

Aracnocóptero: an aircraft designed to inspect wind turbines

The adaptation of the 'aracnocóptero' of the company Arbórea to the needs of the wind sector saves costs in the review of the windmills

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After developing an unmanned aerial vehicle called 'aracnocóptero', the Arbórea company, located in the Scientific Park of the University of Salamanca, has adapted this device to the needs of wind energy companies for the review of wind turbine blades. With the passage of time these gigantic windmills suffer damage and their repair is very expensive. Until now, preventive checks were also very expensive, but this small robotic aircraft can offer accurate information very economically.



The Eol 6 aircraft model is specifically designed for wind turbine reviews. Photo: Arbórea

The 'aracnocóptero' is the result of four years of I+D+i by Arbórea and the Bisite research group of the University of Salamanca. Compared to other UAVs (English unmanned aerial vehicle or unmanned aerial vehicle), it has many advantages, since it has a small size but can carry several kilos of weight and offers great stability. The device is operated from a tablet and can be equipped with many types of cameras and sensors. Now, the 'aracnocóptero' has gone from eight engines (which gave it its name, since spiders have eight legs) to six, to adapt to this specific function. The name of the new model is Eol 6.

The adaptation work has been carried out with the Altertec company, a multinational wind maintenance company based in Valladolid. "We have adapted our platform to develop the first specific aircraft to perform wind turbine inspections", Carlos Bernabéu, head of Arbórea, tells DiCYT. "Although alternative energies have been slowed down here, in the rest of the world they are expanding due to their high profitability and Spain is leading in this industry", with "many of the innovative companies in terms of infrastructure and maintenance of this energy clean", he says. Therefore, the idea of this project is to provide a tool to facilitate an essential aspect such as blade maintenance.

Wear

Wind turbines, which currently have blades up to 100 meters in length, especially marine ones, "have surprising wear despite being made of resistant materials", says the expert. Factors such as temperature changes, the sun's ultraviolet rays or the speeds that reach the ends of the blades with strong winds are very important factors. Although it seems incredible, "when there are windstorms or storms the wind drags stones of considerable size that cause holes that in turn cause an entry of air inside the structure, which causes the blades to end up cracking", says Carlos Bernabéu.

When the deteriorations are incipient, the shovels can be repaired at low cost, but when important structural cracks occur it is necessary to take down up and this is an enormous expense for the companies, so that the insurers demand that there is a good inspection and maintenance plan of wind turbines.

For this, there are currently two procedures. The first is used cranes with very high baskets that raise the maintenance personnel to the appropriate height, an expensive method, slow, not without risks and only applicable in moderate winds, since the basket has to rise sometimes up to 150 meters. The second option is to take down a vertical work team, which implies having many workers and a lot of time, although so far it is the only solution for offshore wind farms.

Automated software

As an alternative, Eol 6 performs this work in record time, with a camera system that can control by a single person from the ground and software that allows managing images. "The program automatically adds the data that this sector needs: time, GPS position and height of the damage, so that a report is generated immediately", he says. In this way, Arbórea calculates that the costs of the system are 10% of those assumed by traditional methods and, therefore, are amortized in a couple of inspections".

The device is so easy to handle that a couple of hours are enough to control it effectively, according to the technicians, but for a technician to be efficient in a job as specific as the inspection of wind turbines, a somewhat more intense training is required, for that, the company of the Science Park of the University of Salamanca already prepares a course that will be offered in the coming months.

Continuous improvements

Although Arbórea already has a lot of demand, it continues to work in its I+D+I line to improve the product and its efficiency. In four years of work there has been an "absolute transformation" in the field of electronics, software and design of this device basically made of titanium and carbon. "Everything we use advances by leaps and bounds. This forces us to always be working to make changes, but it also allows us to improve substantially in all aspects", says the head of Arbórea, referring to factors such as battery life, cameras, sensors and stabilization systems, many of these elements with "unthinkable" advances recently.

In any case, Eol 6 is already in the commercialization phase and the 'aracnocóptero' company opens to new sectors, in addition to wind. "The platform can analyze other infrastructures and obtain aerial images, it is like a tiny satellite that flies at low altitude and offers extraordinary quality. In addition, it can be kept static, without vibrations and in adverse weather conditions. These characteristics are very valuable and we can adapt the software and hardware to what the customer needs", says Carlos Bernabéu.