AUTONOMOUS EMERGENCY BRAKING
THE NEXT SEAT BELT?

Stop the Crash!
#stopthecrash
If you’ve ever been involved in a crash you’ll know just how traumatic, costly and inconvenient it can be for all involved. That’s why at Thatcham we’re determined to ‘stop the crash’ for the benefit of all road users and our experts believe that Autonomous Emergency Braking is the most important new technology we’ve seen to achieve these ambitious aims.

Thatcham is a world renowned motor vehicle research centre funded by the leading UK motor insurers. For over 44 years, Thatcham has provided specialist research based services which have contributed to improvements in vehicle safety, theft reduction and control of crash damage costs. Thatcham Research is a Euro NCAP accredited testing facility and has for over 15 years undertaken rear impact assessment testing of seat and head restraint design which, in collaboration with vehicle manufacturers has driven significant improvements into the UK car parc.

Thatcham Research data underpins the UK Motor Insurance Group Ratings system, which provides underwriting insight on all new vehicles to the industry on behalf of the Association of British Insurers (ABI). In the 1990s Thatcham introduced vehicle security standards which were influential in dramatically reducing vehicle theft in the UK and this focus continues today, alongside the growing importance of our collaboration with car makers to influence the design and specification of cars on UK roads.

More recently our work has focused upon “Advanced Driver Assistance Systems (ADAS)” technologies that improve safety in a range of road conditions and situations through driver warning and intervention. The objective of this work has been to reduce crash frequency in order to bring down the cost of whiplash claims and vehicle repair costs being borne by UK insurers. Although argument persists about the legitimacy of some insurance claims for whiplash injury, the simple fact is that if the crash can be avoided there is no claim, no damage and no risk of personal injury.

By far the most significant of all the new “driver assistance systems” actually available from most car makers right now is Autonomous Emergency Braking (AEB). Growing evidence from other countries and analysis of our own UK insurance claims database clearly demonstrates that cars with effective AEB systems crash significantly less frequently and as a result of this fact lives can be saved, injuries avoided and disruption to roads minimised, whilst our economy benefits accordingly.

Recognising the potential of AEB over 3 years ago, Thatcham introduced a testing programme for AEB systems that led to lower insurance premiums for AEB cars due to a lower insurance group rating, so cars with standard fitment of AEB are now cheaper to insure than equivalent models without this feature.

The impressive efforts of the global car makers to engineer effective new technologies should be applauded by all and the time is right in our view to demonstrate to consumers that vehicles with AEB should be their natural choice.

We would now invite you to support our campaign requesting the Government to provide a fiscal incentive to buyers of new cars with AEB fitted. A summary of our research work is contained in this document and for further information, please visit www.thatcham.org/aeb.

Peter Shaw
Chief Executive
Thatcham Research

#stopthecrash
AEB is one of the most significant developments in vehicle safety since the advent of the seat belt or the airbag.

As technology improves, the numbers of fatal and serious injuries on UK roads are reducing. With improved vehicle structures, improvements to the road infrastructure and consumer test programmes such as Euro NCAP, the number of fatalities has continued to fall, from over 7,000 in the 1970s to just 1,754 in 2012 in the UK alone.

However, some types of injury have been proportionally increasing in recent years, in particular injuries to vulnerable road users and pedestrians, whilst we have also seen a significant rise in whiplash and associated personal injury claims. Auto braking technologies, such as AEB, can help to reduce the kind of incidents that result in these significant injuries by preventing the crash from happening at all.

Some of the reduction in casualties we have seen on UK roads is due to improvements in commonly recognised safety systems, such as seat belts and airbags, defined as passive safety systems that aim to prevent or reduce injury in a crash.

Introduction:

AEB is defined as an active safety system, operating before the crash happens and aiming to prevent the crash from occurring in the first place, or to reduce its severity. With the increasing technological complexity and computing power accessible from a modern vehicle’s control systems, the availability and performance of these active safety systems are improving rapidly.

90% of crashes are due to human error and distraction, so it is easy to understand how driver intervention systems can help to substantially reduce the likelihood of a crash.
Such is the benefit from AEB systems that through the vehicle Group Rating process, UK insurers have already adjusted the insurance rating on cars fitted with the system. The aim is to encourage wider awareness and demand for AEB and since 2012 vehicles with standard fit AEB systems and which have passed a few basic operational criteria, have seen a reduction in their vehicle grouping, translating into potential savings of around 10% on consumers’ insurance premiums.

