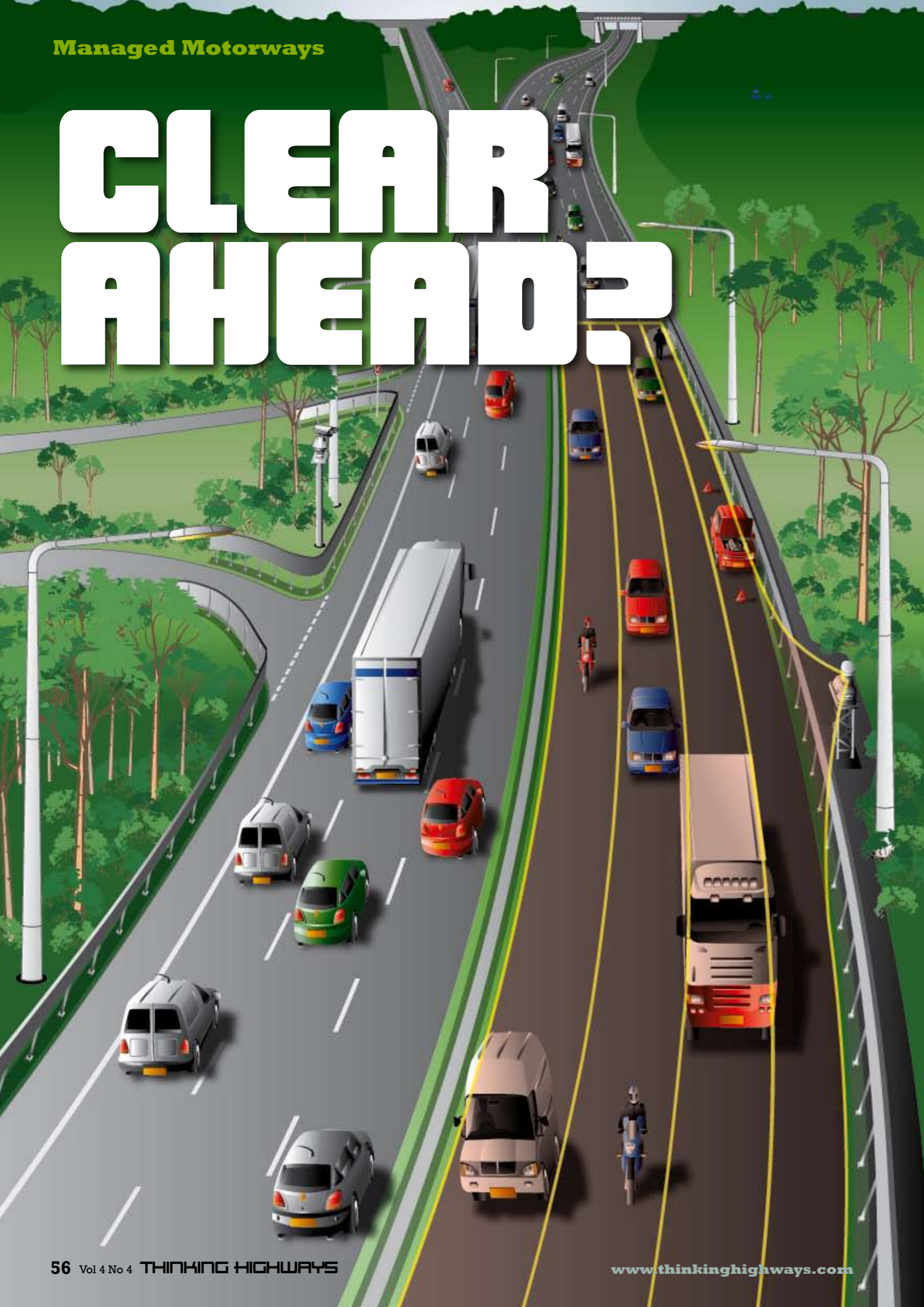


CLEAR AHEAD?



Commercial radar, operating in the 77GHz band, is used increasingly for high performance incident detection for motorways, trunk roads and tunnels. In this interview with DR STEPHEN CLARK, co-founder of Navtech Radar, VIBEKE ULMANN explores the background of the company's success and their expectations for the use of the technology in applications for Managed Motorways and Tunnels



In 1999 a team of engineers set up Navtech Radar specifically to develop millimetre wave (MMW) radar sensor solutions for industrial applications. Building on technology originally developed for offering cruise control in cars, Navtech's engineers have since then developed a level of experience and expertise within their field that is absolutely unique.

Head of Navtech's Division for Incident Detection for Motorways, Trunk Roads and Tunnels, Dr Stephen Clark says, "I think it's fair to say that today, Navtech Radar is the world's leading designer and manufacturer of commercial millimeter wave radar sensors. Since 1999 we have made substantial investments in R&D and manufacturing expertise and this has gained the company a reputation for products that are high performance, robust and extremely reliable".

"We took a strategic decision some years ago and this resulted in a development process with the aim of bringing to market a series of highly effective MMW radar sensor solutions for outdoor commercial applications. This turned out to be a successful route and has led to a series of 'world first' applications such as: the first driverless straddle carrier operational port in the world in Brisbane, Australia, the first quay crane anti-collision safety system using MMW radar on operational ship to shore cranes, the first operational airport ground surface movement system using MMW radar operating at East Midlands Airport, UK, the first commercial off-the-shelf 77GHz MMW radar security system application in a number of countries such as USA, Italy, Poland, Ireland, Kuwait and the UK."

The latest development efforts have seen Navtech Radar launch the first 77GHz MMW radar installation for motorway incident detection and hard shoulder monitoring which has been successfully trialed on the M42 for the UK Highways Agency (HA), and the technology is being delivered to a high profile new tunnel project in the South East of England.

