Wind work by drone

Fast, precise... cost-effective

Inspection at 3 meters from the blades, with a 42 megapixel camera : essential to detect smallest defects.

After the media hype, it's time to confirm it: the UAV is a formidable tool at the service of the wind power industry. SupAirVision is inventing and developing new uses for the UAV to meet the needs of the wind industry: inspection, painting and test of the lightning protection system (LPS).

'The capabilities of UAVs have evolved incredibly in a decade. They have improved in reliability, load capacity and above all, flight precision and stability,' says Sébastien Arnould, founder & CEO of SupAirVision - UAV wind power services. Nowadays, it is possible to fly within a few metres of a wind turbine's blades with great precision, and even touch them to test the lightning path or to carry heavy loads such as high-precision sensors. 'For the wind industry, the UAV is an incredible tool that allows access to the blades or the outside of the nacelle without leaving the ground.

The multi-rotor was born out of the miniaturisation of electronics

As is often the case, it was the army that paved the way... in 1917. A pioneer in aviation, the French army was also behind the invention of the first unmanned aerial vehicle (UAV: Unmanned Aerial Vehicle), which took off for the first time from the military base at Avord. On 2 July 1917 the Frenchman, Max Boucher, successfully took an unmanned aircraft for a flight of 500 metres, at 50 metres above ground level. The challenge at the time was a major one: to create a machine capable of carrying out reconnaissance missions without risking the lives of the pilots. Unfortunately, the technology used on these radio-controlled aircraft was still far too rudimentary for research to be pursued on a large scale.

During the cold war, advances in automation and radio communications enabled the US Air Force to invest in this field. Over the years, as technology evolved, models were perfected, leading to the multi-rotor UAV currently used in inspection.

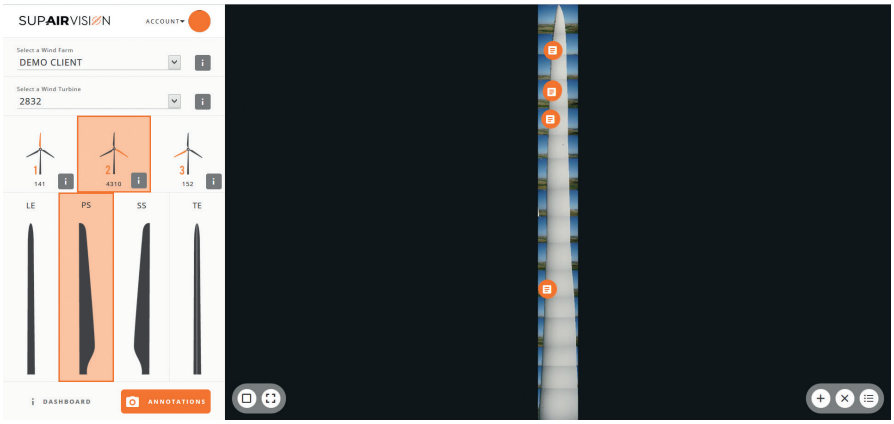
Capable of taking off vertically and maintaining a geostationary position, the multi-rotor UAV, with 4, 6 or 8 motors, invented in the 2000s by amateur model-makers, has revolutionised video and photographic images. Advances in computer technology have enabled the extreme miniaturisation of gyroscopes and computers to assemble the heart of the UAV: its flight controller. At the same time, the arrival on the market of miniature LiPo batteries made it possible to use brushless motors and send them into the air, even on a rudimentary chassis. Finally, the democratisation of GPS has completed the technical specifications of a revolutionary device: the drone!

SupAirVision has its roots in Sébastien Arnould's photography activity at the end of 2010: 'I was one of the pioneers of the drone in France,' explains the director. 'In 2013, I was the first UAV pilot approved in Champagne with AltusPhotos. Right from the start, I felt that this machine would do a lot more than just landscape photos! We are at the heart of the French wind energy field,

Sébastien Arnould

HD photo inspection: a SupAirVision specialty to detect the smallest defects and ensure precision while tracking wind turbine blades

DroneSpray



Online defect annotation platform – an essential reviewing tool for reliable and accurate defects detection

SupAirVision's tools are also perfectly calibrated to inspect measuring masts

50% of French wind turbines are in the north-east of the country, so I became interested in wind turbines. However, the capacities of the machines at the time did not allow us to provide an adequate service for wind turbine operators.'

