BCN™
DRONE CENTER

UAS PARTS

DRONE PILOT COURSE

UAS PARTS

CHASSIS-FRAME-FUSELAGE

This part constitutes the skeleton of the aircraft, it is in most cases the main structure, which determines its size and shape. As for materials, they are made of light alloys of aluminium, magnesium and titanium. Composite materials such as carbon fiber, fiberglass and plastic are used to reduce weight.

MOTOR PROPELLER GROUP

This part is made up of the engines, propellers and rotors that allow the aircraft to move. The most used for rotorcraft are brushless electric motors.

- Propellers: they are rotated by the power transmitted by the engines, raising the aircraft in the air according to the aerodynamic forces. In general, the greater the length of the propeller, the greater the thrust. They are usually made of carbon fiber, plastic or nylon.

BATTERIES

The most used are lithium polymer, "Li-Po". They require a slower charge than “Ni-Cd” or “Ni-MH”, but are manufactured in more forms than Li-Ion, thus optimizing the space in the fuselage dedicated to batteries.

UAS PARTS

FLIGHT CONTROLLER BOARD

This part constitutes the so-called brain of the aircraft, it is the integrated computer that commands the movement orders and collects the system data. Among the elements available are gyroscopes, altitude and height sensors, height variation sensors, compass, speed sensors, position sensors, etc.

COMMAND UNIT

It is made up of radio signal transmitters/receivers that send information to the aircraft for flight control through the control knobs and receive data from the unmanned aircraft sensors through antennas. This information is transmitted to the pilot through data management elements such as screens, LEDs, vibrations, etc.

SPEED REGULATORS OR ESC

The ESC (Electronic Speed Control) are responsible for the aircraft's motors turning at the necessary speed by means of an electrical circuit that varies the speed and direction of the motor to carry out the different movements.

UAS PARTS

GIMBAL

It is the part that serves as stabilization of the payload to the aircraft. It keeps it controlled and level and makes it possible to control the rotation in the axes x, y, z of the payload from the control station. In addition, it prevents the movements of the aircraft and the vibrations of the propellers and engines from affecting the movement and stability of the payload.

