


ENTER THE DRONE

From mapping pollution
to counting crops, the
commercial use of drones is
set to boom in India. But only if
there is legal clarity, writes

MADHAVANKUTTY PILLAI

Ideaforge's Unmanned
Aerial Vehicle, NETRA



WHEN VENKATESH SAI came back to India from the Middle East in 2005, he was still in school. His father, a sales director of a steel company there, had been an avid aeromodeller from the days when a small plane would be fitted to a string that would be operated by the pilot to make it go round in circles. Later aeromodelling would become electric, with planes' motors running on batteries and flight controlled through radio waves. It was a hobby that rubbed off on Venkatesh. The father-son duo didn't have much opportunity to indulge it in the Middle East, but once in India, they decided to get back to it in earnest. It was, however, an expensive hobby. If a plane crashed, they could lose as much as Rs 35,000. So they decided to build their own small aeromodels by importing parts. They would also sell it to other hobbyists, but it wasn't really a business, just something that they did to subsidise their own hobby. That changed in 2009 when Venkatesh, in IX standard then, took part in an IIT Bombay tech fest, competing against 62 engineering college teams. "I had a radi-

cal design. We flew and won the competition. Then we started getting enquiries and decided to convert it into a business," he says.

They became part of a project with the National Aerospace Laboratories (NAL) for a joint research on developing a 2-kg manned backpack Unmanned Aerial Vehicle, a plane that a soldier could carry and launch for things like surveillance. "Any drone has three components—the frame, the power system and the electronic control system. From 2012, we started becoming system integrators. We used to get the power set-up and control system from abroad, make the frame ourselves, integrate it and sell it as a product in India. We sold it to a few army units and corporates," he says.

They, however, had a long-term plan to turn manufacturers of only the control system or autopilot because it was a niche segment with high margins. He compares it to smartphones—there are hundreds of manufacturers, but only three or four companies making their processors. They got a grant from the Tamil Nadu Small and Tiny Industries Association to make a control system plus drone. "We started making our electronics in 2013. By end of

the year, we finished the entire project," he says. He was 18 then and had learnt all of it on the internet.

Venkatesh's company, Sree Sai Aerotech Innovations, now exports control systems to countries like Canada, Germany, Poland, China and the US where systems integrators make drones using them at one-tenth the prevailing market price. "The control system is the most expensive component of a drone. Normally, in a big organisation, 100 people code the software and hardware and you have to amortise those costs over the selling price of the electronics. In my case, because it was a one-man band till about one-and-a-half-years back, it was not only cheaper for the customer but also pretty inexpensive for me," he says.

There are 15 people in Ventakesh's company now, including embedded and software engineers. He is 22 years old. His drones are involved in myriad projects for corporates. One of them was a leading motorcycle company that had a 700-acre facility with a huge pilferage problem. It had put up tripwires on the entire periphery and wanted a solution by which whenever a tripwire breaks, a drone would automatically go to the point, hover for five to ten minutes, recording what is happening there. Another was with a power PSU that had a 7,000-acre solar field in Andhra Pradesh where it wanted drones to monitor the area for security management. Venkatesh is now working with a cigarette company for its tobacco plantations to do a crop count and crop health analysis via drones. For a multinational agribusiness company, his firm did a proof-of-concept study. "We took an aerial shot of their farm, did an analysis and told them nearly 30 per cent of their land is unutilised. They were shocked. They were able to see it in front of them, the visible gaps in their field. This was just in a tract of 3 acres. They have over 170 acres in that region alone," says Venkatesh. Apply the same idea to the entire landscape of India and imagine the leap in productivity of land, he adds.

Military drones have been around for more than four decades. Israel, which pioneered its use, continues to be one of the biggest suppliers to the Indian defence forces. At the other end of the spectrum are the toy airplanes fitted with cameras and used for aerial photography that one can buy online for a few thousand rupees. In between military applications and recreation is the business use of drones, an industry that has just come up over the last few years and is poised to boom.

Gaurav Agarwal, CEO of Allahabad-based Vortex UAS, says that the point of evolution from aeromodelling to commercial Unmanned Aerial Vehicles (UAV) happened in 2007, the year touchscreen and smartphones started getting technologies like GPS, accelerometers and megapixel cameras the size of a pea.

"People and companies started experimenting and putting these technologies on model planes. The business vertical has grown in seven years from nothing to a booming sector," he says. Agarwal's primary business is information technology. He had been an aeromodelling hobbyist since 1993 and when he saw the evolution of the technology, he sensed its commercial potential. "That is when we founded our company," he says. Vortex UAS customises UAVs for users if they want something for a specialised operation. Many of his clients have been government bodies.

Last year in Lucknow, during a Moharram procession, when there is always a possibility of conflict between Shias and Sunnis, his company provided UAVs to the city administration to do aerial surveys to look for things like groups piling up stones to throw at processions. He has also worked for the forest department. "There was a man eating tigris on the loose and we tried to scan the forest for it in 2014," he says.

In 2013, the year of the Maha Kumbh Mela, Agarwal walked into the District Magistrate's office and managed to get two minutes with him. "I opened my laptop and showed him some videos that we had shot. That was enough to get him interested. We flew our UAVs and got some fantastic coverage of the gathering and events," he says. Agarwal has also done another project on pollution of the river Gomti in Lucknow. "We flew a drone over the river, mapped out which nullahs drain into the river, how much discoloration those nullahs were causing. That information was used by the District Magistrate to formalise where all they should take action," he says.

