



Aboriginal answer – using drones to map a sensitive Australian heritage site

For the past two years Australian UAV has undertaken an annual drone survey of the Lake Victoria shoreline. This immense heritage project brings with it three key challenges: big birds, even bigger datasets and lots of very fine sand.

Lake Victoria in Australia is a site in need of tender loving care. Located in a remote part of western New South Wales (NSW), 268 km east of Adelaide, it has seen significant erosion to its shores and damage to many of its cultural heritage sites—such as burial grounds dating back 6,000 years—due to continued water regulation over the past eight decades.



One of the project's 137 eBee flight plans, shown in eMotion.

As a result, annual monitoring of the lake's vegetation, shoreline and cultural heritage is now required by the site's [Aboriginal Heritage Impact Permit](#), issued by the NSW government's Office of Environment & Heritage to manage harm or potential harm to aboriginal objects and places.

Drone decision

In 2014 the monitoring contract was awarded for the first time to [Australian UAV](#), a fast-growing survey, mapping and aerial photography provider, which today has five offices across south east Australia. The contract was then recommissioned in 2015, with follow-up flights in subsequent years also possible.

"The [Murray Darling Basin Authority](#) has commissioned us to perform an aerial survey of the entire Lake Victoria shoreline for two years running," says company director James Rennie. "This monitoring work charts the movement of sands around the lake and documents the effects of vegetation establishment on preventing the exposure of Aboriginal heritage."

This kind of large scale aerial monitoring, at such a challenging remote location, would not have been possible prior to drone technology, Rennie says, unless walking the entire area using terrestrial survey equipment. "However, this would demand a huge number of man hours compared to the time it takes to map the area with a drone," Rennie explains.

Initially, Australian UAV did consider employing manned aircraft to collect the photography it required but, Rennie says, "This resolution was not deemed high enough and using planes was just not cost effective".

The team's two site surveys to date, in 2014 and again in 2015, have therefore employed Australian UAV's fleet of senseFly eBee and eBee RTK drones.

Drone methodology

The data outputs required by the client include RGB and NIR aerial orthomosaics of Lake Victoria's entire 114 km perimeter, at a resolution of 3.5 cm per pixel, and a full digital surface model (DSM) of the area, at the same resolution and tied to the Australian Height Datum by using ground controls.

"We're talking about a huge project," Rennie says, "covering approximately 5,000 hectares or 12,355 acres in total."

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To tackle this mammoth undertaking Rennie's team employs two drones for each trip, often flown simultaneously, with flight planning and monitoring tasks all handled by the drones' eMotion software.

One drone carries an NIR camera onboard, the other an RGB sensor. While one UAV maps a linear section of the lake shore, the other maps the same area but using perpendicular flight lines. The resulting NIR and RGB images are then processed together using Postflight Terra 3D to create what Rennie says is a "very comprehensive DSM". Flight overlaps are typically high, at 75% and 80%, as returning to this remote site to re-fly a section is not a realistic option.

"A team of two local surveyors also sets 500 ground control points to position our drone data with the accuracy the client requires," Rennie adds.

In terms of drone statistics, each annual survey requires approximately 136 eBee flights of around 28 minutes each to cover the lake's full perimeter. This leads to the capture of more than 40,000 images in total. "For this we spend seven days in the field," Rennie reports.



Australian UAV employed two senseFly eBee drones, which were often flown simultaneously.

Preying on technology

The sheer massive size of the project is not the only challenge however. Birds of prey also come into play; these feathered invaders have taken a liking to the team's eBees more than once.

"We had 35 flights this year that were cut short by attacks from birds of prey," Rennie reports. "We used the eMotion software's Climb button for bird avoidance on many occasions and saved the eBee in all but one case. The eBee was brought down due to a dislodged propeller, but the emergency land function ensured there was no further damage and it was quickly located."

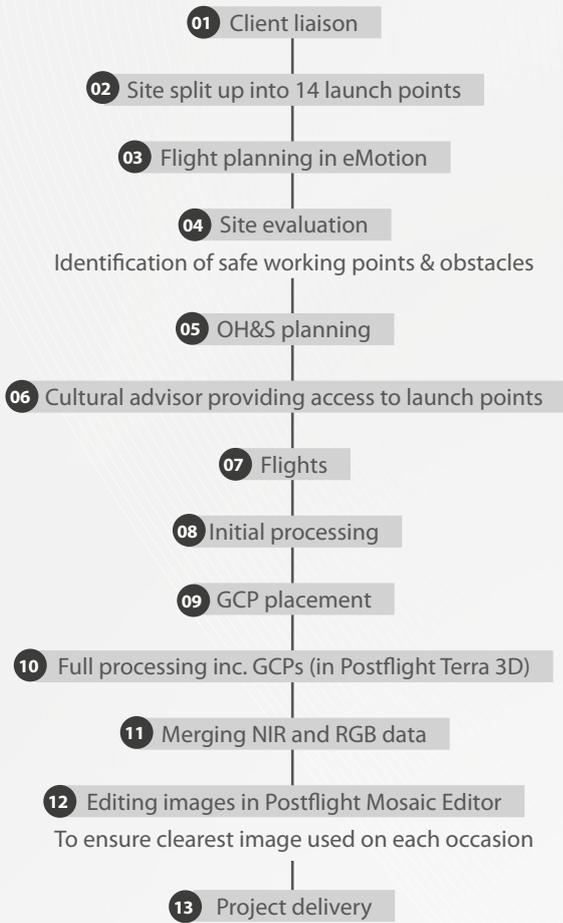


One of the project's many eagle-eyed observers, captured in one of the drone's NIR images.