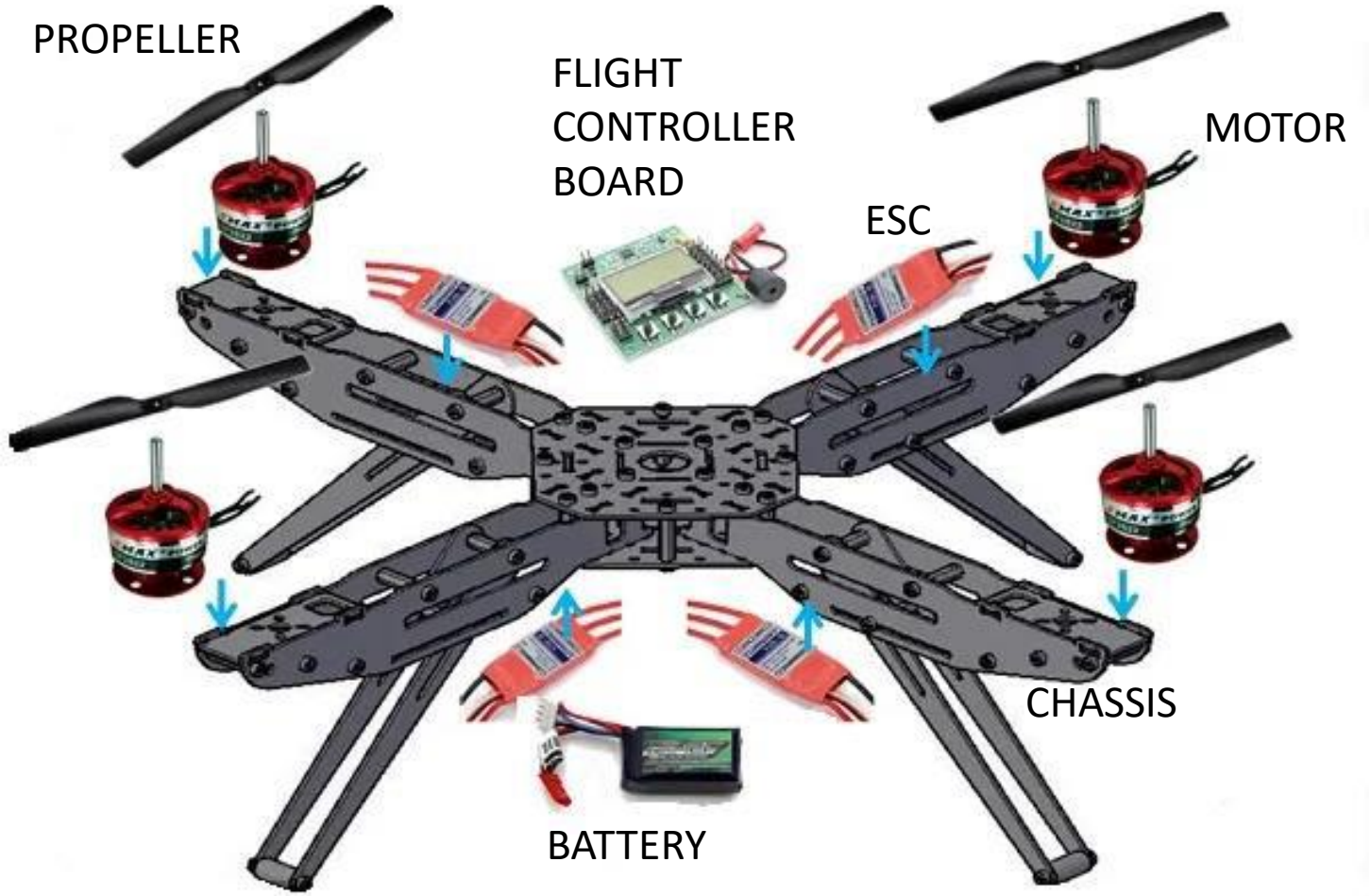
PAYLOAD

It is the part composed of that instrument, mechanism, equipment, component, accessory installed or fixed in the aircraft and is not used or intended to be used for the management or control of the aircraft in flight. Among the most common payloads are optical, thermal, multispectral cameras, but there are many payloads.

LANDING GEAR

It is the part that is used for the aircraft to land and avoid damage when it reaches the ground. In quadcopters they usually take the form of legs, which sometimes integrate the antennas to receive the signal from the remote station and LED lights that vary in color and frequency so that the pilot can know if there is any problem in the state of the aircraft. Other types of trains are retractable, which allows them to be retracted when taking off and not get in front of the camera if it rotates on its axis. For fixed-wing aircraft, wheels are usually used in the landing gear, or even a skid located in its belly or the reinforced fuselage itself on which they land.

UAS PARTS


PROPELLER
FLIGHT CONTROLLER BOARD
ESC
MOTOR
CHASSIS
BATTERY
LANDING GEAR

CONTROL STATION PARTS

The UAS, as a general rule, have a control station or radio station called GCS (Ground Control System), which is used to control the equipment. This control station can be a transmitter with sticks and buttons to control the aircraft, but there are other possibilities such as control by means of computers or even trailers or ratings in the case of more advanced equipment.

The main function of the control station is the command and control of the UAS, through which the necessary movements are produced to guide the aircraft.

