

AN UPDATE ON THE EURO NCAP SAFETY RATINGS PROGRAM

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Introduction

The European New Car Assessment Programme (Euro NCAP) provides consumers with a realistic and objective assessment of the safety performance of some of the most popular cars sold in Europe. The organization has an important influence on vehicle designs and fitment of safety equipment, leading to fewer traffic deaths on European roads.

Established in 1997, Euro NCAP is a non-profit international association independent of the automotive industry. It is backed by seven European governments (France, Germany, Sweden, the Netherlands, the United Kingdom, Luxembourg, and the Catalonia region of Spain); consumer groups through International Consumer Research and Testing organisation; European motoring clubs through the Fédération Internationale de l'Automobile (FIA Region 1, ADAC and ACI); and UK insurers through the Motor Insurance Repair Research Centre (Thatcham).

Euro NCAP's headquarters are in Brussels, Belgium, close to the European Commission and Parliament. Testing of vehicles is carried out at seven accredited laboratories located in six Member States of the European Union: ADAC, BAST, CSI, IDIADA, Thatcham (with MIRA) and TASS.

Over the last 17 years, Euro NCAP has tested more than 500 vehicles, including superminis, small and large family cars, executive cars, MPVs, SUVs, pick-ups, roadsters and vans.

Current and Future Crash Tests

Vehicle buyers owe it to themselves and their families to choose the safest vehicle. To do so they need reliable, accurate and unbiased comparative information regarding the safety performance of individual models. In Europe, all new models

must, by law, pass safety tests before they are sold, but these are minimum standards and the buying public is not informed about how well cars pass these tests. Euro NCAP encourages manufacturers to exceed the minimum requirements and ensures that car buyers can make an informed decision by issuing an easy-to-understand star rating for most popular cars.

Since 2009¹, Euro NCAP has released an overall safety rating with a maximum of 5 stars for each vehicle. The rating is comprised of scores in four important areas:

- Adult protection (driver and passenger);
- Child protection;
- Pedestrian protection, and
- Safety assist technologies.

The underlying tests include full-scale frontal offset and side-impact barrier and pole tests, front-end component tests for pedestrian protection and seat sled tests for whiplash prevention in rear-end crashes. Seat belt reminders, speed limiters and electronic stability control also contribute towards a vehicle's rating. The overall score is calculated by weighing the four scores with respect to each other, while making sure that no single area is underachieving.

The overall rating scheme was introduced to provide a more balanced assessment of various vehicle safety aspects and to add more flexibility to the ratings scheme [2]. In recent years, Euro NCAP has worked on a programme of stepwise updates to the rating scheme [3], focussing on the upgrade of existing crash tests and on adding tests of emerging crash avoidance and advanced driver assistance technologies:

Adult Occupant Protection

In 2014, the assessment of whiplash neck injury has been extended to the rear seating positions. In 2015, an updated set of crash tests for front and side protection will be implemented, including a new full-width frontal crash test and updated barrier and pole tests. What Euro NCAP hopes to achieve is, amongst other things, better restraint systems for the rear passengers. For the full width frontal test this will be

¹ Before 2009, Euro NCAP published three independent ratings per car: adult occupant protection, child occupant protection (as of 2003) and pedestrian protection.

realised by assessing the risk of injury of a small female occupant, controlling forward head excursion and chest displacement and penalizing the tendency to submarine (where the pelvis slides under the lap belt, resulting in abdominal injuries). The updated side barrier test will use a mobile barrier that is heavier, stiffer and wider than that used today [3] and a more advanced side impact dummy in the driver seat. In addition, the new oblique pole test, aligned with the GTR procedure, will apply a geometric assessment of the head protection device. This will assess the area covered by side thorax/head or curtain airbags in both front and rear positions for different sizes of occupants (Figure 1).



Figure 1. In 2015, the Euro NCAP side impact crash tests will be updated with new elements such as the Advanced European Mobile Deformable Barrier (AE-MDB) [3] and the WorldSID mid-sized male dummy.

Child Occupant Protection

In 2013, Euro NCAP introduced a child seat installation check and changed from P to Q dummies for the dynamic assessment. The installation check promotes better compatibility between vehicles and the most popular types of child restraints on the European market, an area which is often a cause of problems in the real world [4]. Further updates are scheduled in the coming years, most importantly a change to taller child dummies - 6 and 10 year old - for the dynamic tests to cover the transitional size group between those children in integral child seats and adults.

Finally, Euro NCAP will provide incentives for vehicle makers to design their vehicles to be compatible with seats approved to the new UN Regulation 129 on “i-Size”.



Figure 2. Euro NCAP's updated child occupant protection assessment protocol provides incentives for manufacturers to offer i-Size compatible seating positions in the vehicle.

Pedestrian Protection

Step-wise updates to the subsystem (adult and child headform, lower leg and upper legform) tests have been introduced since 2010. Firstly, the head form impactors were harmonised with those specified in the GTR and European Regulation. Longstanding industry criticism about subjective impact location selection was addressed by implementing a grid approach first for bonnet and subsequently for bumper and bonnet leading edge testing. At the same time, the scope of the protocol was extended by incorporating the verification of deployable protection devices, such as pop-up bonnets. Finally, the lower leg test device was updated to the Flex PLI impactor [5] with new criteria and limits in 2014 (Figure 3).

