## More than a flight <u>OPERION</u>

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## **Breaking out**

NTERPINE GENERAL MANAGER, DAVID Herries, realised just how important drones, or UAVs (Unmanned Aerial Vehicles), were becoming as a work tool when he used one to take aerial footage of the devastating fire that swept the Port Hills, overlooking Christchurch, in February of 2017.

As a member of the Rural Fire Service national incident response team David was helping gather information about the huge fire that went on to claim the life of a helicopter pilot fighting the blaze, as well as destroying nine houses and 1,600 hectares of trees and vegetation.

He just happened to have a drone from his workplace with him and put it into the air to film the blaze.

The aerial views provided firefighters with real-time information on how the fire was spreading and where they should deploy their resources. When the main fire had passed, an infra-red camera was deployed on the drone to identify hot-spots under the surface, saving hours of painstaking detective work.

From that point, drones went on to become a front-line aerial tool with the Rural Fire Service, with Interpine training groups of rural fire fighters in their use and also supplying them with UAV kits.

"I think everyone could see the value in UAVs from that moment, including ourselves," says David, adding that he had used drones on small fires before and knew their capabilities, but it was the Port Hills incident that really put drones on the map.

Drones have been around for the best part of a decade, firstly appearing as toys and then as large commercially-built film camera platforms that cost hundreds of thousands of dollars.

David says: "We first became aware that drones were going to be an important part of our business – and that of forestry – around 2010, when we saw them moving away from becoming a model-builder's toy to being a highly functional tool.

"But it wasn't until 2015 that we saw technology had caught up with the industry's expectations of what they could do, to the extent you could give one of these devices to an employee and they could use it as part of their everyday work.

"Our interest was around how we could see the forest for the sake of the trees. As foresters it's very hard to get a handle on operations where our trees are often cloaking our roads and are 40 metres high. Before, the only way was to get up and appreciate the view was from a helicopter, which was an expensive exercise.

"There is a huge amount of benefit in just being able to look over the back of that ridge or look down that gully and the drones were becoming automated enough and much more cost-effective to allow us to do that – it was like the iPhone effect and the Fire Service got that concept, especially after Port Hills. They were looking at industrial drones costing several hundred thousand dollars and then, after they trialled one of these small units, they suddenly realised that these were more functional than the expensive ones."

In the first instance, like most other forest management companies in New Zealand, Interpine initially saw drones as just an



Above: Testing the deployment of a synthetic strawline using a drone.

Below left: Interpine General Manager, David Herries, with the remotely-controlled detaching system used in running synthetic strawline ropes and ferrying seedlings by drone.

Below: Successful test over, Interpine's David Heries (right) and Steve Hasnip, with the drone and Dyneema strawline.





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instrument to provide an eye-in-the-sky.

But very soon the development of software and third-party applications, such as GIS mapping, began to match the capabilities of the UAVs themselves, which saw the use of drones extend to aerial photogrammetry.

"We purchased our first one in mid-2015 and by the end of that year we could see a pathway to much wider adoption, progressing to the point where we really started to make use of them for aerial mapping, rather than just an eye-in-thesky," says David.

Inevitably, everyone thought that drones would be able to take on much more sophisticated aerial work, even though the technology was still developing and is still not quite ready for some of those tasks. David calls it the 'Elon Musk effect', drawing parallels with fully autonomous cars.

"Remote sensing is a bit like that," he says, "people think that because you can fly a drone there and find all the cut-over waste and classify it you can come up with just a number at the end. It's not that easy, we still have some way to go before it's at that level."

One issue is that most drones can still only spend less than half an hour in the sky on one battery charge, which limits how far they can fly. Battery development is progressing, but it will be some time before a drone can stay in the air for an hour, or eventually up to three hours.

Another restriction is that current CAA rules only allow drones to fly within line of sight without special permission and not 'over the horizon'. This rule is being reviewed and may be relaxed for specific drones and in certain areas at some point in the future.

Make no mistake, there are exciting opportunities for drones to be more widely used in the future, but David Herries believes there are enough things we can do with them now.

"Let's concentrate on empowering people with these as tools," he says. "So for contractors, they can inspect their equipment in safety, go and have a look over the shoulder of the young faller who's just started in the crew and be able to do that within two tree lengths. Check on how a harvester operator is doing down a long steep gully without spending an hour getting down there and back. All with a relatively inexpensive drone.

"Harvest supervisors can be checking on sediment in the rivers and programming the drone to fly down to a way point and grab the same photo every Friday throughout the whole harvest and having that as part of the resource consent evidence. "You can see with the recent events in Gisborne how that would benefit. Imagine if the contractors were taking a time-lapse from the same point every week to show how they were doing it and how useful that would be. The crew boss can then see what's over there and what the problems are and what's been left and if no one has noticed it, he can then get the crew onto it and make sure it's fixed while still remaining on site."

