

0064 - Overhead Power line stringing with UAV



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INTRODUCTION

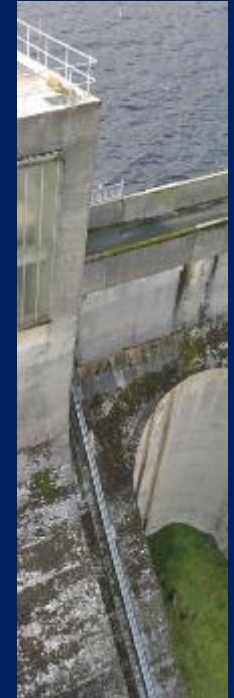
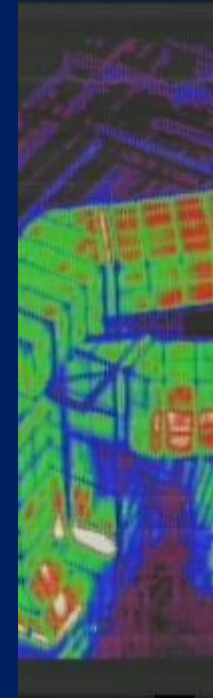
Currently, the quality of operational management of public and private utilities depends on the accuracy and credibility of the information included in their portfolios. Aware of this reality and in order to offer its customers a wide range of solutions in all its activities, CME created the Air Inspections and geoengineering activity, called UAV ENGINEERING.

The Inspections and monitoring are mandatory requirements for anyone working with Infrastructure and Utilities. CME, aware of its responsibility as a reference in the activity, and constantly looking to innovate in its procedures, developed a way to string overhead power lines with UAV, to complement certain tasks with faster execution, reduced operability costs and especially reduce the risk of accidents.



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Step improvement in safety

- Reduction or elimination of working at height
- Less exposure to live lines
- Manned helicopter flights minimized
- Fewer site visits

Dramatic cost savings

- Live line crossing means reduced outages
- Faster than traditional way, with ground crews.

Better quality information

- High quality, consistent and up to date imagery to allow improved decision making
- Removes subjective opinions of an asset's condition
- Intuitive interface



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Challenges

There are several challenges when constructing an overhead powerline:

- long spans,
- river crossing,
- buildings crossing
- highways crossing,
- Powerlines crossing

Traditionally, in these situations, stringers, and helicopters, are commonly used with their huge costs associated.



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Equipment

Type of equipment usage – how much payload per UAV could we consider.

What type of equipment complied with this task: fixed wing or multicopter?

Several tests were made using different equipment through different distances, until we reached our goal. Presently we can string cables around 1,2 km safely.



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Air Traffic

Aerial space licensing – This is an issue that was still unclear. Due to the lack of legislation on UAV operations in different geographic areas. One way to overcome it is to prepare any operation with some anticipation due to air traffic.



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Power line Voltage

To string one or several spans – to really increase the overhead powerline construction we needed to be faster than the traditional way of stringing. So we started to string one span in Medium Voltage and after all the testing we can now string 6 spans in MV, 4 spans in High Voltage and 2 spans in Very High Voltage.



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String Used

Type of String (Thin and Strong) – the type of string was a huge challenge. We needed to operate safely using the thinnest and stronger string available. Also, the string needs to be nonelectric. Presently we're using a 3mm cable with 730 kg of stress strain



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Live line proximity

Live Line Works - One of the most important functionalities was that the UAV should work in live line proximity. We accomplished it with the chosen equipment – UAV.



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Autonomy

Technical limits – the UAV usage was a limitation due to battery autonomy. However, nowadays some UAV equipment can operate more than thirty minutes, which is enough for the major stringing operations.



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Prejudgment

Prejudgment – This was one of the challenges that we had to overcome unexpectedly. To reassure to all the field crews that the UAV was a tool and not a gadget. That the UAV usage was being set not to complicate, but by the contrary, to help on construction, operation and maintenance. To improve health and safety and to reduce operation costs.



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Process Overview

Several pilot projects have been made in different powerlines in different situations throughout Portuguese territory.

Different procedures were taken considering distribution or transmission powerline stringing, due to difference in terrain, span size, conductors disposition and distances.

Firstly, we worked with riggers on top of the towers to collect the UAV attached string. However, we had to change this methodology due to the usage of the same manpower as the traditional way



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Process Overview

Presently we use an assembled “V” shape part, on the top of the towers that will collect the string. This part will then close and fix the string instantly. This way the string will not get out, due to wind speed and motion.

The UAV will operate between poles using a specific insulated string, called UAV thin string. This string will, then pull a stronger string/rope that will be used to pull all the electric wires and OPGW, if applicable.



Continuous improvement

- Increase battery autonomy;
- Increase payload;
- Work out of line of sight;
- Operations with two GCS;
- Obstacles sensor;
- Distance increase.



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Conclusions

The UAV usage for powerline stringing is a fast, cost reduction and safety way for operations in powerline O&M.

CME is currently using this process on a day to day basis. And on a near future we intend to equip every stringing crew with an UAV, for a better operations method.



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UAV ENGINEERING