Motorway incident detection

England's Active Traffic Management (ATM) system – directs drivers to use the hard shoulder during times of peak congestion using electronic signs above each



Navtech Radar's Dr Stephen Clark

"We've proved that this equipment could be used as part of a future operator support tool"

lane. Together with variable speed limits, which help smooth the flow of traffic, the scheme has had great success in reducing congestion on the M42 near Birmingham. However, radar really made its presence felt as a part of the HASMOS (HARD Shoulder MONitoring System) project, developed by SEA and run by WSP on behalf of the HA. A proof of concept, data fusion tool

called HASMOS pulled together inputs from multiple sensor types (loops in the road, video cameras and more latterly radar) and developed algorithms able to provide optimum detection of slow or stopped vehicles from the information gathered. Clark says, "In connection with the hard shoulder trials on the M42, alarms were generated based on speeds falling below pre-determined thresholds. For the hard shoulder monitoring application the HA isn't interested in speed, track identity and positional information for all vehicles, so for HASMOS we send on only the tracked vehicle information likely to indicate a problem or something on the hard shoulder, together with confidence limits. This allows the system to make judgments and alarms to be generated as appropriate. We also generated our own alarms independently for comparison.

"Video footage was used by WSP Group as a truth model against which to check alarm logs and we were able to demonstrate a higher detection rate for those areas within radar coverage whilst retaining a very low false alarm rate. Effectively, we've proved that this equipment could be used as part of a future operator support tool for wider hard shoulder management deployment."



Roadside-mounted radar for incident detection at the hard-shoulder trials on the M42

“Our current systems can detect to a range of 800m radius (1600m diameter) per unit and have a minimum range of 10m in either direction from the radar scanner. However, tests have indicated that this can be reduced to 2m in any one direction (or a diameter of 4m). With the system typically mounted 1m back from the roadside, that would mean that blind spots would effectively be eliminated, giving us complete coverage up to 800m. And, in any case, multiple radar systems can be sited such that their detection zones overlap and work in unison”.

“The trial was motivated by recent systems that showed a disappointing level of false alarms”

Radar for tunnel applications

Stephen Clark explains, “We have dedicated substantial resources over the past few years to the development of automatic radar incident detection systems for tunnels. We know that tunnel operators will typically want to know - in real time - if an ‘incident’ occurs. This might include a slow moving vehicle, stopped vehicles, reversing vehicles, pedestrians or debris on the road. If this information is received quickly and reliably, the operators and/or traffic management authorities can respond accordingly. They can alert emergency services to deal with a developing situation and provide full information, so that the response is appropriate. Reliable information from any detection system is vital, as a steady stream of nuisance alarms will, after some time, be ignored by the tunnel operators”.

“Radar automatic incident detection provides exceptionally low false alarm rate. Further, individual radar have long detection ranges per device which results in fewer sensors and a lower installation cost. This in turn means lower ongoing maintenance costs. Radar is unaffected by fog, bright sunlight or general dust and grime and it will continue to detect vehicles and people though smoke in the event that there is a fire incident, which could be invaluable to emergency services”.

The UK Highways Agency has always been at the forefront of ITS and in order to assess radar technology and its performance, the HA instructed Atkins to conduct a site trial on the Navtech Radar’s Clearway™ TS 350-X detection system in the Southwick Tunnel on the A27 in Sussex. The requirement was to determine the suitability of Clearway™ as part of an incident detection system for the new Hindhead Tunnel on the A3 in the South East

of the England. The trial was set up to determine if the radar system could function effectively within the tunnel bore and if it could detect the following:

- Slow moving or Stopped Vehicles
- Pedestrians in the tunnel bore
- Debris/Objects anywhere on the tunnel carriageway

The TS 350-X solution scans 360° to monitor oncoming and receding traffic; it detects both moving and stationary objects. These are all ‘tracked’ in software and their respective movements followed. Any track measured below a threshold speed for more than the configured trigger time will generate an alarm. The system is able to provide alarms according to incident type. The set-up of the trial, using two radar sensors, was made in conjunction with Paul Ducker Systems Ltd, a specialist tunnels system integrator. The trial was actually motivated by a number of recent video incident detection systems that showed a disappointing level of false alarms. During the trial, a number of incidents were staged in an empty bore involving slow and /or stopped vehicles, people entering the tunnel from the portal and walking through. Trials for detecting typical roadside debris were also staged. The system was monitored for several months and alarms raised were compared to video footage and the radar system showed an extremely low false alarm rate of circa one per 24 hours”.

The future

Now that Navtech’s technology has been tried and tested for tunnel applications, as well as for motorways, how does the company view the future prospects?

Says Clark: “We see an interesting market with a wider adoption of Radar technology as a part of automatic incident detection systems. The technology is highly suitable for several reasons, not least the fact that it is not influenced by the changing light condition or smoke i.e. in the tunnels, and it is not influenced by fog/rain/snow either, hence continues to track vehicles and pedestrians in cases of incidents - and this could save valuable time in directing emergency services. As long as there is Line of Sight the radar will ‘see’ everything. The detection zones are simply ‘drawn’ in the software within the radar coverage and this allows you to exclude areas outside of the hard shoulder or the lanes. In case of debris on the road surface our results show that we can detect objects as small as a laptop bag. Combine this with the low false alarm rate and the potential benefits in terms of lower investment, because of the need for fewer sensors, and the corresponding lower maintenance, and there is reason to be optimistic.

“I am therefore confident that the next couple of years will see Navtech’s technology implemented in a number of projects both in the UK as well as overseas,” Clark concludes. **TH**

For more information visit www.navtechradar.com

