SWOV Fact sheet

Euro NCAP, a safety instrument

Summary
Since early 1997, in Europe, a cooperation of consumer organizations, European governments, the European Commission, and car organizations have been doing crash tests to judge the safety of cars. This programme is called Euro NCAP.
The test programme consists of four tests of new cars to see how good their frontal impact safety, side impact safety, and pedestrian protection is. Cars are subdivided into nine groups by mass and body shape.
Euro NCAP has stimulated the interest for vehicle safety of all parties involved and, although this is difficult to measure, has had a positive effect on car safety over the last few years. One problem is that crash tests only say something about safety in a collision with a vehicle of the same group, but little about how a collision ends in practice. Extending the programme is being considered.

What is Euro NCAP?
Euro NCAP is an acronym of *European New Car Assessment Programme*. The programme was started as test method for new cars, following the test programmes in the USA (NCAP) and Australia (ANCAP).
The EU has an extensive system of legal requirements and Directives that new cars must meet before they are allowed on the road (see the SWOV Fact sheet *Vehicle regulations*). The Euro NCAP requirements, however, are sometimes stricter than the legal requirements which initially encountered a lot of resistance from the car industry.

Euro NCAP formally started in late 1996 after the Transport Research Laboratory (TRL), commissioned by the British government, set up and carried out a series of crash tests, and was making the results public. In order to strengthen their position against the then hostile car industry, the Federation International d'Automobile (FIA), the Swedish government, and International Consumer Research and Testing (ICRT) joined the Euro NCAP team. The first test results were published in February 1997 at a press conference.
This resulted in a number of other organizations joining Euro NCAP, which presently has a board consisting of representatives from five national governments (the United Kingdom, Sweden, France, Germany, and the Netherlands), one regional government (Catalonia in Spain), FIA, ADAC, and Thatcham as representative of the British insurers. The Board is situated in Brussels and the current chairman is the Swede Claes Tingvall.
The EU also supports Euro NCAP's programme. This results in sufficient financing beings generated to complete the expensive test programme for each new car model.

How does Euro NCAP work?
Periodically, new cars are purchased and tested, often in series of comparable models. The test programme is documented accurately. New car types are tested against requirements that are partly stricter than the legal ones. For the time being Euro NCAP concentrates on crash safety.
The results of the various tests of a car type are indicated by coloured ribbons and by awarding a maximum of 5 stars. Separate scores are given to pedestrian protection and child safety.
A by no means unimportant feature of Euro NCAP is the subdivision of cars are into groups, by mass and body shape, and that the test results are only comparable for cars within the same category.

Initially, the programme was only intended to give consumers a better insight into the safety differences between cars in order to encourage them to make a better choice. However, it is doubtful whether Euro NCAP has ever achieved this goal. Although car manufacturers initially had strong objections to the test results being published, they soon saw that a good Euro NCAP result was good advertising. This seems to make them a more direct target group than the consumers, all the more so because they now strive for the best possible result. Individual manufacturers also want to be the first to be informed about the test results before they are published.

Which vehicle categories does Euro NCAP use?
Euro NCAP distinguishes six main groups of cars: supermini, family car, executive car, roadster, SUV, MPV. Family cars, SUVs, and MPVs are further subdivided into 'small' and 'large' so that there is a total of nine types. For each group two examples are given, the alphabetically first and last in that particular category:

– superminis:	Audi A2	–	VW Polo
– small family cars:	Audi A3	–	VW Golf
– large family cars:	Audi A4	–	Volvo S60
– executive cars:	Audi A6	–	Volvo S80
– roadsters:	Audi TT	–	Opel Tigra
– small SUVs:	Honda CR-V	–	Toyota RAV4
– large SUVs:	Range Rover	–	Volvo XC90
– small MPVs:	Citroen Berlingo	–	VW Touran
– large MPVs:	Chrysler Voyager	–	Renault Espace

As mentioned earlier, the test results are only comparable within the same main category.