The performance of the system is assessed by Thatcham using a dynamic test against a stationary realistic car target, at speeds from 10-50km/h; the performance is used to derive the size of the group rating reduction applied.

This pioneering system to encourage broader AEB fitment has subsequently been adopted in Germany too, giving more incentives for manufacturers to fit AEB systems and protect even more road users.

Electronic Stability Control (ESC) was one of the first highly effective crash avoidance technologies. This system, which became widespread in new vehicles from 2000, helps to prevent loss of control or skidding during high speed manoeuvres or on slippery surfaces and is therefore very effective at preventing or mitigating single vehicle crashes.

ESC was an important enabling technology for AEB, since it automatically controls the vehicles brakes. AEB builds on this by using forward looking sensors to anticipate potential hazards ahead. The first AEB systems used RADAR technology and were often associated with Adaptive Cruise Control (ACC) and Forward Collision Warning (FCW) systems. These were most often optional systems, sometimes fitted at high cost, but were shown to have a significant benefit, reducing damage and injuries by at least 10% and 14% respectively.

Mainstream AEB entered the market in 2008 when Volvo launched standard fit City Safety, using a low cost laser based LIDAR sensor. As it was fitted as standard the effect could be easily statistically measured and subsequent international insurance claims data rapidly highlighted the benefits. This showed a reduction in third party damage crashes and injuries by at least 15% and 18% respectively. Thatcham’s study of UK insurance claims data showed an 18% reduction in third party personal injury claims and a 9% reduction in third party damage claims over the period from 2009 to 2013. Forecasts by Thatcham estimate that if an incentive scheme were combined with a regulation requiring mandatory AEB fitment on new cars by 2020, then in the period 2015 to 2025 over 750,000 damage claims and over 19,000 deaths and serious injuries could be avoided.

A subsequent report from the Department for Transport showed that ESC reduces the risk of your involvement in a life threatening crash by up to 25%.

The evidence that AEB is working on our roads is extremely encouraging, not least because it is already contributing to reducing the whiplash problem for the UK. There are over 550,000 whiplash claims annually in the UK, costing society £2 billion and adding an extra £90 a year to the average motor insurance premium.

The performance of the system is assessed by Thatcham using a dynamic test against a stationary realistic car target, at speeds from 10-50km/h; the performance is used to derive the size of the group rating reduction applied.

The performance of the system is assessed by Thatcham using a dynamic test against a stationary realistic car target, at speeds from 10-50km/h; the performance is used to derive the size of the group rating reduction applied.

This pioneering system to encourage broader AEB fitment has subsequently been adopted in Germany too, giving more incentives for manufacturers to fit AEB systems and protect even more road users.
AEB: System Types

Different AEB systems are effective at different speed ranges, depending on the sensor technology used. Three quarters of all collisions occur at speeds of less than 20mph\(^2\). The majority of these low speed crashes are seen in city environments such as queuing traffic, at junctions or roundabouts, where most whiplash injuries also occur. This is where AEB systems using the cost effective LIDAR sensor are very effective, typically avoiding crashes completely at speeds of up to 12-15mph and mitigating those up to 25mph.

Higher speed crashes can be addressed by RADAR based systems, which are typically more expensive and often only available currently as optional extras depending on the vehicle manufacturer. These ‘Urban’ type crashes are not as common, but as you might expect are normally more serious. RADAR based systems are effective at preventing or mitigating these higher speed crashes up to motorway speeds.

As environmental, economic and congestion pressures encourage more cyclists and pedestrians, we have seen the proportions of injured road users changing. Whilst overall numbers of all casualties are decreasing each year, pedestrians and particularly cyclists now represent an increasing share of the injuries. In 2012 in the UK there were 420 pedestrian and 118 cyclist fatalities\(^1\).