CONTROL STATION PARTS

SIGNAL TRANSMITTER/RECEIVER

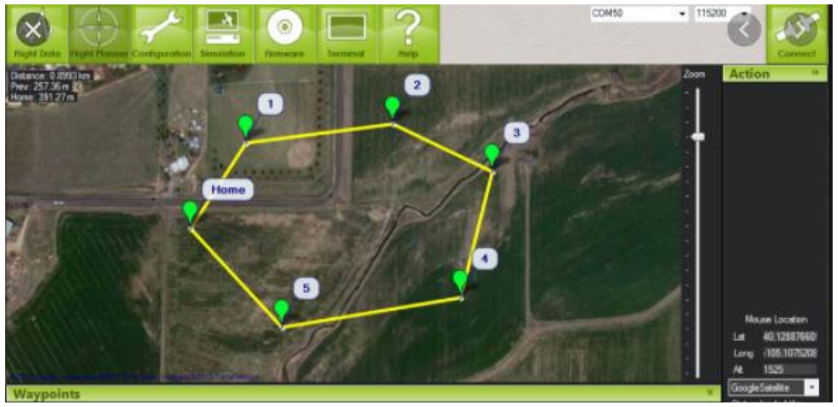
It sends information to the aircraft for flight control and receives data from the sensors through radio signals through an antenna.

CONTROL ELEMENTS OR COMMANDS

They allow the aircraft to be directed, allowing control over the engines and the rest of the systems that influence the flight.

DATA DISPLAY AND MANAGEMENT ELEMENTS

Process positioning and telemetry data and display the necessary information for the flight. The systems that have an FPV transmitter that will go inside the aircraft and the video receiver of the control station will show the images of the cameras that the UAS carries. Through its software you can program the autopilot, control the camera, have telemetry data, access the geocaging or geofencing functions and even return to the previously registered point of origin.



UAS COMMUNICATIONS

Communication services allow the exchange of information between the different ground systems and the aircraft. Communication links can be divided into uplink (from the control station to the aircraft) and downlink (from the aircraft to the control station).

UPLOAD LINK (From the CGS to the UAS)

- Control commands (flight plan, speed, return home, takeoff/landing, etc.).
- GNSS corrections (if any).
- Commands for the payment load (management of the gimbal and the command of the video/image orders).

DOWNLINK (From the UAS to the CGS)

- Telemetry (flight data).
- Payload status (gimbal position) and batteries.
- Video/images taken by the payload.

TYPICAL PERFORMANCE PARAMETERS FOR COMMAND AND CONTROL LINK (EFFECTIVE RANGE, OPERATING FREQUENCY, AND LATENCY)

- Latency: Time required to produce, process, send, receive, interpret and execute a command order.
- Frequency band: It is a small frequency section of the radio spectrum used in radio communications, where communication channels are used for similar services to avoid interference and allow efficient use of the spectrum. Typical communications link frequencies in UAS use are 2.4 Ghz and 5.8 Ghz.

UAS SENSORS

Another very important part of the command and control element are the sensors that indicate data such as the position of the UA, the flight height, the orientation of the UA and the attitude of the aircraft. The main sensors that a UA can count on are:

IMU (Inertial Measurement Unit)

Sensor that calculates the relative position of the UA. It is made up of an accelerometer (measures the linear acceleration with which the sensor moves) and a gyroscope (measures the angular velocity) combined.

LOCATION SENSOR

Sensors are needed to determine the absolute position of the UA. The most popular way to do this is by using GNSS (Global Positioning Satellite System). Relative positioning sensors (altimeter, sonar, AGL ultrasonic height sensor, Deckfinder) can also be used. To obtain the position of the UAS in the x,y,z axes, that is, in three dimensions, at least 4 satellites are needed.