Which vehicle aspects are tested in Euro NCAP?
Euro NCAP carries out four tests (see also the '*test procedures*' on the Euro NCAP website).

Frontal impact
The safety of the front of the car is tested by a collision of the test car against an immovable, concrete block to which a deformable element is mounted simulating a collision opponent. The collision speed is 64 km/h, which is faster than the EU requirement of 56 km/h. The other specifications are more or less the same as the legal test requirements (EU Directive 96/79).
During this test, internationally approved dummies are used to measure and register forces and accelerations. The dummies used are a driver dummy, a passenger dummy, and a child dummy sitting on the rear seats in a child restraint system. This last is only done if the car manufacturer considers it relevant.

Side impact and Pole impact
There are two types of test for the side of a car. In the first test the whole of the car side is rammed by a 'trolley' with a deformable element at the front that simulates the front of a car and has the mass of an 'average' car. This construction is driven against the test car at a speed of 50 km/h. This test is nearly the same as the legal test (EU Directive 96/27).
In the second test, known as the pole impact, the test car is propelled into a narrow steel pole at a speed of 29 km/h. There is not mandatory equivalent of this test.

Pedestrian protection
This refers to what is known as the collision-friendly car front. The car front is tested for its deformability at various places in the case of a collision with a pedestrian. This test is not yet mandatory. However, since October 2005 there is an EU Directive (2003/102) that sets out requirements for the car front of new models for the benefit of pedestrians and other vulnerable road users.
Extra points are awarded if the car is equipped with the standard ESC (Electronic Stability Control) and an acoustic SBR (Seat Belt Reminder).

For every separate crash test and for the other safety assessments there is a protocol in which the procedure is described as accurately possible - for further information see the Euro NCAP website: www.EuroNCAP.com.

Which other tests does Euro NCAP aspire to?
Considering the success of the current Euro NCAP programme, an extension of the present testing is being considered. This refers to the following additions:
- More crash tests; one serious option is to include testing the rear end of the car for safety in rear end collisions. Waiting is for agreement on this within the EEVC, the organization which usually develops the tests used by Euro NCAP.

– Tests involving the field of primary safety; the way to test the road 'behaviour' of cars is being considered. Since a driver is an indispensable factor in testing a car's road behaviour, a 'subjective element' is introduced here. This explains why, until now, it has not been possible to come up with tests that are sufficiently objective. A step in the right direction has in any case been set with by recommending ESC (Electronic Stability Control).

How do manufacturers react to Euro NCAP?
In Euro NCAP's initial period, the manufacturers were not keen on publishing Euro NCAP's test results. This is not surprising because weak spots of existing car constructions became public knowledge. But the more stars a model was awarded, the more enthusiasm there was to benefit from favourable results. The manufacturers began to strive at getting as many stars as possible, preferably 5, and used the results in their adverts. Manufacturers have the right to react to test results before they are published. This can even lead to any possible defects being put right and the car being tested again, provided of course that the improved feature is applied in all cars of that model.
Not all new vehicle models are tested via Euro NCAP; the supply of new models is too large for this.

What does Euro NCAP not do?
The Euro NCAP programme has a number of shortcomings. In the first place, every crash test that is carried out according to a standard protocol, only simulates one of the many possibilities in real life; a choice for a particular collision direction, collision speed, and crash opponent has already been make. That is, of course, the limitation of all crash tests and one tries to make a representative choice from the many possibilities.
But there is also something more fundamental that is wrong. This directly concerns the test method, in particular that of head-on collisions. An immovable, concrete block is used that in no way represents one of the most important characteristics of 'the other vehicle' viz. the mass. However, it is true that a deformable element is mounted to simulate the frontal structure of the other vehicle.
The consequence of using an immovable, concrete block as crash opponent is that this, as it were, becomes a reflection of the colliding/tested vehicle. It's as if the test vehicle crashes into a just as heavy vehicle. The result is thus not normative for real life in which there will nearly always be a considerable difference in mass between two vehicles that collide head-on. Moreover, lately various studies have shown that mass difference is in fact one of the most important factors that influence the severity of the outcome of a collision (Van Kampen, 2000).
The same shortcoming also applies to the secondary safety requirements for a car's front as specified in EU Directive 96/79. It is for good reasons that, since 1999, the European Commission has been busy trying to improve the test method by research into 'incompatibility'. However, until now the interested parties have not reached agreement on the necessary extension of the current requirements for the frontal crash test. On the other hand there is the impression that car manufacturers really do try to make their cars safer for a collision between two completely differing masses.

