

Inspections go autonomous



Danny Ellis

PES caught up with Danny Ellis, CEO and co-Founder of Skyspecs, to hear about the latest drone inspection technology. It's an exciting time for Skyspecs as they look towards expanding their services in Europe.

PES: Welcome to PES Wind magazine. Thanks for talking with us. Would you like to begin by explaining a little about the background of your organisation and how you currently serve the wind industry?

Danny Ellis: SkySpecs was founded in 2012 with the goal of developing technology to automate the inspection process of large structures. We have been working on autonomous drone software since 2009 when we competed in an international research competition as students at the University of Michigan. Our focus is on automating blade inspections to help improve the quality of data, measurably reduce the effort to complete inspections and enable preventative maintenance of the wind turbine blades. With better, faster and more accurate inspection technology,

owners and operators of wind farms will be able to maximise their energy output while reducing their maintenance expenses.

PES: Is wind energy a growing business area for you? How are you capitalising on this growth?

DE: Wind energy is SkySpecs' primary focus. We have been working in the wind industry since 2013 and have continued to grow our business with the increasing demand for blade and tower inspections. As more installations are built and older towers begin to see significant wear and tear, there is an increased demand for safe, efficient, and repeatable methods for monitoring the health of the turbines. We are capitalising on this opportunity by providing an automated solution for inspections.



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PES: Your team has been working with drones for 7 years, how have the designs evolved over that time?

DE: When we started out in 2009, drone technology didn't exist in the way it does today. We built every aspect of the system from the carbon fibre frame, the circuit boards and all of the software from the flight stability to the navigation. Our core value resided in the autonomous navigation software, but without a drone platform, the software wasn't worth very much. As the industry progressed, drone platforms became available and quickly increased their performance capabilities while lowering their cost. This allowed SkySpecs to refocus our core competency, the software to enable completely autonomous operation.

PES: We see that SkySpecs have drones which are capable of avoiding obstacles, please could you expand on this and explain the benefits and/or implications in terms of cost and time to the end user?

DE: From the very beginning, we concentrated on developing a sensor and software suite that allows the drone to observe the world around it and intelligently fly through it. Autonomous flight within close proximity to structures has always been the goal. While we were in development, we realised we could begin testing in the field with a human operator as long as we had the ability to avoid hitting the structure.

It is incredibly difficult, if not impossible, to fly close to a wind turbine blade while looking 100 meters into the air without colliding with the blade. With our

development of basic collision avoidance, we were able to fly the drone safely within 2 meters of the blade while capturing images with the on-board camera. Collision avoidance was really a stepping stone along our path to a complete autonomous navigation system.

PES: Can you tell us something about the technology used by SkySpecs for inspections? And how you're helping to limit turbine downtime?

DE: When the drone can operate autonomously, it is able to follow a much more precise path than a human operator is capable of. The drone knows where it is relative to the wind turbine at all times and is able to trigger the camera at precise locations to ensure the appropriate data is collected. The inspection is completed in under 20 minutes and it is unnecessary for a technician to go up-tower. This is far faster than other inspection techniques, whether it be rope climbers or ground-based photography.

Our solution allows the turbine to be stopped in one position and then immediately started back up again when the inspection is complete. Imagine a scenario when the field of wind turbines is monitored regularly by drones that are automatically docked on the nacelle, coming out of their enclosures anytime an inspection is needed, whether after a storm or on demand, without ever sending a person to the field. This is the point when the industry will stop considering cost per inspection and will instead focus on overall maintenance and optimisation cost based on big data analytics.



PES: Is your work weather dependent, what sort of climates are you able to work in?

DE: All drones are somewhat weather dependent. They are only able to fly in wind speeds up to their maximum flight speed and in precipitation that allows the inspection camera to be useful. Since we do not build the drone, but instead install our software on existing drones, we are able to adapt to weather limitations.

PES: What quality of image do you capture, what equipment do you use and why?

DE: The quality of images is completely dependent on which inspection camera we fly. We choose these inspection cameras based on our customers' needs and requirements. Since we are able to fly close to the wind turbine, the quality of the pictures is always going to be better than pictures taken from the ground, which is a major benefit.

PES: Geographically speaking, where are the key markets for you?

DE: Right now we are working in North America simply because we are based in the U.S. We are in the process of expanding to Europe for 2017, which is why we are exhibiting at the WindEurope Summit in Hamburg this year and debuting our

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autonomous tech at an event during the conference.

We believe our technology is going to have the largest impact in offshore wind inspection, which Europe is leading.

PES: What are your thoughts about prospects for the rest of 2016 and moving in to 2017, with regard to your organization, and the wind industry in general?

DE: We are beginning to see a shift in the mentality of the wind industry from reactive maintenance to proactive, predictive maintenance. Government subsidies in the U.S. were just extended to 2020, incentivising an estimated 45 GW of new wind farms to be installed between now and then. The wind industry is a growing market that is going to require even more inspection and maintenance in the coming years. This year has been a development year for SkySpecs and our customers and partners, but 2017 is going to be our growth

year where we will bring our technology to as many farms as possible.

PES: And conversely, what presents you with the biggest challenges?

DE: Management of the data collected is a current challenge. Unlike prior inspection methods, drone inspections can easily generate upwards of 10 gigabytes of data per turbine. This data needs to be transferred over the internet, analysed and delivered to customers in an easy-to-understand way. Another challenge we face is moving from one technician in the field deploying the drone to one technician offsite controlling many drones. In the U.S. and Germany, it isn't legal yet to allow one person to control multiple drones or to be beyond line-of-sight, but we expect these rules to change as technology improves. ■

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