Infrared system helps pilots and drivers see in fog and at night

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A European research project has developed a prototype infrared-camera system that substantially enhances human visual perception in poor visibility conditions such as fog, heavy rain and at night.

The system doubled airline pilots' ability to detect obstacles in tests simulating poor visibility, and in road tests it boosted automobile drivers' vision up to 400 per cent. It could eventually be used aboard commercial airliners and in cars to improve safety.

As Pierre-Albert Breton of Thales Avionics, a partner in the SEE project explains, poor visibility causes flight delays, diversions and cancellations, as well as accidents. Studies also show that far more automobile accidents occur at night than during the day.

In the IST-funded SEE project, which ended in December, researchers developed two types of sensors, one detecting the short wave infrared band and another the long wave. Combining complementary data from the two cameras, the system produces a more complete image than either sensor could produce on its own.

"The challenge was to develop a low-cost technology to detect all the elements that would be visible to the naked eye in good conditions and display them to the driver or pilot on a screen," says Breton.

Since foggy weather is difficult to predict, "An important step was to develop a simulator to validate the system's feasibility in a broad range of visibility conditions, with airline pilots using the simulator," says Breton. "We wanted to determine if pilots would accept the system."

"Feedback from pilots was very useful," says Breton. "They told us the system was very effective for detecting other aircraft on the runway. The planes are very hot, so the infrared systems pick that up very well." The system improved pilot visibility of obstacles by about 100 per cent, says Breton. "So, if a pilot could see an obstacle at 300 metres with the naked eye, the system would allow seeing it at 600 metres, giving more time to react."

In November 2001, a passenger flight crashed into a forest on a night landing approach into Zurich, killing 24. Could the SEE system have prevented it? Maybe, says Breton. "It allows the pilot to see the landscape and detect obstacles earlier, but the system is not magic. Simulation showed it to be less effective in landings. Due to the speed of an approach, a visibility gain of 50 per cent or even 100 per cent is not as significant as it is in runway taxiing," he says.

SEE researchers also conducted tests on cars driven in real, foggy conditions, says Breton. The dual cameras, weighing 15 kilos, were

mounted on the car roof, with an electronic system for piloting and recording in the trunk. The system improved human visual perception by at least fourfold, says Breton. "It was really effective at detecting a person or an animal on the side of the road." This could help drivers see pedestrians or cyclists in poor visibility conditions, a major source of accidents, he says.

BMW, one of the project's eight partners, is exploring low-cost applications of the system to improve automotive safety. "This would certainly be a marketable feature," says Breton. However, he says, the current system's cost of 5,000 euros – a cockpit system would cost far more – makes it impractical. Work is planned to bring down the cost.

For aviation, the next step is to use pilot feedback in developing a complete cockpit simulator, for more extensive tests with pilots, says Breton. He estimates it will be at least another ten years before the system could be installed on commercial airliners. "There is still a lot of testing and refinement to be done."

Source: IST Results