Drone, sensor, data, this is the triptych that is at the heart of SupAirVision. UAV control, semi-automatic piloting, digitalisation of the wind turbine blade and the development of new sensors will enable us to develop a relevant offer for professionals in the wind energy sector.

Sherlock represents SupAirVision's 'historical' service: the HD photo of wind turbine blades accessible to technicians from their computer screen. 'By flying only 3 m from the blade thanks to our lidar technology, the drone - equipped with a 42 million pixel full-format camera - can capture the smallest defects,' explains Zhewei Yu, CTO of SupAirVision.

'Then we assemble the photos using artificial intelligence to digitally reconstruct the blade and deliver it to our cloud platform,' continues Lucas Réocreux, SupAirVision R&D engineer. 'Defects are detected automatically, validated by a blade and composite expert, and then recorded in an automatically generated inspection report.'

SupAirVision has a goal to support wind farm operators and developers! This is why we have adapted Sherlock to inspect the weather masts as well, with the same HD quality as used for the blades. We built a partnership with experts, that have 12

years of experience in weather mast inspections and installation. We provide a full service of inspection and defect detection in order to prevent risks from human interventions and to avoid dropping the masts. SupAirVison helps you maintain your assets as long as possible.

Active thermography for in-depth detection

The development of new sensors to detect faults invisible to the naked eye, and therefore in photographs, has been a fundamental part of the work carried out by the SupAirVision team since the creation of the project. There are several technologies capable of achieving this objective, but the only one that does not require contact with the surface and that can be embedded is thermography.

'We have filed a patent with Engie Green and the University of Reims on an internal defect detection system. Pulsed dynamic thermography enables us to characterise the depth of the defect thanks to the on-board laser that heats the blade,' explains Zhewei Yu.

Active and passive thermography is an important area of development to improve the maintenance of wind turbine blades and prevent major breakages and breakdowns. The challenge for operators and manufacturers is to detect delaminations, fibre wrinkles and the presence of water before they become visible on the surface of the blades. SupAirVision is developing an internal fault detection tool that can be used on the ground or on an aerial work platform (skyclimber), which can be taken on board by a robot or a drone.

Drone Volta

Lightning diagnostics to pamper the blades

SupAirVision's latest innovation, the lightning path test benefits directly from the major innovations in the UAV world in recent years. 'To come and touch the lightning pellet at the end of the blade, with a drone connected to the ground by an 80 m wire, you need a perfect mix between the propellers, motors, flight controller and on-board sensors, and the design of the chassis,' explains Diego Garcia, SupAirVision's R&D engineer. 'The touch is also very technical, so as to ensure perfect conductivity and to enable the ohmic resistance of the lightning path to be measured,' explains David Perinet, SupAirVision UAV technician. 'We have to ensure overall rigidity while remaining flexible to accompany the movement of the drone and the blade. It's a major technical challenge!'

This innovation patented by SupAirVision is eagerly awaited by wind turbine operators. Faster, UAV-based diagnostics above all make it possible to avoid mobilising human resources at height. It therefore improves site safety.

The innovation is on the move. The UAV is on such a steep technical progress curve that the limits are unknown. Sensor suppliers are following the same progress, miniaturising their equipment and facilitating their mechanical, electrical and electronic integration. Finally, the progress of robotics is ending up making an astonishing cocktail that has not finished surprising and above all bringing operational benefits to the wind industry.

Aerial painting, always on wind turbines

SupAirVision has already covered 320 logos from wind turbine nacelles in less than a year by painting them in white. It was in response to a customer's request that the SupAirVision team and its partner Drones Center looked into this particular and innovative application of the UAV: aerial painting. Following the takeover of the operator, all the logos of the machines had to disappear! Before an intervention time of only one hour per wind turbine for 10 m² logos, the UAV is much faster than a team of rope access technicians, and incredibly more profitable than a team of painters on an aerial work platform.

Several prototypes have been built and tested, and different paint spraying solutions have been tested, and several types of paint have been created to come up with an efficient and effective tool. The challenge for us was to master aerial painting,' explains Sébastien Arnould, founder and CEO of SupAirVision. We started with the nacelles, but the blades are an important field of action and research: technical coatings or de-icing, there are many requirements for spraying at height. And the UAV always presents the same arguments: ease of use, speed of action, human safety.

Try Volta at our launch price, just include this code in your quote request: VOLTA_PES

www.supairvision.com **Innovation**