skimming:** perform an aggressive maneuver at a low AGL
Multiple platforms	Simultaneous platform control from the same control station
Multiple control stations	Multiple control stations available for controlling or monitoring
Route	Intuitive user interface for waypoint and route creation. Inflight mission edit.
Mapping tools	Automatic mapping route generation by selecting the target surface and camera parameters.
Payload	Camera gimbal, tracking antenna, transponder, camera shooter...
Flight modes	Fully autonomus flight, assited control and manual control.
Safety pitot	Safety pilot can take manual aircraft control at any time during the operation. Joystick can be connected by wire to the control station or using an onboard receiver.

Safety	
Fail safe modes	Configure custom automatic actions to take place on event detection **Actions:** go home, parachute deployment, glide… **Events:** flight time, distance, data link lose, GPS lose, waypoint reach, sensor value…
Warnings	Customizable visual and sound warnings
Qualification	DO-178B, DO-254, and DO-160G evidences for airworthiness certification
FTS	Dissimilar microprocessors and regulation stages. Configurable output for safety protocol activation on Veronte failure or manual activation
Redundancy	Dual and triple module redundant configurations
Fault Tolerant	Fail safe, fail operational for redundant configurations
Export	No export restrictions, ITAR free



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