



Savings & security: using drones in place of Lidar

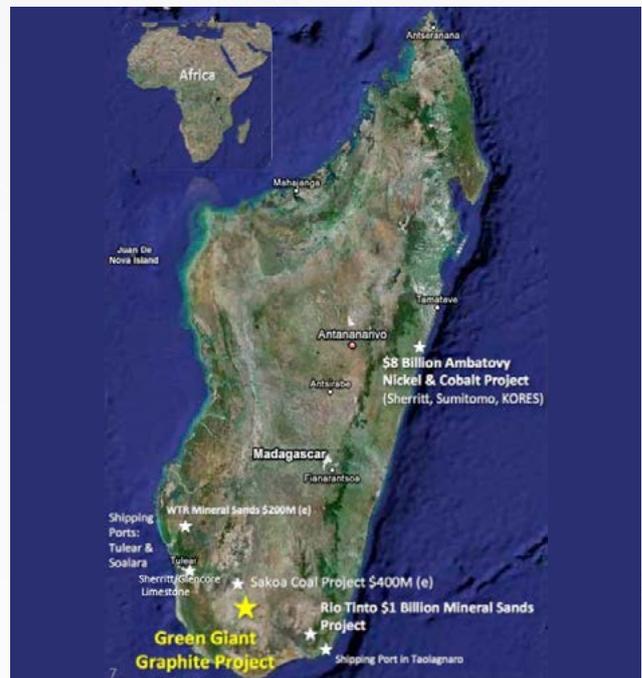
When Energizer Resources needed to survey a large graphite mine site in Madagascar, its team purchased two senseFly drones to avoid the expense of airborne Lidar. That just left the issue of disappearing control points to deal with...

Off the coast of East Africa, in Madagascar, a large graphite mining project is coming to life. The flagship project of [Energizer Resources Inc.](#), it is named the Molo Graphite Project, or simply 'the Molo'.

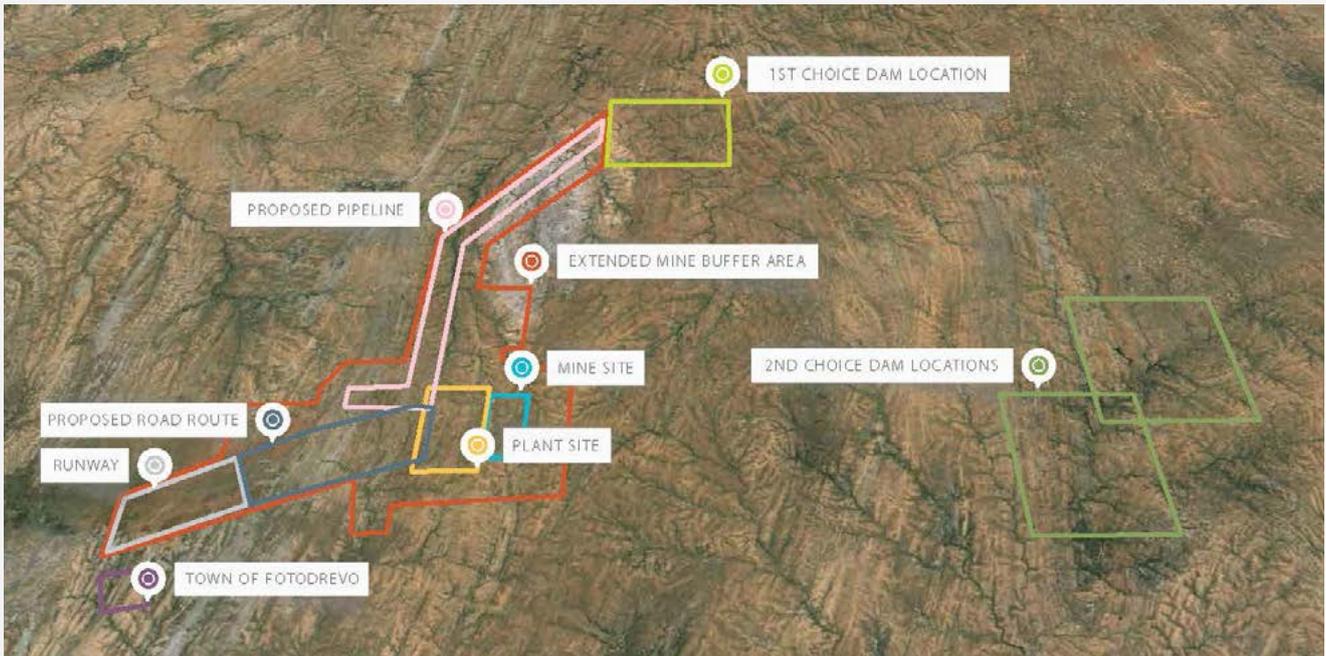
Part of the 1,000 km² Green Giant Graphite Project in the arid south of the country, the Molo deposit itself spans 5 km² and is thought to contain between 80 and 120 million tonnes of high-quality, all-flake graphite — used in refractories, batteries and consumer electronics — making it one of the largest such deposits in the world.

