



BIRDS EYE VIEW ON: CORONA SENSOR POWER INSPECTION

By Chris Knight & Dan Dirksen

Experts will agree that there are several Electrical Utility applications for UAS (Unmanned Aerial System) Corona inspections. Currently, these UAS Corona inspections are not widely adopted and accepted within the industry. They are however accomplished from the ground with hand-held systems that have some significant limitations, from merely accessing the lines to limited viewing angles. This provides a significant growth opportunity for the UAS inspection industry. Corona discharges can impact every major infrastructure component in the power grid, therefore a clear need for this type of inspection is established. UAS inspections have the unique ability to provide reports that include actionable data with speed and accuracy that the industry has never seen thorough coupling new technologies into a complete solution. In the following paragraphs, we are going to take a look into where the UAS Corona Inspection Industry is today, and more importantly where the industry is headed in the future.

What is Corona Discharge?

A corona discharge is the result of fluorescence. A process where a free electron is accelerated by an electric field and impacts a nitrogen molecule with enough energy to knock 2 or more electron out of their orbits, ionizing the molecules. The energized molecule will return to its normal state after emission of the excess energy as photons. This is called fluorescence.

In the case of nitrogen, the emitted photons are mainly in the ultraviolet (UV) range (100 – 400nm). These emitted photons can sometimes be seen as flashes of blue light. Other air molecules may also fluoresce, adding their light. The visible light range is roughly 400nm to 700nm. Corona Inspection allows the daytime identification of Corona Discharge by using a UV filter to identify the fluorescence and then display that over daytime video.

Why It's Important to Electrical Utilities.

Electrical Utilities are responsible for providing customers with electricity that is reliable, dependable, safe, environmentally responsible, and fairly priced. While inefficiencies can be found across each of these topics, Corona discharges create undesirable power loss, audible noise, electromagnetic interference, and insulation damage. These byproducts cause premature failure of critical power grid infrastructure. Corona inspection can provide predictive information that indicates symptoms prior to failure on a non-intrusive basis ensuring the power grid remains reliable and dependable. Due to the wide range of these requirements, Electrical Utility companies tend to be risk averse and need a strong business case (Public Utility Commission governance)

to adopt new technologies. If you attend any UAS conference, you will quickly realize that the UAS inspection industry views power line inspections as a huge opportunity and is emphasizing all facets of inspection from sensor advancement to process and workflow development. We can all agree that it's an amazing opportunity for UAS inspection advancement, and innovation and growth of the industry are taking hold, we are still many years away from drones inspecting every mile of Transmission or Distribution line.

In practice, the Power Grid has so many redundancies that "run-to-fail" currently works and rarely causes an outage. However, the risk of a transmission line causing a fire in a dry or heavily wooded area is a real concern. It cannot be overlooked or refuted that UAS inspection can provide real results and value in mitigating these risks. When you look at the financial liability that Electric Utilities have, take for example several major fires across the country, the business case is certainly sound. But when you look at the destruction the fire left behind, one starts to ask why we aren't using UAS inspections to perform predictive maintenance as opposed to reactive maintenance. How many more fires can an Electric Utility be responsible for before they realize the value in inspecting power lines with a UAS?

Where can Corona Inspection be used?

The power grid can be categorized into 5 major systems: Generation, Transmission, Distribution, Substations, and Consumption. Corona Inspection provides the ability to identify and locate corona discharge in all of the 5 major systems. UAS Corona inspections provide an immediate added benefit in Transmission, Distribution, and Substations by being able to fly closer and provide visual perspectives that were previously impossible with traditional forms of coronal inspection. At first look, the assumption is the opportunity is in Transmission lines because they are a higher voltage and define the environment that corona discharge exists. Although this is true, the Electrical Utilities are more concerned with Substations because unlike Transmission or Distribution the redundancy of the grid doesn't allow for maintenance by simply rerouting the power grid.

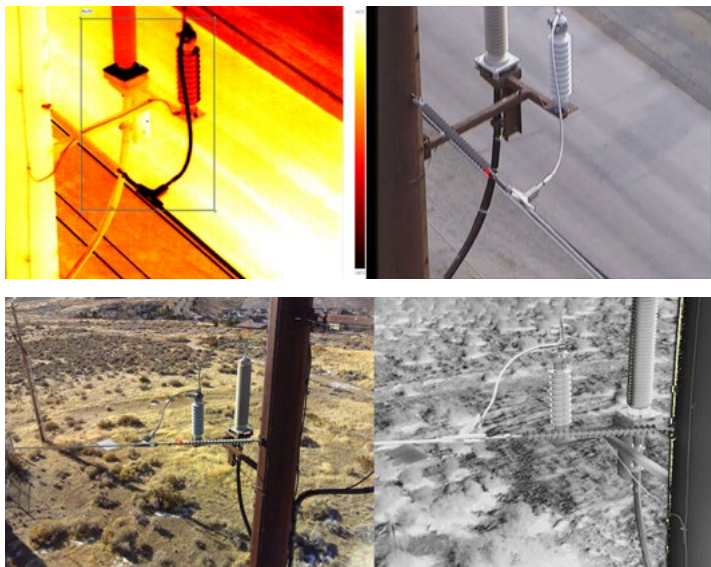
Going Further and Faster Together

If the UAS industry is going to win over the Electric Utilities, we aren't going to do it by completing a Corona inspection with a quadcopter and call a press conference stating that we have revolutionized the industry. Although, any success is a step in the right direction, in order to make real change the industry needs to provide a solution that makes our customers ask why they are doing it the old way. Offering a major shift by combining multiple sensors, capturing as much data as possible, and delivering a product that presents actionable data, cost savings and overall efficiency to the process through back end near real-time data distribution. This is the change that will lead the Electrical inspection industry to implement UAS inspections. That is why AviSight is proud to introduce a triple integrated sensor featuring:

Corona Thermal E/O

You can see by the images featured below that we are talking about a generational paradigm shift for inspection data and that data's actionability. Just another way AviSight is leading the revolution in unmanned power inspections.

If you would like to learn more about how AviSight has integrated corona sensing on our UAV solutions and combined this with AviSight's C3UBE™, Live Look Fault Vision™, and AI Assisted Fault Detection for a fully integrated end user solution that is bringing electric utility companies results that are decades ahead of their old solutions, or learn more about any of the technologies mentioned above please contact us at: C3UBE@AviSight.com.



Combined EO, Thermal, and coronal sensor image of a faulty power line. Coronal discharge, represented by the red blotches, shows a fault at the end of a horizontal insulator.