UNIMPAIRED VISION

OPERATORS ARE FINDING IT INCREASINGLY HARD TO MAINTAIN LINE-OF-SIGHT CONTACT WITH UAVS, AS THEY FLY LONGER AND LONGER SURVEYING MISSIONS. BOTH TECHNOLOGY AND CHANGES IN LEGISLATION ARE NEEDED, SAYS FRANCOIS GERVAIX

Corridor mapping is crucial for the effective planning, design and analysis of linear infrastructure, which includes roads, pipelines, rail lines and telecommunication lines, as well as monitoring natural features such as rivers and coastlines. Geospatial professionals now use three main methods to map linear sites – terrestrial mapping, helicopters or UAVs, the last of which can boost efficiency, improve safety in the field and deliver highly accurate results.

Historically, corridor mapping has been seen as logistically problematic. Using traditional surveying techniques, such as GPS base or total stations, is difficult as most corridors are too big to map terrestrially; even in the instances where it is possible, terrestrial measurement is slow, requiring stop-start activity either on foot or by vehicle and more operators in the field. The intermittent nature of this technique can be both costly and increase the time required on the project.

Ensuring that the data collected is of the highest quality of course remains of paramount importance, but the narrow, lean characteristics of corridors presents a geometric challenge – forward intersections are inaccurate, numerically unstable and easily influenced by external factors such as blurred images. To achieve reliable results, equipment which offers internal accuracy as a result of precise GNSS measurements should be used.

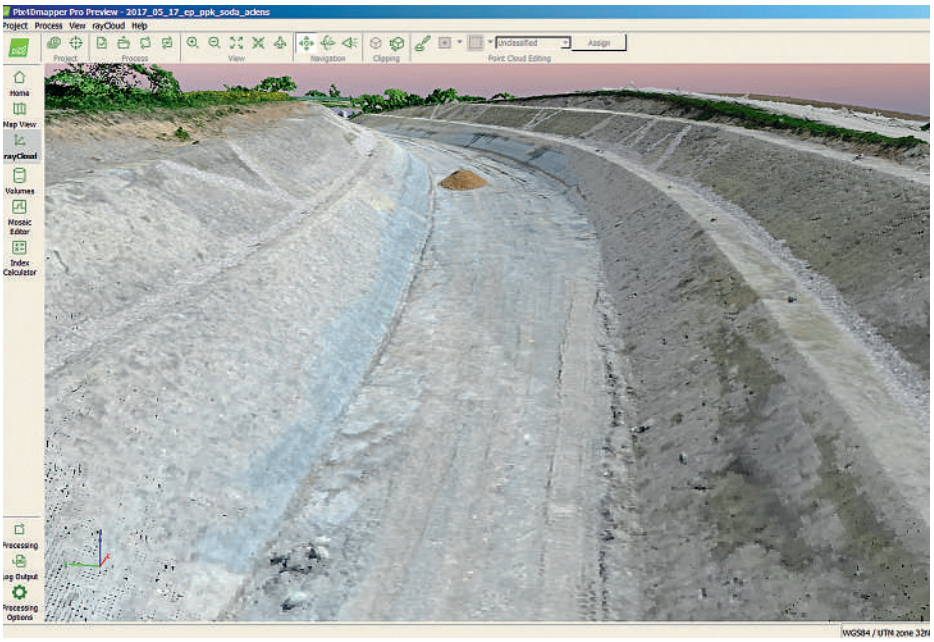
Finally, safety is also vital for geospatial professionals, but minimising risk can be challenging on corridor missions. For instance, mapping sites from the ground can raise concerns, particularly on high traffic sites such as quarries and roads.

The view today

Typically carrying a high-resolution camera or LiDAR sensor, as well as a precise GNSS and inertial measurement unit, helicopters are often used instead of terrestrial tools and enable professionals to carry out corridor mapping much more quickly. However, their use can be problematic, too: availability for such tasks can be limited, potentially delaying projects; the cost to rent the aircraft is significant – in Europe, the price is likely to be between €30 and €40 per minute; securing flight authorisations can be difficult; and the emissions produced by helicopters means they are increasingly being seen as a less environmentally friendly option.

Choosing the most effective mapping technique is vital to ensure the success of a project and reduce costs overall. While UAVs are in use as a viable alternative to manned aircraft, the technology has had inefficiencies that have left some frustrated. For example, UAV operators have been forced to use ad-hoc workflows planned through trial and error and using rectangular coverage blocks, which are manually positioned, end-to-end, to map along the corridor. This is inefficient, time-consuming and can risk providing insufficient images or overlap to properly reconstruct the results.

UAV technology has also been affected by regulations, including strict restrictions that are in place globally near airports to prevent collisions with aircraft. This is particularly relevant when mapping long corridors with UAVs, as such projects frequently become extended (EVLOS) and beyond visual line of sight (BVLOS) operations. In most countries, the aviation authorities have not yet put in place frameworks



A close-up view of a point cloud generated in Pix4Dmapper Pro

An eBee Plus UAV flying over a linear site

senseFly Corridor integration kit and senseFly SODA photogrammetry camera. senseFly Corridor is a new combination of hardware and software that simplifies the mapping of linear infrastructure and sites by UAV

for UAV operators to fly such missions and in those that have, the process of gaining such approvals can be lengthy and complex. However, regulators are increasingly aware that the process is cumbersome and understand the need to adapt and put in place measures to support, rather than hinder, commercial operations.

