Euro NCAP Rating Review 2018

Report from the Ratings Group

European New Car Assessment Programme
Ratings Group Report
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Preface

This document presents how the strategic items presented in Euro NCAP's "Roadmap 2025" will be introduced into the Overall Rating Scheme in the years to come and what performance is required for each star level.

The content of this document is based on the decisions made by the Euro NCAP Rating Group and has been agreed by the Board of Directors at its June 2018 meeting.

Abbreviations

AOP	Adult Occupant Protection
AEB	Autonomous Emergency Braking
AES	Autonomous Emergency Steering
C2C	Car-to-Car (Scenario)
CCR	Car to Car Rear-end (Scenario)
COP	Child Occupant Protection
CPD	Child Presence Detection
CRS	Child Restraint System
eCall+	eCall technology capable of sending advanced safety information
ELK	Emergency Lane Keeping
FW	Full Width
GSR	General Safety Regulation
JA	Junction Assist
LSS	Lane Support System
MPDB	Mobile Progressive Deformable Barrier
OSM	Occupant Status Monitoring (including Driver Monitoring)
PTW	Powered Two Wheeler
SA	Safety Assist
SAS	Speed Assistance System
SBR	Seat Belt Reminder
SLD	Speed Limitation Device
V2v, V2x	Vehicle-to-vehicle, Vehicle-to-everything Communication
VRU	Vulnerable Road User

Introduction

Background

The Roadmap 2025 “In Pursuit of Vision Zero”, released in September 2017, is Euro NCAP’s latest strategic plan. The document highlights recent and breakthrough vehicle technologies on the European market, designed to improve the safety of car occupants and other road users. Raising awareness of these safety systems, improving their technical capabilities and encouraging their availability across all vehicle segments, are important elements of an effective strategy to reduce road traffic injuries and fatalities.

Despite the undoubted advances in automated driving technology, future consumers will still need to rely on state-of-the-art safety systems with proven performance. With the Roadmap 2025, Euro NCAP continues the path taken in recent years but also explores new avenues. The overall safety rating promotes robust systems that help the driver to drive safely, avoid collisions with other road users and minimize the consequences of unavoidable crashes. Improving post-crash safety is a new goal, addressing the growing challenges for rescuers after a crash involving modern vehicles.

How to develop an effective countermeasure and what technical solution is chosen, is left to the vehicle manufacturers. Euro NCAP’s role is to reward industry’s innovators and early adopters to help create and facilitate the market for safety. The timeline included in the roadmap indicates when Euro NCAP expects new technologies to have entered the market and to be available for testing as part of the rating scheme.

These rating introduction dates are among several informed assumptions made in this document, based, amongst others, on market insight, technology and regulatory trends, expected benefit and performance in the real world. In an area such as automotive safety, where technology is introduced at an unprecedented rate, making constraining assumptions is essential to convert the abstract real-world problem into a well-defined one to which solutions can be engineered. This way, the safety rating not only provides information to consumers about current safety levels but also acts as a catalyst to improved safety in the future.

Objectives

The Ratings Group was re-instated in the winter of 2017 to outline the detailed rating scheme for the period up to (and including) 2023 based on the roadmap. It was decided not to develop detailed numbers for the rating years 2024 and 2025, due to the large uncertainty about the content evolution - V2x technology in particular -, the impact of the announced revision of the General Safety Regulation (GSR) and the transition into a more scenario based assessment.

As part of the work, the group reviewed the rating scheme of Euro NCAP to date, including the updates already announced for 2020, and proposed a rationale for implementing new items. Using test results of recently rated cars and projections of expected performance, thresholds were defined for each star level. The resulting rating scheme is demanding but will reward those car manufacturers who continue to prioritise safety.

Together with guidance about the future assessments, this report contains the detailed targets, points and percentages upon which the rating will be calculated. As the underlying protocols, tools and assessment criteria are under development or, in other instances, still need to be developed, these numbers will need to be confirmed closer to the date of implementation. This is particularly true for the later years.

Table 1. Representatives in Euro NCAP's Rating Group

Andre Seeck (Chair)	*BASt*	Matthew Avery	*Thatcham*
Aled Williams (Secretary)	*Euro NCAP*	Volker Sandner	*ADAC/FIA*
Michiel van Ratingen	*Euro NCAP*	Henry Gutman	*CSI/ACI*
Richard Schram	*Euro NCAP*	Max Lang	*ÖMTC/FIA*
Pierre Castaing	*UTAC-CERAM/French MoT*	Joaquim Huguet	*IDIADA*
Céline Vallaude	*UTAC-CERAM/French MoT*		
Anders Lie	*STA*		

Guiding Principles

In the upcoming period, Euro NCAP will continue to issue overall star ratings based on a compilation of relevant safety tests and checks. The system of boxes, though not always perfect, has proved to be sufficiently flexible to accommodate new tests and effectively drive improvements in the vehicle fleet. The change from annual to biennial updates (from 2016) has brought more stability, even if the latest updates may have become more substantial as a result. Rating stability and robustness are recognised as key to delivering the roadmap and therefore are important precepts that have guided the new rating scheme.