David says the usefulness of these ideas were underlined while he was at a logging site undertaking aerial mapping and the foreman approached him and said 'look I was just about to shoot up the hill and check on our feller/buncher in some windthrow over the back and I wanted to see how he's getting on and if there are any problems (there was no radio coverage) so it's going to take me an hour to walk up there and talk to him on the radio for 20 minutes and then walk back down'.

David says: "So we flew over there and watched him for 20 minutes and flew back, all done with a two or three-minute flight time up the hill, and he was like 'where do I get one of these?'

"That quickly highlighted the benefit of an eye-in-the-sky – you can get a totally different perspective of the lay of the land and keep yourself out of danger, too.

"Damon Wise, down at Pan Pac, said to me one time that if we could get one of these into every harvest crew it would be so helpful. They've got some really complicated hauling chutes in terms of risk and hazard, and there's value in being able to get a view of the chute and show the crew what it looks like from different perspectives on the ipad in the container in the morning to discuss how they can get around the issues. They have done some trials and it's in their budget to put people on our training course to get them upskilled in drone use."

David and his team at Interpine could see the demand for this type of training

*Top:* Interpine's Chris Scoggins fastens the sling containing around 70 Radiata Pine seedlings to the hitching line.

Two in the middle: A sling full of seedlings ready to be delivered to the silvi planters. Drone is hitched up to the seedlings – plenty of boxes in the background for resupplying

Below: Lift off! Chris Scroggins sends the drone off on its first delivery.





service around the time they purchased their first drones. After attending just the second drone course run by Massey University, David approached them with a joint venture proposal and interpine ran its first training course in October 2016.

Massey still runs its own course for all users, but the Interpine one is tailored specifically to forestry and allied industries with instructors qualified to CAA Part 102. Massey has now run more than 80 of its courses, with Interpine already up to course number 8.

"We wanted to ensure that we as an industry not only took advantage of the massive benefits that these tools can provide, but to do it in a responsible manner and ensure we didn't make the front page of the newspaper for the wrong reasons," says David.

Each course takes up to 14 people at a time and in addition to working with Massey University, Interpine has struck up a business relationship with drone manufacturer DII Industries and David has visited their factories and discussed what technologies are on the horizon. This relationship has also enabled interpine to be in a position to provide drone kits for any of those attending its courses.

So what does the future of drone use look like?

"I think you will see the continuation of drones around the size of the Phantom become far more functional through their software and capabilities," says David. "Having zoom cameras on a small drone will be among them, enabling better visual use.

"We will see them become more rugged - we are seeing that now with the advent of the IPA3-rating for weather-proof drones. You will see them look after themselves in airspace - you may not have to do this course in future because drones will have a transponder/receiver, just like manned aircraft that will have them as mandatory from 2021, and they will be able to talk to each other."

And we'll see bigger drones evolve that can undertake more advanced roles than just being an eye-in-the-sky or being used in mapping. This is already happening, with drones that can now be bought off-the-shelf equipped with spraying units for tackling weeds or wilding trees in difficult locations.

These machines can lift a payload weighing up to tokg and they also have larger batteries that provide more than 30 minutes of flight time. But David doesn't see spraying drones becoming any larger because of weight restrictions - to remain classed as a drone they must still keep under the 25kg limit, including payload.

But it's other applications that are now starting to show the true versatility of the drone, such as flying out strawlines on difficult terrain and ferrying seedlings to silvi workers on hillsides. Trials of both applications are already under way.

Helicopters have been used to run out strawlines on some long and difficult settings in the past but it's an expensive exercise. especially for yarders working in remote



David Kerr uses the radio to direct the drone pilot.

locations. But it is only in recent times that 'affordable' drones have become capable of rope line, not wire, of course.

Interpine isn't the first to experiment with running strawlines using a drone. That wily Otago logger, Bill Winmill, has been trialling a variety of drones in his crew and recently invested in a larger model that is more capable of taking the weight. It's still a work in progress. reason why you couldn't fly it out in stages."

But the Interpine team has now refined the idea through the development of a remotelycontrolled detaching system that enables the rope to be released by the drone operator.

Fitted to a 6-rotor DII M600 Pro drone that is capable of lifting 6.5kg payloads, the Interpine team demonstrated the strawline-lifting capabilities to NZ Logger while we were at the recent UAV training course.

The release mechanism is fitted to a long, weighted line so that the strawline does not become tangled in the craft's rotor blades.

100mm Dyneema synthetic rope and the short demo proved that either option can be lifted easily and flown out significant distances.

of some local Rotorua forest managers and carrying the weight of a strawline - a synthetic contractors further tested the limits of its capabilities.

> "We could fly a 10mm synthetic rope out to around 250 metres successfully and if you wanted to go further, say 400 metres or more. you'd probably drop down to the 6mm rope." says David. "For longer settings, there is no Further trials are being carried out and it is expected some crews in the Kaingaroa Forest will be using drones to run their strawlines soon. NZ Logger will be keeping an eye on this development.