The lakeside environment has also led the team to adapt its drone use. "The lake is surrounded by fine sand, which creates a challenge for camera lenses and the drone's motors, so we have tools on hand to remove any sand, should this cause a problem," Rennie says. "Where possible, we also set landing areas on the harder wet sand or further from the lake shoreline where there is some vegetation. In areas where landing on soft sand is unavoidable, our operators catch the eBees, which is something we couldn't do with any other drone. This was determined to be safe because with the eBee its motor is no longer running at landing and the mass of the airframe is very low."

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Project workflow



Results

Following several weeks of data processing back at base, Rennie and the team produce the client's key deliverables: a full DSM spanning the entire shoreline of Lake Victoria and a full set of drone-sourced NIR and RGB orthomosaic geoTIFF files.

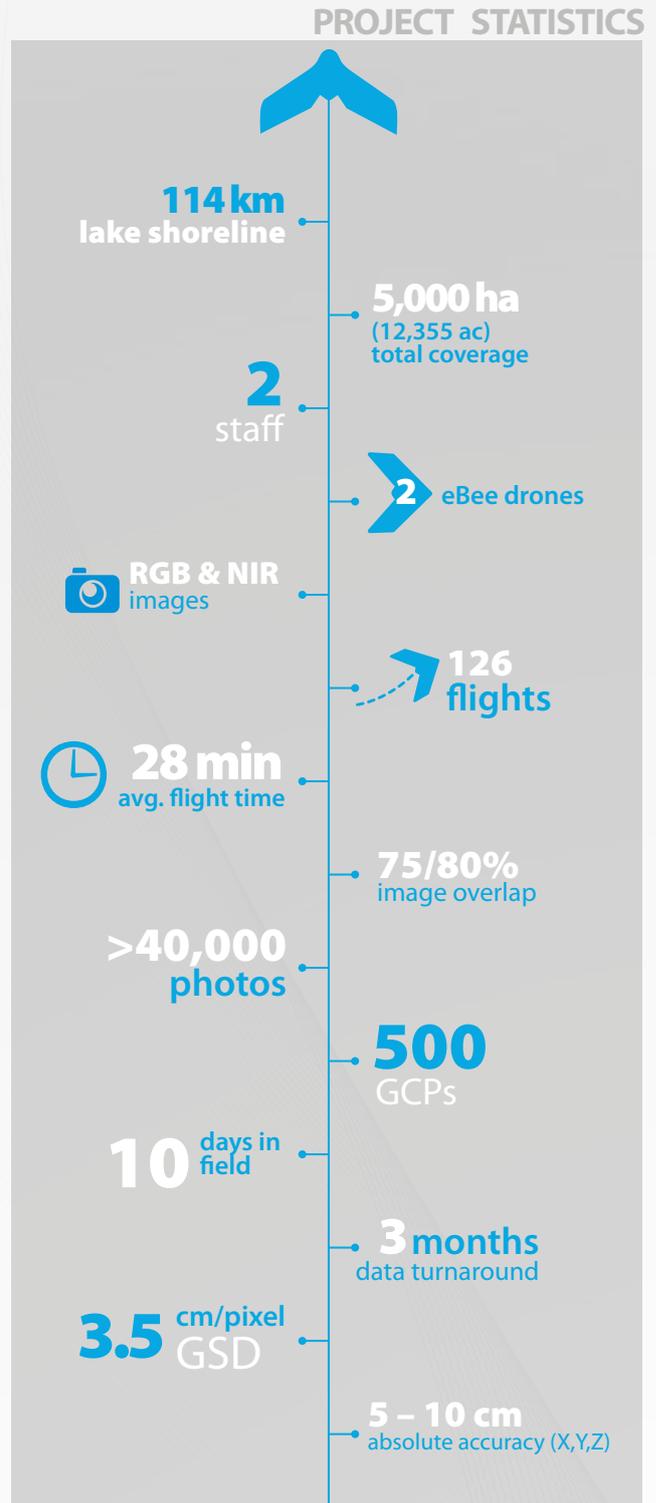
"This remains an annual project and the client has been very happy with the results thus far," Rennie reports.



A single RGB orthomosaic, just one small part of Australian UAV's huge Lake Victoria survey.

About Australian UAV

Australian UAV (www.auav.com.au) was established in 2013 by experienced consulting engineers, scientists and film industry professionals with a focus on professionalism, safety and high quality product delivery. The company has grown rapidly and as of July 2015 operates four offices spanning Victoria, NSW and Tasmania. "Collecting reliable and cost-effective aerial images has, in many cases, changed the way our clients do their business," says Rennie. "We anticipate further ongoing growth and our eBee drones will be a central workhorse to facilitate that."



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