

# What lies beneath?

QinetiQ invented the 'Millimetre-Wave Camera' to enable soldiers and pilots to see through thick fog. Now the device looks set to improve the quality of everything from airport security to computer games.

Last June, Britain was horrified by the deaths of 58 Chinese asylum-seekers, found trapped without oxygen in a lorry cargo hold at Dover. The Dutch driver, Perry Wacker, had closed the air vents to his live payload on one of the hottest days of the summer.

Wacker received a 14-year prison sentence for manslaughter and sparked a year of unwanted media interest for the Home Office in the process. In the wake of the tragedy, and with a general election looming, Labour pledged to step up the war against illegal immigrants. Meanwhile, the Home Secretary, Jack Straw, announced plans for new measures designed to locate stowaways. However, despite heavy government investment it seems that dogs, carbon dioxide detectors and £2,000 spot fines for travel operators and ferry companies have done little to stem the tide of illegal immigration. As recently as July, *The Times* revealed that up to 1,000 people try to smuggle themselves onto UK shores every month.

So what can be done to curb this figure? At QinetiQ, a group of Malvern scientists think they may have the answer in the form of the "millimetre-wave camera" (MWC).

Based on a MOD project carried out by DERA in the early 1990s, the MWC can effectively see through layers of soft materials, like the canvas walls of a lorry. Most things around us reflect radiation that the camera is sensitive to. The human body for instance reflects around 50% of the incident radiation it receives at 35 and 94GHz. At these wavelengths, clothing and other materials are more transparent.



## Eurotunnel success

"A while before QinetiQ was formed we recognised that MWC technology could be exploited in commercial markets such as security," says Kevin Murphy, Business Group Manager for Microwave Sensors, part of the QinetiQ Sensors and Electronics Division.

"We had approached Eurotunnel plc in the past as part of a wider publicity drive to see if they were interested in using the camera to detect illegal immigrants in canvas-sided freight vehicles, but at the time they had only shown a polite interest.

"When illegal immigration became such a political hot potato and the Government introduced £2,000 fines for travel operators, Eurotunnel approached us once more and we decided to work together to assess the MWC at their terminal at Coquelles."

Eurotunnel started to test the MWC in June on haulage passing through its Coquelles terminal. Almost immediately, the benefits of the system were felt – primarily because it was quicker than its X-ray equivalents, which had to be manoeuvred around each truck, normally at the rate of one every ten minutes.

The MWC could function from one spot, hidden from view. As each lorry passed the MWC field of view it would take a real-time picture that could be processed quickly and easily by a single operator. Unfortunately, not even millimetre-wave technology has a penetrating gaze capable of seeing through metal freight or lorries lined with asbestos. But haulage fitting that description – presently only 25% of the total – could eventually be directed down a different lane to be searched with more vigour.

"In just three months we have saved Eurotunnel tens of thousands of pounds in fines," says Kevin, "The feedback we've had has been really positive and there have been strong indications that they will continue to work with QinetiQ for some time."

In order to keep gaining momentum with the project, the team already has plans to improve the system at Coquelles to increase its performance, and success rate. As Janusz Adamson, Commercial Manager for the project explains, software developed by the MWC team will soon be available to automate the system.

"Eventually, software may negate the need for human interaction," he explains. "We are effectively going to 'teach' it to recognise the tell-tale signs of immigrant activity within the trucks so that automatic warnings can be sent to port security."

Janusz adds that, with the addition of the new software, haulage drivers will be blissfully unaware that their cargo is being so closely monitored. Commercial-off-the-shelf speed sensors will simply tell the camera at what rate to scan the truck and make the necessary adjustments to create a reliable image of the inside.

"At present, the system relies on an operator being able to judge a vehicle's speed on approach," adds Kevin. "Speed sensors will negate the need for this. Indeed, the software we plan to develop may see us do away with an operator altogether."



## A raft of applications

With a shining success rate at Coquelles in its first three months of trial operation the MWC is, understandably, beginning to turn heads in the security market. Discuss new applications with the team and you are met with a barrage of possibilities:

"We have an eye on using the camera in airports," confirms Kevin. "Passengers would simply walk through an L-shaped screening area, and be scanned from all directions."

"The whole process will be over in a matter of seconds, and most people will be unaware that they have just been scanned for weapons or contraband," adds Janusz. "There will still be a need to x-ray bags, but the MWC will be the front line of airport detection methods."

In fact, weapon detection in general is another potential market area for the technology. Police forces could use the technology to reveal whether or not a suspect has a concealed weapon, before officers get too close for comfort. In addition, banks and other secure areas could use the MWC to scan customers.

But it isn't just in security that the MWC could prove useful. According to Janusz, a number of markets including transport, medicine, retail and even computer games

could benefit substantially from the invention.

"Shipping could use the system in the same way as military pilots – to overcome bad visibility caused by hazardous weather." He says. "The system would be especially useful for ships coming into port or across areas where there is a high concentration of boats. When used in conjunction with radar it would certainly help build a 3D picture of a ship's surroundings." Elsewhere in the transport sector, aircraft could potentially use the system when approaching an airport docking bay in bad weather, allowing pilots to align aircraft with greater accuracy.

Other potential products include a whole-body scanner, which could be used by shoppers to record their precise body measurements on a smart card and by computer gamers to convert their body measurements into 3D computer game characters. Hand-held versions of the MWC could be used to detect mobile phone signals beneath avalanche snow and earthquake rubble. "In short, this technology can potentially do for people scanning what X-ray technology has done for luggage scanning," concludes Kevin.

It's hard to disagree when you see the detailed pictures that come from the MWC at Coquelles.