In May this year, PriceWaterhouseCoopers released a study estimating the emerging market for commercial applications of drones at \$127 billion. The main areas it highlighted for business services were infrastructure—monitoring investment, asset inventory, etcetera—which accounted for \$45.2 billion, followed by agriculture—crop supervision, soil analysis and so on—at \$32 billion. Then there was transport, security, media and entertainment, insurance, telecommunication and mining. Its report said, "One of the primary usages of drones is to supervise the ongoing investments and maintenance of existing infrastructure. Drones are also used in transport, for last-mile services, as well as in agriculture, not only gathering and quickly analysing data on land and crops, but also helping in precise spraying of plants."

MRINAL PAI IS one of those aspiring for a slice of this pie. While studying at an engineering college, he had spent most of his time in a workshop experimenting and making drones to take part in international competitions. In 2013, he and his team won a NASA competition for the best drone design and that gave them the confidence to take the plunge. In 2014, soon after he graduated, Pai co-founded Skylark Drones in Bengaluru. Skylark focuses on the infrastructure and mining sectors. "We build our own drones, we collect the information, process it, do a lot of analytics on top of the data," he says.

On how useful drones can be, he gives the example of an infrastructure company that builds roads and whose basic requirement is topographical information. Presently, surveying a few hundred kilometres of roads manually would take three to four months. Drones could do that in one-tenth the time. "That is just the start. With the same data, you can extract other information like the number of trees, where houses are located. You can design your infrastructure on the top of that data," he says.

Skylark has a fleet of eight-nine high-end drones and 18 full-time employees. They are doing 300 km of canal mapping in Karnataka and 250 km of national highways surveillance in

Maharashtra. They are working with Coal India too for mining.

There is no clear estimate for the potential of the Indian market and one reason is that on paper, the commercial use of drones is mostly illegal. In October 2014, the Director General of Civil Aviation issued a notice saying it was in the process of formulating regulations for use of Unmanned Aerial Vehicles and till such time 'no non government agency, organisation, or an individual will launch a UAS in Indian Civil Air-space for any purpose whatsoever'. Amlan Mohanty, a lawyer who focuses on the interface between technology and law and writes on it on his website *Techlawtopia*, says, "If the Government is using it, that's okay. By experience, I've found that if a private entity collaborates with a government entity for a government end-use, that is also possibly legal. But in all other cases, it is prohibited under law by virtue of this public notice."

After a year-and-a-half, the DGCA came out with draft guidelines in April this year, but these are yet to be finalised. Mohanty thinks the draft guidelines are a positive step forward, giving some shape to the regulatory framework. "There is a registration requirement with a unique registration number attached to each drone, which in some way would address a lot of the security-related issues that come up with the use of drones," he says. Mohanty expects the guidelines to come through in a year.

Given the legal ambiguity, companies that offer drone services now do much of their work for government end-use. The largest company in this space is Ideaforge and its founder Ankit Mehta was just 24 when he launched it in 2007. His interest in drones began as a student at IIT Bombay, when he and his fellow students made a quadrotor for a project. He didn't start Ideaforge to make drones, though. It was in the alternative energy business. "But we were always taking up these bootstrapping projects with IIT Bombay to keep ourselves afloat. Those projects were all related to UAVs. Initially we created data loggers for aeromodels to be able to see if we can create a control system using that," he says. Along with IIT Bombay, his firm took part and won a competition conducted by the US Department of Defence and the Indian Army together. "The DRDO then felt that this technology can be developed from scratch in India and therefore it is something that should be leveraged. Based on DRDO's

demands, we developed the world's smallest and lightest auto pilot to automate their UAV platforms. In 2009, we also launched India's first fully autonomous small UAV. Subsequently, we have gained more than 95 per cent of the Indian market," says Mehta.

Interestingly, an Ideaforge prototype also led to drones becoming popular among the general public. An article on them in a newspaper was read by actress Dia Mirza, who showed it to director Rajkumar Hirani. He was making

3 Idiots at the time and the scene in which Aamir Khan makes and flies a drone is based on an Ideaforge design.

Ideaforge, says Mehta, has almost all the security agencies of the country as clients—from the Central Armed Police Forces, defence forces to many state police forces. Its drones have been used for disaster management, counter insurgency operations, border management, infiltration monitoring, anti-militancy operations, traffic management, crowd management and mapping. According to him, the market for small UAVs in India is between \$10 million and \$20 million. "But it is growing at a rapid pace," he adds.

Not all drones fulfil their promise. In August-end, there was an experiment conducted to use drones supplied by a private company to catch traffic violators on the Mumbai-Pune Expressway. Some offenders did get booked and there was hype of a drone squadron to make drivers obey traffic laws. Within days, however, the traffic department reported that it was in fact a failure because the drones didn't work in rain or fog and its batteries had to be replaced every 15 minutes. It is, however, still a glimpse into the future. The technology is only going to get better. Delivery services are already being done in controlled environments abroad. Amazon, for

example, has started secretly testing delivering products via drones in the British countryside. The technology website *Recode* had an article in which Uber's head of technology Jeff Holden was quoted saying that the company is looking at technology that could, in a decade, make passenger vehicles take-off vertically and land. It could eventually be driverless, thus technically making it a drone. Even if his timeline is optimistic, the world could in the future be travelling in drone taxis. Without humans behind the wheel, there might then be no need for a drone squadron to monitor traffic. ■



"The using of drones for commercial applications still needs five to six years to completely mature in India"

VENKATESH SAI,

Sree Sai Aerotech Innovations

"Based on DRDO's demands, we developed the world's smallest and lightest auto pilot to automate their UAV platforms"

ANKIT MEHTA, IdeaForge