Having released its preliminary economic assessment of the Molo in February 2013, Energizer Resources contracted a mining engineering company, DRA, to perform a full Bankable Feasibility Study. Now complete ([read more](#)), this study's goal was simple: to determine whether or not it was viable to bring the Molo into production.

As part of this study a full land survey was required. This would be used to create a 3D contour map of the site. The team would then use this to determine the location of the mine's dam — since such mines are highly dependent on water — plus the location of its accompanying pipeline, as well as the positions of plant assets such as buildings and equipment.



The Green Giant Graphite Project in southern Madagascar is truly immense, spanning over 1,000 km².



The 150 km² that Energizer Resources flew in total comprised several parcels of land.

“For this survey we looked at various approaches with DRA,” explains Eric Steffler, the geomatics manager at Energizer Resources. “We looked at flying a large-scale Lidar survey for example, using manned aircraft, which would have enabled us to produce a full hydrological model of the region, covering 3,000 km². However this would have been very expensive — involving the importing of aircraft from South Africa — running to hundreds of thousands of dollars.”

Luckily, DRA discovered that another organisation had already flown some of the area in question and was happy to share its data. With access to this info, Energizer and DRA were able to narrow down the target region to a much more manageable 150 square kilometres. But that still left the question of how to survey this land.

Unmanned value

“We chose to employ drones for two reasons,” Steffler says: “One was the price. This was very low compared to a Lidar survey, which would have cost hundreds of thousands of dollars, even with our reduced survey area. The second was that by making a capital investment in two eBee drones, we could then fly these over our other properties in Canada. Since we now have the technology we need to produce digital elevation models and air photos ourselves, we don’t have to hire third-party companies to do this for us.”

“The price (of the drones) was very low compared to a Lidar survey, which would have cost hundreds of thousands of dollars”

The 150 km² to be surveyed comprised several parcels. Three large, square areas were flown to ascertain the best location for the site’s dam. An additional corridor covered the route of the favored dam site’s proposed pipeline. Plus, three further parcels were flown to the west of the site: the mine site itself; the plant site; and a rectangular parcel, the possible route of a road heading to the nearby town of Fotodrevo.

DRA also requested a second set of flights. It required these in order to source baseline data from outside the original survey area and to analyse the condition of an existing road that would connect the proposed plant site with the town of Bekily — a stop on any future materials’ journey to the Madagascan coast.

In terms of creating the required outputs, Steffler and his team would first create a digital terrain model (DTM), in grid format. This would then be used to generate 3D contour maps of the site (eight sets in total), featuring half-metre and two-metre contours.