> "There are many benefits," says David. "This method obviously saves time, but you've also got to look at the health & safety aspects removing people from a potentially hazardous task is probably one of the key drivers for employing a drone to run strawlines."

The development of the remotely-controlled It can be deployed with either 6mm or detaching system also led the Interpine team to look at using drones for the delivery of Radiata Pine seedlings to silviculture workers on steep and difficult country. Anyone who has

A subsequent trial carried out for the benefit been involved in this sort of work knows how challenging it can be to re-supply workers with trees as they plant difficult-to-access blocks.

never thought he'd see seedlings flown in by drone.

Re-supplying by air seemed like the answer. Originally the idea was to fly boxes of seedlings to workers on the hill, but it was decided that the trees could be more easily transported when wrapped in a small sling equipped with eyelets for attaching to the electronic hook, and it would also eliminate the weight of the box.

NZ Logger was on hand for the very first trial of this system, in a small planting block just to the south-west of Rotorua city.

The 35-hectare site is owned by a Maori trust and until now it was a steep, gorsestrewn wasteland. Under Interpine's direction, the gorse was cut and the block has now been planted with Radiata Pines to provide the trust with future income from a site that was previously unused.

The task of planting the pines was undertaken by Whakatane-based Scholtens Contractors and had to be planned for a week when no rain was forecast, as the M600 Pro drone is not a waterproof model.

The 6-rotor DJI M600 Pro drone is capable of lifting 6.5kg payloads.

The silvl crew were a little bemused with the sight of drones being set up as they carried their first boxes up the hill to begin planting.

Normally, one of their team would be assigned to the duty of 'donkey' to ferry full boxes up the hill for his colleagues and take down the empties – not a particularly pleasant task when four boxes on a backpack frame can weigh as much as 60kg. Today, the drone would do the donkey work.

After the drone was set up and a take-off / landing site prepared, David and I climbed the hill to watch and record the action.

Being a foggy morning there were unlikely to be low flying manned aircraft or helicopters in the area, but chief UAV pilot, Chris Scoggins, had submitted a NOTAM (aka a notification) to the CAA-run website, contacted the Rotorua airport control tower to advise where the drone would be used that morning and at what height (under 40 metres, which is the normal limit for a UAV) and also got permission from the land owner – all requirements for flying drones out in the open (there are exceptions to these rules, but you'd best do the Part 101 RPAS course to understand them).

At first, David called in the drone and its cargo of seedlings slung underneath in the tarp as each of the planters needed to be re-supplied. But each group was provided with a radio and given the opportunity to call in their own supplies and soon there was a regular shuttle going up and down

the hill, taking no more than a couple of minutes, instead of 15 minutes or more on foot. The service is so accurate, the bundles of seedlings are being dropped straight into the arms of waiting planters on the ground.

By smoko, all the planters were enthusiastic converts to the use of the 'drone donkey' and silvi crew boss, Rodney Scholtens, was beaming at the thought of how this could transform his operation.

"It's amazing, eh," says Rodney. "I never thought I'd see anything like this in my lifetime.

"It would save on using a 'donkey' and it's much better for the boys to be supplied regularly than to carry full loads all the time. They can even have their food and water flown up."

David agrees, adding: "This way we are not asking planters to operate on 45-degree slopes with a big weight hanging off them – they can carry fewer trees at any one time and smaller drink containers. It has to be safer.

"There are plenty of slip and fall incidents being recorded by planters and by using a drone I'm sure those instances can be reduced."

David also thinks drones can make a useful contribution in the planning of planting sites, by taking LiDAR recordings of the topography and identifying risk areas for those on the ground to be aware of.

But the \$18,000-to-\$22,000 cost of a new waterproof drone that can operate in all conditions might be a barrier to some silvicuture contractors who are thinking about purchasing one, plus the additional costs to train up one or two (or more) members of the crew to operate it.

David says forest owners / managers will need to work with their silviculture contractors to help facilitate the introduction of this new technology, just as they are doing with the introduction of new innovations to harvesting crews, such as winch-assist systems.

With the planting season only taking up five months of the year at the most, is it worthwhile owning that sort of technology or would it be better to lease it or contract out the drone service to a third party?

These are questions that will need to be discussed by the forestry companies and their contractors.

What is clear already, is that drone use within the forestry sector will continue to grow in future years as more people adopt the technology and new uses are discovered.

David Herries says the next generation foresters will grow up with drones in the same way today's generation has with chainsaws.

Interpine is already talking to Toi Ohomai about including learning units on drone technology as part of its teaching curriculum. That means students graduating from Toi Ohomai forestry courses will already have Part 101 RPAS qualifications, which will make them more valuable as employees for both forestry companies and contractors.

It's the way of the future. And it's here now.