AEB can now address these vulnerable road user collisions too, since systems are now combining cameras with RADARS in sensor fusion.
AEB: Assessments

Thatcham is a member of Euro NCAP and has been leading the implementation of testing procedures into their consumer vehicle safety ratings programme. Tests are carried out to exacting standards with the vehicles precisely controlled by test engineers and robots, using high precision measuring equipment. This work involved the use of real world crash scenarios to define the tests, bringing about the development of a realistic car target that could be repeatedly impacted, and the subsequent definition of the assessment and scoring procedures.

For Euro NCAP the tests mirror those implemented by the aforementioned UK insurance group rating process and these low speed tests against a stationary car target are termed ‘City’ tests. Thatcham and Euro NCAP have also defined higher speed tests against both stationary and moving car targets, known as ‘Inter-Urban’ tests.

FROM 2014 THESE CITY AND INTER-URBAN TESTS HAVE BECOME A KEY ELEMENT OF EURO NCAP’S NEW CAR ASSESSMENT PROGRAMME, see www.euroncap.com/results/aeb.aspx

Similarly detailed test procedures for the assessment of pedestrian AEB systems are almost complete and are planned for implementation during 2016. This type of test procedure is now also being adopted further afield in the US, Japan and China.
ESC and AEB are just the beginning of the revolution in crash avoidance. Advanced Driver Assistance Systems (ADAS), such as AEB, designed to prevent or mitigate different crash types, are entering the market every year. The future will bring autonomous steering to prevent head-on collisions and ‘run off road’ crashes which are often very serious, or even fatal. As technology develops, we’ll also see opportunities to reduce other vulnerable road user deaths such as the junction scenario where a car pulls out in front of a motorcycle.

It is important for drivers to remember that most of the ADAS systems currently available are designed to support them only in emergencies, and that the driver remains responsible for the vehicle at all times. In the longer term, we can expect to see systems that will automate normal driving functions in limited traffic circumstances, such as control of speed and steering on motorways, in order to relieve the driver of the driving burden. Eventually, driverless cars will transfer this burden from the driver to the vehicle – but that is a long way off for the mainstream market, with the first fully driverless cars not expected until the end of the next decade.

THE NEW WORLD OF CRASH AVOIDANCE TECHNOLOGIES IS ON OUR ROADS TODAY IN THE FORM OF AEB, AND IS ALREADY REDUCING CRASHES, PREVENTING INJURIES AND FATALITIES AND SAVING ASSOCIATED SOCIETAL COSTS.
Andrew Miller, Chief Technical Officer, Thatcham
As an automotive engineer with over 25 years’ experience in design and development, Andrew Miller directs Thatcham’s Research department on behalf of the UK Motor Insurers to reduce claims costs in three key areas: safety and crash performance, repair technologies and vehicle security; and to provide accurate vehicle risk assessments within the vehicle group ratings the company provides on behalf of the UK insurance market.
Andrew works closely with the insurance industry, UK Government, Non-Governmental Organisations and other trade bodies to ensure that Thatcham’s long term research work is effective in reducing the human and financial costs associated with vehicle safety and vehicle crime, and in providing cost effective repair information and knowledge to the repair industry. Andrew is Company Secretary and Board Member on the European consumer crash testing safety organisation Euro NCAP, which publicly rates new vehicles on behalf of the consumer. Andrew is a member of the Society of Automotive Engineers and the Institute of Directors.

Matthew Avery, Research Director, Thatcham
As Director of Research at Thatcham, Matthew’s current role involves liaison with vehicle manufacturers, legislators and global NCAP initiatives in all aspects of crash testing, with a view to encouraging safer designs and more cost effective vehicle repair. Matthew has led much of Thatcham’s research work into whiplash testing. He co-authored the international insurance seat assessment procedure, now used as the basis for the Euro NCAP whiplash test and also advises on whiplash issues within the European legislative framework. He also chairs various working groups within the crash test community.
Matthew is currently leading detailed research into collision avoidance technologies and has been pivotal in the definition of test procedures to evaluate AEB, which are now being integrated into the UK Group Rating system and Euro NCAP for 2014. In 2011 he was awarded the US Government Special Award of Appreciation for his contribution to the field of traffic safety for his work in Electronic Stability Control and AEB test procedures.

3 INSURANCE INSTITUTE FOR HIGHWAY SAFETY (IIHS) (2012) They’re working. Status Report, 47.
THATCHAM IS A NOT-FOR-PROFIT ORGANISATION