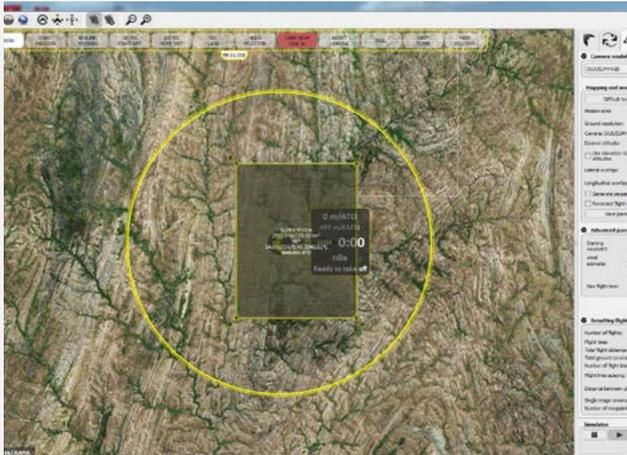
The team also wanted to utilise the individual RGB shots its UAVs acquired. “Air photo interpretation was required to determine the locations of villages, roads, crops, and culturally significant items such as tombs and historic trees,” Steffler says. “We also needed to examine the quality of the roads that we would use for transporting material to and from the site, and our RGB shots would also form part of our environmental assessment.”

Drone methodology

Surveying these different parcels kept Energizer’s eBees seriously busy, with the 150 km² total coverage easily at the larger end of UAV mapping projects. Steffler calculated his UAVs would need to complete over 300 flights in total, with an

average flight time of 35 minutes, an average flight coverage of 2.5 km², and capturing some 150 RGB images per flight (15,000 photos in total).

“For our flight planning, we set a ground resolution of 9.9 cm per pixel in the drone’s eMotion software,” Steffler explains. “We chose this figure to ensure that, after processing the images in Postflight, we could still achieve the 20 cm product accuracy that DRA required. This GSD meant eMotion set a flight altitude of 292 metres above the eBee’s take-off point. We also used eMotion’s multi-drone function to manage flying our two UAVs in the same region at the same time.”



Planning a UAV flight, using the eBee’s eMotion software, over one of the site’s three possible dam locations.



Two of the project’s field staff were responsible for operating Energizer’s eBees.

Since no existing control data was available, Steffler’s team used their GPS system to locate and post-process 70 ground control points across the project area. However this GCP work was not without its challenges.

Geo-referencing with guards

“The terrain was fairly flat, so navigating this wasn’t a problem,” Steffler explains. “But after flying for a few days we noticed that our control points would go missing. These GCPs were made from plywood, painted white, with crosses marked in black duct tape. Local residents would take them and use them for fixing their roofs, or as tables. So, to stop this happening, we hired locals from the nearby town to sit close and guard the control points as we flew.”

“Local residents would take the GCPs and use them for fixing their roofs, or as tables”

Energizer’s three staff spent a total of 90 days in the field, setting GCPs and flying the drones. Steffler meanwhile managed the data processing himself, spending up to 12 hours per day on this task — over 120 days in total.

“With 10 to 12 flights flown each day we had 16 to 18 gigabytes of raw data to process every night,” he says. “We needed to buy a more powerful computer to deal with this data. Then once the entire survey had been flown, we had to merge the data together. For this we used open-source SAGA GIS software. This took us over two months.”

PROJECT WORKFLOW

- 01 Determine total survey area/parcels
- 02 Plan number of flights per day
- 03 Perform flights & set GCPs
(10 hours per day inc. travel)
- 04 Process images
- 05 Generate orthomosaics & DTMs
- 06 Back in the office: creation of contour maps
- 07 Final data products sent to contractor (DRA)

The results



The project's western orthomosaic, layered over satellite imagery of the site.



A close-up of one of the project's orthomosaics, showing the arid terrain and red earth typical of the area.



A section of one of the project's eight 3D contour maps.

The final data products Eric and his team produced achieved a GSD of 9.75 cm, and accuracy within DRA's requested +/- 20 cm range. "Our mean re-projection error was 0.179 pixels," Steffler adds.