As mentioned earlier, the Euro NCAP requirements are partly more demanding than the legal requirements. There are sometimes fears that this causes cars to have fronts that are too strong. This would in turn cause more damage rather than less, in the much more frequent minor collisions. Apparently, in practice, this is not so bad, since various studies show that newer cars have a much better crash safety than older ones.

A logical consequence of the lack of representativeness of the Euro NCAP tests for two-car collisions is that their results cannot be mutually compared for vehicles of different groups. Cars in different categories have different masses, but hidden behind the mass are also the structure and geometry of the vehicles.
A maximum score of 5 stars for a car of the executive category, for example a Mercedes Benz of 1,750 kg, and a maximum score of 5 stars for a car of the supermini category, for example a Suzuki Alto of 1,000 kg, as it happens say nothing about the outcome of a collision between these two completely different cars. The cars are not compatible and the lighter/smaller of the two is always at a great disadvantage.
Most that can be said is that both cars perform the same against a fixed obstacle, but as soon as there are other collision opponents, like for instance these two 5-star cars colliding with each other, the outcome of such a collision will not at all agree with that of the tests.

What is Euro NCAP's effect?
Lie & Tingvall (2000) have reported that the stars awarded in Euro NCAP are themselves no prediction of the road safety effects of collisions. That is why they used real crash data to determine a relation between the number of stars and the safety in real traffic.
Similar attempts had already been made in the USA (Kahane et al., 1994) and Australia (Newstead & Cameron, 1999) where an NCAP has existed longer than in Europe. Lie & Tingvall also point to the importance of mass, which greatly influences the outcome of collisions. As already stated, the mass in Euro NCAP is more or less allowed for by subdividing cars into separate categories; that is why the stars of the various groups are not comparable. By a so-called pairwise comparison of Swedish two-car crashes, they found a correlation between stars and the injury rate, at least in severe or fatal crashes. They had corrected the data for the already mentioned interfering mass effect.
With reference to the size of this effect, the authors concluded that, in general, cars with many stars 'produce' approximately 30% fewer fatal and severe injuries than cars with few stars. This is a very large effect that was put somewhat into perspective in a recent TNO study (De Vries, 2006). Using the method developed by Newstead, this study used Dutch crash data with vehicle details to establish whether cars from recent years did also become safer in the Netherlands. The study showed that there had been a steady safety improvement, but by no means as large as the improvement Lie & Tingvall had found. Furthermore, TNO found that no conclusion can be drawn about whether cars with many stars have a much better crash safety than cars without any stars. TNO concluded this from the most recent data gathered for that purpose from European crashes with cars within the framework of the EU PENDANT project (see the PENDANT website for further results of this study: www.vsi.tugraz.at/pendant).

Even if the real effect of Euro NCAP on improving vehicle safety is not yet clear, statistics in the Netherlands also show that cars have been getting a lot (crash) safer during the last decades (besides the quoted TNO study see also SWOV, 2007; Van Kampen, 2007). This is at least also to the credit of Euro NCAP, which has stimulated the interest in vehicle safety improvement of all parties involved (governments, car manufacturers, consumers and research institutes).

Publications and sources
(SWOV reports in Dutch have an English summary)
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Website:
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