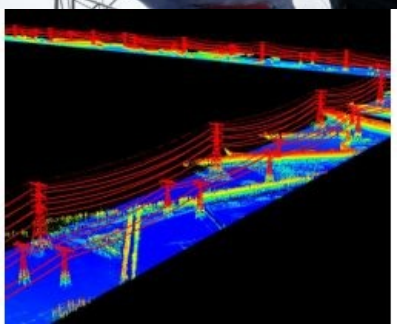
CHCNAV ALPHAAIR 450

Airborne Lidar Applied to Power Line Maintenance



With the rapid development of civil construction and the increasing demand for electricity in recent years, the market segment of power grid construction has grown significantly. Meanwhile, how to efficiently manage such large-scale power line networks and how to guarantee the reliability of power transmission is becoming increasingly important. A one-off power outage incident will not only result in losses to power line management companies but can also have serious repercussions for end users and society as a whole.

With the increasing mileage of high-voltage transmission lines, traditional observation and monitoring methods are increasingly unable to meet maintenance requirements. As a result, more automated and smarter inspection methods are needed, and the airborne Lidar method is now being adopted in this domain.

Customer pain points

As the scale of the power grid has expanded rapidly in recent years, the number of long-distance transmission lines has also increased significantly. A growing proportion of them are in mountainous areas. To carry out daily power line maintenance, the inventory of assets and the resolution of power-related incidents, continuous monitoring is required. Currently, most of the daily inspections are carried out by electrical engineers using traditional manual working methods or photogrammetry methods.

Figure 1: Traditional power line patrol work.

Customer pain points include:

- **High workloads -** The rapid increase in power line mileage results in a high workload. Traditional manual inspection methods cannot keep up with operational requirements.
- **High labour costs** - Traditional manual inspections are associated with low speed, high costs, poor accuracy and high labour intensity.
- **High Standards** - The demand for higher daily observation quality has increased significantly in recent years.
- **Helicopter Use –** Long preparation time**,** high costs, high risk. It does not support daily routine inspections.

Lidar solution advantages

Continuous development of Lidar technology means that it can now be used in power line monitoring applications. Using the captured aerial point cloud data and its software processing, the power line can be easily extracted and generated as a 3D model. In addition, due to the high scalability of the power line, the Lidar solution also has fast optimization and asset inventory capabilities. A Lidar solution supports multiple echoes that can capture the coordinates of the power line, power installations, vegetation and ground objects in a single scan to significantly improve inspection efficiency. Some of the key benefits include:

The AlphaAir 450 weighs 1kg, which is perfectly suited to the drones' payload requirements.

- A final acceptance inspection of a new power network project and raw file creation. This includes power line channels (trees and buildings), intersections (power lines, highways, railways), electrical installations (safety distances, gradients), ground wire sag and internal.
- Simplification in calculating the safety distance between the power line and vegetation or new constructions. Support for rough estimation of the vegetation growth pattern, the deformation of the line under high temperatures and the measurement of the interval between the points of intersection.
- Site layout of the electrical facilities prior to the construction phase and design of the components' size.

Alphaair 450 key features

Key features of the Alphaair 450 include an integrated Lidar and camera to allow fast extraction of information from the point cloud data and high-resolution images. The advanced power line analysis software supports customized reports and data content. The Alphaair 450 supports several types of drones - CHCNAV BB4, fixed-wing UAVs, DJI M300 - enabling longer duration and high stability to better meet the needs of patrols.

Airborne Lidar survey – typical workflow

Mission Planning

A well-designed mission plan is a key factor for a successful flight. It needs to take into account multiple factors such as local topography, flight duration, project area, etc. The take-off site must also be chosen in an open sky area for safety. For power line applications, CHCNAV AA450 and DJI M300 are very effective allies.

Data Capture - CoProcess Software

AA450 supports both manual and automatic control methods to start scanning. And it can capture point cloud data and high-resolution image data simultaneously.

Power line Lidar imagery, captured by the Alphaair 450.

Data Processing

CoProcess is a software solution that contains a sophisticated Powerlines module for the post-processing of inspection data. It enables the rapid acquisition of high-precision 3D information from point cloud data, including terrain relief, electrical facilities, surrounding environment, etc. Ultimately, CoProcess can provide a more technical and efficient workflow for power grid planning, daily maintenance and incident investigation.

Furthermore, it contains a 3D view management module that supports multiple views to present 3D point cloud data intuitively and a point cloud measurement module that enables the quick and easy measurement of lengths, areas, thicknesses, density and angles etc.

The powerful ground filter and classification function can classify point cloud data into ground points, power line points and surrounding object points. This feature enables automatic data processing and saves considerable time.

CoProcess supports automatic DEM and DSM extraction based on classified point cloud data and it also supports manual and semi-automatic power line extraction, which allows power line data to be extracted from a large number of points. After extraction, it can perform additional automated detection and export the vectorized result.

CoProcess can export an obstacle detection analysis report, a vegetation growth forecast and a completion acceptance report in HTML and MS WORD format. It can automatically detect the data according to the parameters and if they do not meet the requirements, it will warn you and export a statistical graph for analysis.