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Indian scientist develops technology to prevent mid-air collisions

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BANGALORE: Sophisticated, unmanned aerial vehicles (UAVs) scouring the skies for enemy vehicles, can face a small glitch when they fly at low altitudes. Many run the risk of crashing into objects like tall buildings and trees. Dr Radhakant Padhi, a 37-year-old scientist from Bangalore's Indian Institute of Science (IISc), has developed a technology that can prevent mid-air collisions of both manned and unmanned UAVs. Infact, he has received a funding of $80,000 from the Air Force Research Lab, US, to develop collision avoidance algorithms for UAVs.

Friends love to call Dr Padhi's technology the 'MPSP algorithm'. This algorithm is a series of pre-installed instructions which can detect and destroy a target. Mission-specific instructions are fed, which helps aerospace vehicles reach their destination, even if they deviate from their predefined path. The algorithm that Dr Padhi has designed acts as the 'virtual brain' of a flight vehicle.

"As UAVs fly at a low altitude, they tend to collide with low-lying objects and even other flying UAVs. So, an algorithm had to be worked out whereby they can detect and avoid these," explains Dr Padhi.

Dr Padhi who started work on the algorithm while doing his ME in aerospace at the IISc, in 1996, honed it to perfection while working on advanced missile technology at the Research Centre Imarat, DRDO. He later developed an advanced version — the MPSP algorithm — while working on one of the missile guidance problems in 2005. Dr Padhi, currently works as an associate professor at the department of aerospace engineering at IISc. This technology can be deployed to avoid mid-air collisions of commercial aircrafts as well.

But what attracted global attention, particularly from the US, was when he sent in a white paper elaborating how this technology could be used to prevent mid-air collisions, and more global offers poured in.

Dr Padhi successfully completed a Rs 15 lakh-project for the South Korean University to design advanced control technology for a challenging super-sonic air-breathing engine through a local company in Bangalore.

Back home, the Defence Research Development Organisation (DRDO), will be conducting field trials to create a defence shield over Indian airspace which can intercept and destroy any incoming ballistic missile using Dr Padhi's technology.

"We will conduct a flight test of the anti-missile system again in June to build the ballistic missile defence (BMD) shield against any incoming medium or long range missiles," DRDO director-general VK Saraswat had said.

Experts say that this new ballistic missile defence (BMD) "will be 20-30% more efficient" and quicker than the ones used in the United States. Once the BMD is in place, India would join a fairly exclusive defence club along with Russia and Israel.

"DRDO realised the potential of my technology around 3 years back. Of particular interest to them were the different algorithms used for control and guidance of missiles and aircraft," says Dr Padhi.

One of the applications of this technology is in increasing the range of air-to-air missile. India's long-range missile, Agni III, is capable of hitting targets 3,500 km away, "and the new technology can boost it to hit the target accurately, even if it deviates from its path", said a senior DRDO scientist who did not wish to be quoted.

"We are using this technology in our air-to-air missile programmes, which is going to be tested very soon, as it is helping us to almost double the range of the missile," the DRDO scientist added.

Another challenging area where this technology is being put to use is for replacing the expensive hardware in missiles with intelligent software. Because of the elimination of hardware that is otherwise part of the payload, the overall weight of the missile is lowered, and hence, the overall cost also comes down.

India is moving ahead to use solid motors in their missiles, as a great help as a lot of time and effort is wasted in having routine re-checks and regular maintenance to keep a missile with liquid engine combat ready.

This technology also helps to control the missiles run by solid motors, during the flight, which otherwise is not possible.