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Design of an autonomous drone for agricultural control

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1 Tor of reference

This document will define the clauses and requirements to carry out the project. A distinction is made between technical and working conditions.

1.1 Technical specifications

As far as the electronic components are concerned, they maintain a compatibility relationship with each other due to their electronic nature. For example, a change of battery voltage would imply changing the rest of the components to adapt them to the new voltage. The characteristics of the components selected in the project report must be respected, but there are some factors that can be improved. They are shown in the following table:

Component	Quantity	Alternative specifications
Motor	4	-Lower KV -Smaller weight -Bigger thrust
ESC	4	-Smaller size or weight
Battery	1	-Bigger capacity -Lower discharge capacity -Smaller size or weight
FC	1	-Better IMU -Smaller weight
PDB	1	-Smaller weight
TX	1	-More number of channels
RX	1	-Smaller weight or size
GNSS	1	-Smaller CEP -Smaller weight or size
LED stripes	2	-Less power consumption
Camera	1	-Better resolution -Smaller weight or size
Gimbal	1	-Smaller weight

Table 1: Possible components selection improvements. *Own elaboration.*

With regard to the characteristics of self-designed components, it is essential to respect all measurements for their correct assembly. In addition, they must all offer the ability to be 3D printed. However, alternative materials offering similar performance can be used. The basic conditions to be met for each part are as follows:

- **Upper and lower frame.** These are the most important parts as they receive the direct stress and protect the components. The alternative material must have a tensile strength of 9 MPa. It must also be a plastic and can offer a lower bulk density.
- **Inner bracket.** It does not withstand any load so the material properties may be more basic and offer less strength.

- **Landing gear legs.** The weight of the drone is not a big burden because the material chosen can be weaker and cheaper.
- **Propellers.** Propellers can be made of plastic, carbon fibre or a composite of both. It will only affect stability, stiffness and impact resistance. In terms of flight quality, it should not be noticeable much difference if a similar material is used.

Finally, with regard to the fixing components such as screws, the thread pitch chosen must be respected, as well as the cross-section of the tie wraps chosen, as they must pass through the holes in the frame.

1.2 Working conditions

The following conditions and their variants must be met in order for the company to be able to perform client services to the satisfaction of the customer:

- The programme used for image processing and flight planning can be either UgCS or Pix4d Capture or any other similar software.
- The operator contracted to operate the drone must meet the conditions imposed in the Commission Implementing Regulation (EU) 2019/947.
- The worker shall be paid on an hourly wage basis and in no case more than 40 hours per week. If this were the case, the incorporation of a second worker would be reconsidered.
- A safe means of transport must be provided for the operator to be able to travel to different customers. This can be a car or a van, but not a motorbike, as the drone must be carried with the operator.
- The worker shall be provided with a sufficiently powerful computer to be able to work. It should have a minimum of 8GB ram and an i7 processor or higher.
- The worker can work from home to do the post-processing work on the images.
- The drone should be covered by full insurance as it is prone to fire and theft.
- The operator is responsible for notifying about the replacement of the battery every one and a half years or when noticing a considerable decrease of its capacities.
- The delivery time of results to the client should in no case exceed one week from the time of in-flight image collection.