Chinese Journal of Traumatology 19 (2016) 63–69

Contents lists available at ScienceDirect

Chinese Journal of Traumatology

journal homepage: http://www.elsevier.com/locate/CJTEE

Invited review

The European New Car Assessment Programme: A historical review

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ARTICLE INFO

Article history:
Received 15 September 2015
Received in revised form
10 October 2015
Accepted 16 November 2015
Available online 29 January 2016

Keywords:
European New Car Assessment Programme
Vehicle safety
Safety rating
Crash testing

ABSTRACT

Established in 1997, the European New Car Assessment Programme (Euro NCAP) provides consumers with a safety performance assessment for the majority of the most popular cars in Europe. Thanks to its rigorous crash tests, Euro NCAP has rapidly become an important driver safety improvement to new cars. After ten years of rating vehicles, Euro NCAP felt that a change was necessary to stay in tune with rapidly emerging driver assistance and crash avoidance systems and to respond to shifting priorities in road safety. A new overall rating system was introduced that combines the most important aspects of vehicle safety under a single star rating. The overall rating system has allowed Euro NCAP to continue to push for better fitment and higher performance for vehicles sold on the European market. In the coming years, the safety rating is expected to play an important role in the support of the roll-out of highly automated vehicles.

Over the last decade, the European New Car Assessment Programme (Euro NCAP) has become synonymous with crash testing and safety ratings. In the same period, the total road death toll in EU-28 has been reduced by roughly a quarter, despite a significant growth in road traffic volumes.[1] One important factor is that cars in Europe have become much safer, partly due to the vehicle industry's response to initiatives such as Euro NCAP.

Euro NCAP provides motoring consumers with a realistic and objective assessment of the safety performance of the most popular cars sold in Europe. At present the organisation has 12 members representing the citizens and consumers in the whole of Europe. These include the member state governments of the United Kingdom, Germany, France, Sweden, the Netherlands, Luxemburg and the regional government of Catalonia, the International Automobile Federation, motoring clubs (Allgemeiner Deutscher Automobil-Club (ADAC) and Automobile Club d'Italia), Consumers International and the Motor Insurance Repair Research Centre Thatcham. In the 18 years of its existence, Euro NCAP has published ratings on over 500 different vehicles, including superminis, family cars and multi-purpose vehicles, roadsters, sport utility vehicles, pick-up trucks, hybrids and, recently, full electric vehicles.[2]

This retrospective paper presents a historical overview of the Euro NCAP programme from its beginning in 1997 to today and investigates the impact which the programme has had, and still has, on the proliferation of safer vehicles on the European market and elsewhere. It also explores the future of vehicle safety and discusses what role the safety rating body is intending to play in the next years.

The origins of consumer testing in Europe

Since the early seventies, a number of European governments have, through the European Experimental Vehicles Committee (EEVC),[3] collaborated on the development of test procedures and equipment to assess various aspects of car crash safety. By the

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Peer review under responsibility of Daping Hospital and the Research Institute of Surgery of the Third Military Medical University.

http://dx.doi.org/10.1016/j.cjtee.2015.11.016

middle of 1990s, this research had resulted in completely new full scale crash test procedures for protection of car occupants in frontal and side impacts, and a component test procedure for assessing the protection of pedestrians hit by the fronts of cars. At that time, the only full scale crash test required by European legislation was a full width rigid block impact designed only to control intrusion of the steering column in a frontal crash.

In 1979, the National Highway Traffic Safety Administration started the New Car Assessment Programme (NCAP),[4] where cars were frontal impact tested at the impact speed of 35 miles per hour. In Europe, the German motor club ADAC and the motoring magazine *Auto Motor und Sport* started to perform offset rigid wall frontal crash tests and to publish the results as consumer information. At around the same time, a single series of frontal tests, jointly funded by the UK Department of Transport (DfT) and International Testing and using the EEVC offset deformable frontal impact test procedure, were published.[5] These programmes highlighted the beneficial effects that consumer information could offer and got the ball rolling for a permanent programme for the whole of Europe.

In November 1996, the Swedish National Road Administration (SNRA), the Federation Internationale de l'Automobile (FIA) and International Testing were the first organisations to join in the UK DfT with the newly formed Euro NCAP.[6] Taking as a starting point, the same EEVC procedures that would form the basis of future legislation, dedicated test and rating protocols were developed for front impact and side impact (including 3-year-old & 18-month-old dummies in manufacturer's recommended child restraint systems) and for pedestrian protection. The first results on seven superminis were presented at TRL in the UK in February 1997. The release of these first results caused considerable media interest, fuelled by a strong critical response from some of the car manufacturers.

