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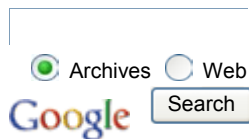
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## New machines, fresh frontiers

**T.V. Jayan and G.S. Mudur on some of the technologies that bagged the India Innovation Growth awards in New Delhi**



A new "intelligent" flying machine designed by a team of young engineers from the Indian Institute of Technology, Kanpur, may soon be seen flying over remote jungles, railway tracks, or the nation's coastline, perhaps keeping a lookout for Naxalites, smugglers or wild animals.



Trashed plastic bottles and discarded car tyres might in the near future propel your vehicle and provide fuel for cooking your food, if a small firm in Mumbai gets real with its dream.

The 'intelligent' flying machine developed by IIT, Kanpur, researchers and (below) the mobile ATM designed by a Bangalore-based IT firm

And banks might have a better chance of serving people in the remote corners of the country with a unique mobile automatic teller machine (ATM) that a Bangalore-based IT firm has designed. All three innovations — marking the journey of Indian science through the early 21st century — were among a set of technologies that bagged the India Innovation Growth awards — a joint effort by Lockheed Martin Corporation, the Federation of Indian Chambers of Commerce and Industry, and the IC2 Institute at the University of Texas — to propel promising technologies from India towards the domestic and international markets.


What started out as a routine undergraduate project for Nimish Sharma of IIT, Kanpur, has turned into India's first private initiative to develop an unmanned aerial vehicle (UAV) — an aircraft the size of a motorbike, designed to pilotlessly perform assigned tasks. The UAV stands out from other such projects in its complete reliance on indigenous know-how. "Most UAV systems typically depend on multiple components outsourced from various companies and then integrated into one system," says Sharma, MD of Aurora Integrated Systems, the company that has developed the prototype unmanned aerial vehicle. "We've designed and developed the complete system — all the components, software and hardware," says Sharma.

"They have a globally competitive technology," says Ray Johnson, senior vice-president and chief technology officer of Lockheed Martin Corporation, the defence and aerospace company based in Bethesda, US. "This UAV appears to be particularly strong in the technology of autonomous navigation," Johnson told *KnowHow*.

As Sharma and another aerospace engineering student Vineet Singh began to design their UAV, others with complementary expertise joined the effort. MTech computer science students Mohit Mundhra and Mohit Mangal put together algorithms, or rules, to build "intelligence" into the machine — giving it the ability to take off, perform a surveillance mission and land without a pilot. And electrical engineering students Gaurav Gupta and Shobhit Niranjana focused on methods to integrate multiple aerial shots taken

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by the UAV into a meaningful picture.

The team plans to build a range of UAVs, including a small five feet-wing span machine to fly about 90 minutes and larger models that will be able to fly for up to 16 hours. "We expect a market in homeland security — for the police, the coast guards and for railway track surveillance," says Sharma. It may also have applications in the surveillance of crops and in tracking wildlife.

If making unmanned airplanes that snoop around to track suspicious movements involves high engineering skills, of no less importance is the innovation of a band of engineers from Mumbai that addresses a tricky problem — mounting plastic waste.

With degradable plastics constituting a mere 5 to 7 per cent of some three billion tonnes of plastics discarded worldwide every year, managing plastic waste has become a humongous problem.

Tolarpati Raghavendra Rao of Sustainable Technologies and Environmental Projects (Steps), an up and coming Mumbai firm, may not only be able to take care of your throwaway PET bottles, plastic bags and broken computer keyboards in an eco-friendly way but also produce petroleum fuels from them.

That's a curious role reversal as plastics are conventionally made from depleting petroleum reserves! Rao's firm has already developed a number of catalysts which, when blended, produce natural gas and liquid fuels such as petrol, diesel and kerosene from the waste.

"Not just plastics, they are capable of producing fuel from anything organic," Rao, who spent nearly three decades in the petroleum industry before launching off on his own, told *KnowHow*. Steps currently has put up three different prototypes of its technology that are on demonstration in India, Malaysia and the Netherlands.

The technique particularly caught the attention of oil palm mills in the Far East. "We have shown them how to produce oil and gas from empty fruit bunches which are otherwise thrown away after the oil is extracted," says Rao.

A typical 40-tonne-per-day plant produces as much 100 to 200 tonnes of waste a day. And with nearly 300 oil palm mills in Malaysia alone, crushed fruit bunches there pose a serious environmental menace, says Ali Mohammad Manat, Rao's partner in Malaysia. "The conversion of the waste leads to about 55 per cent recovery of natural gas and another 15 per cent of very high-grade, export-quality biodiesel," he adds. The gas produced by a 50-tonne-plant as a value-added by-product can produce nearly 7,000 units of electricity an hour, enough to run the entire plant.

India's acclaimed prowess in IT also surfaced at the India Innovation Growth programme, with a Bangalore-based IT firm picking up an award for a blend of hardware and software that might allow ATM money machines to proliferate across rural India in the coming years.

Mahendra Pratap and his colleagues at Integra Micro System (IMS) have developed a smart card for a mobile ATM machine to access bank accounts. The card not only contains an identification tag for its owner but also serves as a passbook, recording each credit and withdrawal from the account via the ATM. IMS executive director Ram Siruparapu says the ATM may be placed in a van that drives around clusters of villages that lack banking facilities. This rural ATM machine — called iMFAST — will not require regular electric supply but can run on car batteries. Costing just Rs 50,000 — less than one-tenth of the cost of a normal ATM — iMFAST can use either landline or mobile networks to connect to the bank's central server. In places where there is no connectivity, the device can record all transactions offline and transfer them onto the server later.

According to Mahendra Pratap, chief adviser of IMS, the device which uses fingerprints for identification and calls out instructions in local languages has elicited interest from several Indian banks, with Corporation Bank already undertaking a four-month trial in Kasaghatta,

a village 70 km from Bangalore. The bank has ordered 100 machines, while others like Indian Bank, Oriental Bank, Canara Bank and Punjab National bank are evaluating the technology.



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