Having successfully completed the Molo's UAV survey, and having used its outputs to inform DRA's feasibility study, Steffler is now effusive in his praise of drone technology. "The return on our investment has been amazing. We saved ourselves hundreds of thousands of dollars by using the drones in place of airborne Lidar, plus we have sub-contracted our UAVs and personnel on several other jobs," Steffler says.

“ The return on our investment has been amazing ”

Steffler's team flew, for example, a 44 square kilometer mission in northern Quebec, Canada, for an exploration client. This survey, which Steffler says was "a great success", was used to determine the location of remote outcrops on a large mining property.



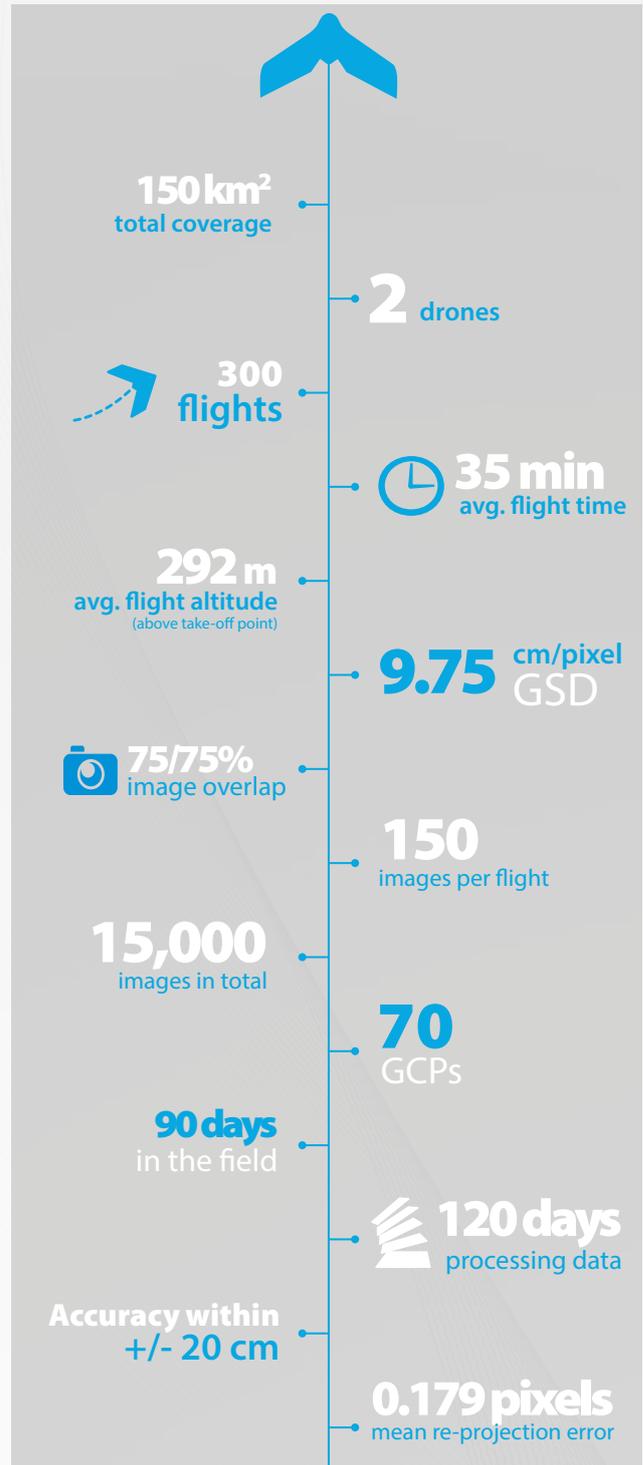
Energizer's team has since sub-contracted its senseFly UAVs and personnel on several jobs, including at this remote location in Quebec, Canada.

About Energizer Resources Inc.

Energizer Resources Inc. (www.energizerresources.com) is a mineral exploration and mine development company based in Toronto, Canada.

[Read more about the Molo deposit project.](#)

PROJECT STATISTICS



Discover eBee:

Learn more at www.sensefly.com/drones/ebee.html

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