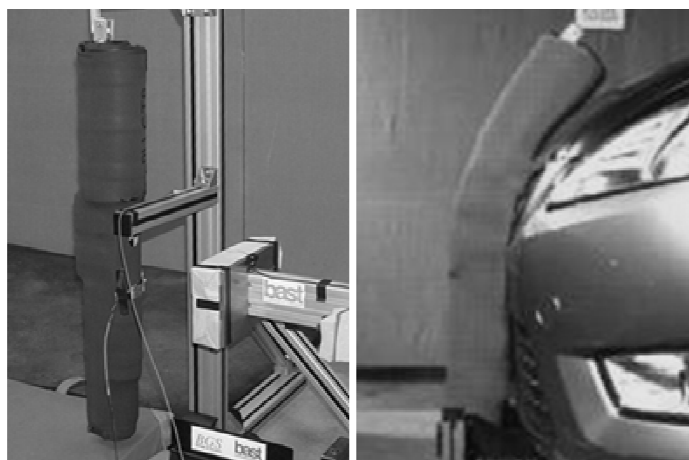


Figure 3. The Flex-PLI is used to assess pedestrian knee and tibia injury risk.

Promoting Advanced Safety Technology

In 2009, the assessment area of Safety Assist was newly introduced to the rating to reflect the increasing importance of rapidly emerging crash avoidance technology. While only a few safety assist technologies were included initially (Seat belt reminders, Speed Limitation Devices and Electronic Stability Control on a fitment basis), it is clear that considerable safety benefits can be realised by rewarding wider fitment of robust crash avoidance and driver assistant systems.

Safety Assist

Following the start of the ESC track testing in the rating scheme in 2011, the assessment of Speed Limitation devices was broadened in 2013 to include intelligent Speed Assistance Systems which employ digital mapping and/or speed sign recognition [6]. In 2014, lane support systems were added to the assessment, as well as autonomous emergency braking systems (which may also include forward collision warning) which help to avoid or mitigate rear-end crashes both at high and low speeds [7]. This will be followed in 2016 with the inclusion of Pedestrian Detection technology (as part of the Pedestrian Protection assessment).



Figure 4. Euro NCAP started to assess AEB systems in 2014 using specially designed “impactable” vehicle target and test equipment.

Rewarding innovation: Euro NCAP Advanced

Since 2010, Euro NCAP has been rewarding vehicle manufacturers that make available new technologies which have a scientifically proven safety benefit for consumers and society but are not yet considered in the rating scheme [8]. Many of these technologies focus on avoiding crashes by informing, advising, alerting or supporting drivers in dangerous situations. Recognizing these advances under Euro NCAP Advanced provides an incentive to manufacturers to accelerate the availability of new safety equipment across their model ranges, helps vehicle buyers factor these features into their purchasing decisions.

The Euro NCAP Advanced assessment process, “Beyond NCAP”, is putting high emphasis on the potential casualty reduction of new safety innovations. Hence the reward system also serves as method by which Euro NCAP identifies key important technologies and it paves the way for inclusion of these technologies in the rating scheme (Figure 5).



Figure 5. In 2011, Volkswagen received the Euro NCAP Advanced Reward for its City Emergency Brake system on the VW up!. From 2014 onwards, AEB City systems are included in the rating.

The Future of Safety: Driverless Cars

The idea of automated and self-driving cars has been widely aired in technical discussions and in media coverage recently. The rapid development of electronic safety systems has made the concept possible and prototype systems are able to

“drive” in controlled situations. The established vehicle industry is active in this field but new players such as Google have also shown prototypes. There is no doubt that greater automation will lead to a revolution in safety, putting it above all other requirements and characteristics of a car. Not only will the self-driving car have the technology to sense, avoid and mitigate in potential crash scenarios, it will also drive in a safer manner. Besides that, used in a manual way, the vehicle will always carry the safety elements and technologies to intervene when necessary. Euro NCAP plans to engage in the roll out of vehicle automation as a way to dramatically improve vehicle safety and safe driving. It will continue to promote best safety practice when vehicles start to have elements fitted which support automated driving and to ensure that the vehicle manufacturer remains responsible for safe operation of the system.

Challenges in the next 5 years

New cars today are much safer than they were a decade ago thanks to improved crash test standards, crumple zones, seatbelts and airbags which help protect occupants in a crash. While most occupant safety measures can be considered mature, more could and should be done to improve their robustness for the general diversity of vehicle occupants and crash scenarios.

Crash avoidance systems can help prevent accidents from happening in the first place. They should be effectively deployed to address the above key accident scenarios, including those that involve other road users and commercial vehicles. Today, the uptake of crash avoidance technology still poses a particular challenge: a large variety of systems is available but only a few are offered as standard. The uptake of optional systems is still low and depends greatly on market incentives. In the coming years, the need for more onboard technologies to support (partial) automated driving will probably make crash avoidance systems cheaper and more cost-effective across the European car fleet.

Besides the price, acceptance and volume of advanced technologies are driven largely by how well consumers understand these features and value them. For this, the vehicle rating must reflect the true contribution of passive and active safety measures to the overall safety performance. The lack of traceability of (the performance of) systems in the market, the complex role of driver behaviour and

inconsistency in Human Machine Interface (HMI) applied across industry, all further complicate the important task of identifying the true potential of avoidance technology.

Euro NCAP's new 2020 strategic plan [9] presents the way in which Euro NCAP intends to address these challenges.

International Cooperation

Last but not least, Euro NCAP is committed to building a strong international partnership between NCAPs world-wide by strengthening bi-lateral cooperation with regional stakeholders and through its participation in Global NCAP in the UN Decade of Action [10]. It will support initiatives to harmonise, where feasible and appropriate, test tools and/or procedures, particularly in the area of crash avoidance, provide assistance to emerging NCAPs and give credit to global manufacturers that produce safe vehicles around the world.

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