Collaboration from UAV producers and operators is vital to drive forward change and increase the effectiveness of the technology. At senseFly, we're working with our global distributor network to support authorities in putting in place EVLOS and BVLOS regulations that are fit-for-purpose and will ensure operations run safely. In association with Air Navigation Pro, senseFly has created the Safer Together campaign – an initiative designed to reduce the risk of mid-air collision by providing general aviation pilots and UAV operators with bi-directional awareness of each other's aerial activities. More recently, we have advanced this focus on safety, partnering with AirMap, an airspace management platform for UAVs. By integrating AirMap's situational awareness data, including airspace rules and real-time alerts, into senseFly's eMotion flight and data management software, professional UAV operators can now access critical information and tools to enable safe missions.

We're also working closely with individual operators to support them in becoming authorised for EVLOS and BVLOS missions. For instance, in February, we worked closely with Switzerland's Federal Office of Civil Aviation to pioneer the flexible, extended use of UAVs in the country – a critical move to enable businesses to deliver larger, more complex projects. To support the developments, we are collaborating with eBee customers globally to help them to apply for anytime BVLOS authorisation.

Industry innovations

As surveyors increasingly look to improve time and planning efficiencies, while enabling them to gain EVLOS and BVLOS permissions, UAV technology is leading the way from an innovation perspective. For example, senseFly Corridor, a platform enhancement that simplifies the UAV mapping of linear assets, has been developed to provide a geometrically and logistically efficient method of planning and executing UAV flights. Optimised for any eBee Plus UAV that carries a senseFly SODA photogrammetry camera, the new software includes a camera integration kit and a new corridor mapping 'mission block' within senseFly eMotion 3 ground station software. Designed to offer improved ground resolution, the rotated camera position captures images in a corridor-friendly portrait format and enables operators to fly the eBee Plus closer to the ground for a resolution of down to 1.5cm per pixel, without compromising the image overlaps the digital outputs require. This camera orientation also helps shorten processing times after flight by 30% when compared to using a normal, landscape-position UAV camera.

Case study

senseFly Corridor has already been used by Gaznat SA as an easy-to-use solution for the BVLOS mapping of a 30km underground pipeline. Gaznat needed to prove that the height of the earth above the pipeline was at least 1m along its entire route. The company, which supplies and transports high pressure natural gas in western Switzerland, flew a senseFly eBee Plus RTK/PPK, alongside senseFly SODA Corridor technology, to offer fully autonomous, precise GNSS.

senseFly Corridor uses an optimal number of lines that have been determined empirically. As Gaznat needed to move from different location points, it was most appropriate to acquire images along an odd number of lines. Using a default three flight lines for each mapping section, senseFly Corridor helped ensure angular stability for the photogrammetric reconstruction by combining several lines with a precise geolocation and common key points between neighbouring images. In addition, the software successfully provided a flight plan with just the right number of images, to optimise the operation's efficiency.

Gaznat applied senseFly's technology as an end-to-end solution from flight planning, where senseFly eMotion3 and corridor mapping 'mission block' were used, to the post-processing stage, during which eMotion3 ground station software was used for PPK post-processing and Pix4D Mapper for 3D reconstruction and point cloud generation.

The use of senseFly Corridor led to improved spatial flexibility and resulted in a decrease in the number of hours required to complete the project. For instance, one field day using the senseFly UAV system would have taken two weeks of terrestrial surveying. In addition, the project was up to a third cheaper than the likely cost of using a manned aircraft.

Expanding UAV applications

With the UAV industry moving at a pace, the latest innovations in mapping technology are expected to make linear mapping easier and more efficient. For those geospatial professionals who are willing to explore and adopt new workflows, it marks an opportunity to improve decision-making capabilities by giving access to accurate data at an earlier stage in a project. As more and more professionals look for end-to-end solutions, UAV technology has a unique opportunity to further spread its wings and meet this demand.

COLLABORATION FROM UAV PRODUCERS AND OPERATORS IS VITAL TO DRIVE FORWARD CHANGE AND INCREASE THE EFFECTIVENESS OF THE TECHNOLOGY

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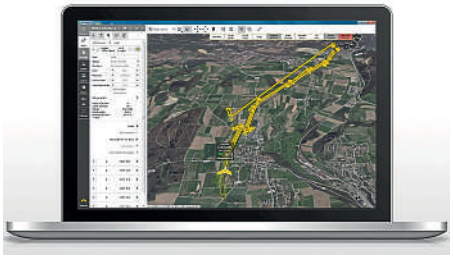

Corridor missions are comprised of different sections, with a new segment necessary for each change of direction, in senseFly's eMotion flight planning software