UAS SENSORS

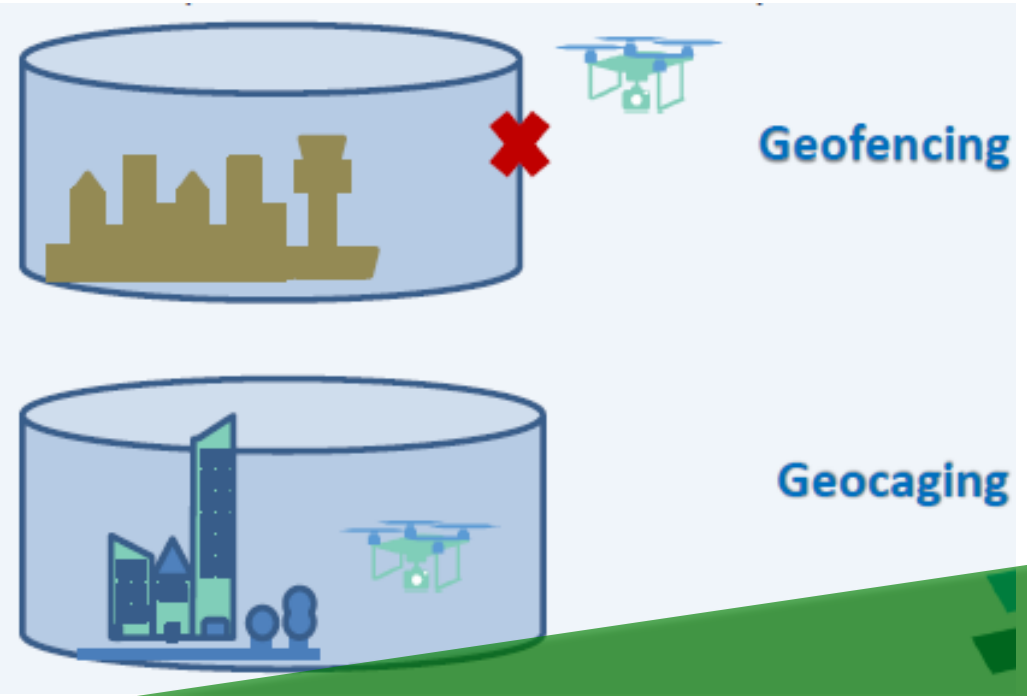
Geolocation is one of the most important aspects to take into account when operating with UAS. This function allows the UAS to know its exact position and perform automated operations as well as provide support to pilots during flight.

GEOFENCING SYSTEM

Operational volume/virtual airspace limit established by geolocation, within which the aircraft has been limited from entering by software. In this case, the pilot must define an operational volume where the unmanned aircraft will fly in which he will not be able to access.

GEOCAGING SYSTEM

Operational volume/virtual limit of the airspace established through geolocation, within which the departure of the aircraft has been limited by software. In this case, the pilot must define an operational volume where the unmanned aircraft will fly and which it will not be able to leave, without exceeding the horizontal and vertical limits.



UAS SENSORS

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BAROMETRIC PRESSURE SENSOR/PRESSURE SENSOR

With this sensor it would be possible to have a barometric altimeter and/or vertical speed indicator. The altimeter allows knowing altitudes or heights depending on its configuration (usually indicated in feet -ft-), while the vertical speed indicator facilitates the ascent and descent rate (usually represented in feet per minute -ft/min-). To know the height of the UAS flight, radio altimeters are also used or values are obtained by means of a GNSS satellite."

MAGNETOMETER

This sensor provides information about magnetic north. It is used as a compass to always know the direction in which the UA nose is pointing.

ANTI-COLLISION SENSORS-SENSE AND AVOID (SAA)

System by which the aircraft can detect and avoid fixed obstacles in its flight path without pilot intervention.

FLIGHT INSTRUMENTS

From the information collected through the sensors shown above, the following flight instruments are fed.

AUTOPILOT

- Manages data from sensors to give orders to motors and control surfaces based on the commands received. The sensors receive the data that is managed in the autopilot.
- In case of loss of GNSS, the autopilot starts to command a hovering (stationary flight over a point) and in a pre-established time if this signal is not recovered, the aircraft will proceed to vertical landing.
- The autopilot allows the UAS to follow the planned route, compensating for the effects of wind and other flight disturbances.

FLIGHT TERMINATION SYSTEM (FTS)

System that UAS have to reach a level of safety before an emergency by terminating the flight in safety conditions. UAS have several safe flight termination systems:

- Return to Home (RTH): consists of a security system by which the aircraft in case of communication failure or loss of control of the UA, maintains a predetermined height and returns to a position previously defined security. Once in that position, the UAS lands automatically.
- Landing against battery depletion.

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Thanks for your attention

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