In October 1998, new directives, based on the EEVC's recommendations, concerning frontal and side vehicle impact (96/79/EC and 96/27/EC respectively) became effective for all new vehicles. In the same year, Euro NCAP achieved legal status when it became an International Association under Belgian law. From the formation of Euro NCAP, the FIA took the lead in promoting the programme and in discussions with other potential members. As a consequence, more European governments, automobile clubs and representatives from the insurance industry have joined Euro NCAP over the years. Operational control of Euro NCAP moved from the UK to a full time secretariat based in Brussels in 1999.

The evolution of vehicle safety

From 1997 onwards, new batches of test results were published about twice each year and car manufacturers, setting aside their initial reservations, started to sponsor the testing of their own cars. As new car models replaced those already tested, the improvements in their occupant star ratings could be clearly seen (Fig. 1). In June 2001, the Renault Laguna became the first car to be awarded 5 stars for occupant protection, made possible by the introduction of the pole test (see section below). Following from this success, manufacturers increasingly saw 5 stars as the goal for all their new models.

The first period of Euro NCAP testing was coincided with the introduction of the first realistic crash tests in European legislation. Consequently, the vehicle safety standard in industry was evolved at a fast pace, in particular in occupant protection. From the beginning, it was intended that Euro NCAP would encourage manufacturers to exceed the legal requirements and this was achieved by applying more stringent and/or additional test conditions and by extending the assessment to new areas of vehicle safety, as illustrated by the examples below.

The pole test

Research has shown that pole side impacts are relatively uncommon, but they represent a disproportionately high level of fatalities and AIS3+ injuries.[7] In the late nineties, car manufacturers started to introduce countermeasures focussed on preventing head and (to a lesser extent) thorax injuries, which together represent the predominant cause of death in such crashes. As head impact did not regularly occur in the barrier test, Euro NCAP added an optional pole test to demonstrate the benefit of the head protecting airbags for side impact. With no appropriate test being developed in Europe, the US side impact pole test[8] was adapted for use with the European side impact dummy EUROSID-1. Using this procedure, the results for the first cars were published in 2000. More recently, Euro NCAP's pole test has seen several updates, including the test dummy, performance criteria and scoring.

Knee protection

One of the most contentious areas of the adult occupant assessment is related to knee protection. The seating procedure for the adult dummies ensures that the knees always hit the same small areas of the facia in the frontal impact test. With this knowledge, manufacturers have generally ensured that these areas are relatively free from hazards. However, accident research showed that crash victims can impact their knees on virtually any part of the facia they can reach. Before Euro NCAP, such areas were untested and frequently contained aggressive structures. Such hazards were frequently found in the region of the steering column.

Euro NCAP examines the whole facia area and penalties are applied to the Euro NCAP score where hazards are found. In 2007, a dedicated “knee mapping” sled procedure[9] has been adopted to help manufacturers demonstrate the safe design of the facia area for different sizes of front seat occupants and avoid penalties.

Pedestrian protection

In contrast to the advances made in occupant protection, improvements in pedestrian protection were initially slow to emerge. In 2002, the European Commission and Association des Constructeurs Européens d'Automobiles reached a voluntary agreement on pedestrian protection[10] but failed to implement the state-of-the-art pedestrian protection subsystem tests developed and validated by EEVC. This left Euro NCAP to deal with an industry unwilling to make the necessary investments to improve vehicle front-ends. Lack of progress was such that at the beginning of 2002, Euro NCAP revised its pedestrian testing and assessment protocols

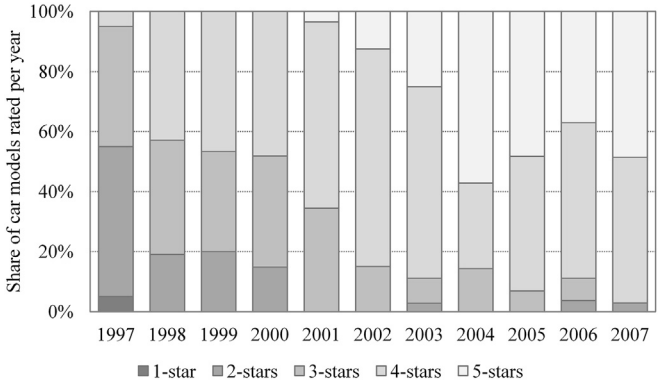

Fig. 1. The evolution of adult occupant star ratings over the first decade of testing.