A lot can change in a decade and the same can be said about the automotive industry which went through some major changes over the past ten years. Cars now are better in quality, more technologically advanced and have more comfort features than ever before, but are also much safer than their predecessors. Equipped with advanced sensors, cars have become increasingly able to prevent or mitigate collisions, changing the way we define and evaluate vehicle safety in the process. While good occupant protection remains essential for any vehicle, AEB technology has become a must for top-rated cars. Forward looking sensors have become so critical (and affordable) that soon one will be available on any car rated by Euro NCAP. This outlook on the rapid development and spread of sensing technologies has motivated Euro NCAP to continue to raise the bar even higher in the period ahead. By setting thresholds carefully, only well-equipped cars with AEB will become eligible for five and four stars, while all cars will need to be equipped with at least one forward looking sensor.

Finally, most of the new content is related to crash avoidance rather than to occupant protection. As was previously the case, points have been attributed to new assessments based on the potential safety benefit, expected system performance and test limitations, e.g. target maturity. Euro NCAP considers avoidance systems as complementary to passive safety in the rating scheme, in the same way as they often operate together in real life. Therefore, where it is the case that the same crash population and/or scenarios are addressed by both active and passive safety tests in the rating, a minimum performance in passive safety is required to be eligible for the active safety assessment. Notably, this is the case for Whiplash and low speed autobrake (AEB City), and for pedestrian subsystem and AEB for VRU, respectively.

Rating Plan

Below, the ratings plan for the rating period 2020-2023 is outlined. Points, weights, overall criteria and balance criteria limits are summarised in Appendix A.

2020/2021

Scheduled content updates

Adult Occupant Protection – (1) MPDB frontal offset test including "compatibility" assessment; (2) Revised AMDB near-side test and full adoption of far-side sled test; (3) Revised Whiplash (front) seat assessment procedure; (4) Adoption of post-crash (rescue) assessment. (5) Removal of AEB City points from the box.

Child Occupant Protection – Updates to the dynamic assessment (regarding changes in front and side barrier test protocols).

VRU Protection – (1) New AEB/AES Junction for Pedestrian and (2) AEB Reverse scenarios for Pedestrian; (3) Revised AEB/AES scenarios for Cyclist. See Appendix B for more details.

Safety Assist – (1) New AEB Junction Assist for cars, turn across path scenarios; (2) Minor updates to SAS requirements.

Rating scheme

Table 2. 2020/2021 Points allocation

AOP (40%)		COP (20%)		VRU (20%)		SA (20%)	
8	Front MPDB[a]	16	Dynamic front[f]	12	Adult head form	2	SBR[k]
8	Front FW	8	Dynamic side[f]	12	Child head form	1	Occupant Status[k]
6	Side AMDB[b]	12	CRS installation	6	Upper leg form	3	SAS[l]
6	Side pole	13	Vehicle based	6	Lower leg form		
4	Far side					4	LSS C2C
4	Whiplash F/R[c]					2	AEB JA C2C[m]
				7	*AEB/AES Pe[g]	4	AEB/AES CCR[n]
2	Rescue[d]			2	*AEB Reverse Pe[h]		
				9	*AEB/AES Cy[i]		
38	**Total AOP**[e]	**49**	**Total COP**	**54**	**Total VRU**[j]	**16**	**Total SA**

Notes

(a) Mobile Progressive Deformable Barrier test: during this two-year phase-in period, the "compatibility" modifier will be halved (from maximum 8 to 4 out of 16 protocol points).

(b) Impact speed increases to 60 km/h and barrier mass to 1400 kg.

(c) Revised front seat assessment based on the 2018 data review. Point allocation is as follows: 3 points for front seat and 1 point for rear seat.

Notes (continued)

(d) "Rescue" point allocation is as follows: 1 point available for each of multi-collision brake technology and eCall+. Pre-conditions for scoring will include the availability of Rescue Sheet and Emergency Response Guide according to ISO 17840. A maximum -2 points penalty will be applied to the total box score if pre-conditions are not met. The score for the assessment can therefore range from -2 to +2 points.

(e) AEB-City tests will be incorporated into AEB/AES CCR (see Safety Assist box).

(f) Revised front and side test conditions for Q6 and Q10 crash test dummies, possibly including a revision of criteria, limits and dummy hardware.

(g) Extending AEB Pedestrian test scenarios by adding turning (at crossing) test scenarios, allowing for both braking (AEB) and steering (AES) interventions.

(h) Extending AEB Pedestrian test scenarios by adding reverse (back-over) test scenarios.

(i) Updating AEB Cyclist test scenarios to include higher target speed scenarios and obstructed scenarios, allowing for both braking (AEB) and steering (AES) interventions.

(j) Only vehicles that achieve a score of 22 points or more in the subsystem tests are eligible for scoring active safety points (marked by an asterisk in the table).

(k) Points allocation as follows: 2 points related to SBR, complementary to requirements in Regulation No 16 of the Economic Commission for Europe of the United Nations (UN/ECE). Euro NCAP compliant front seat SBR is a pre-condition for Driver Monitoring scoring as part of OSM.

(l) Progressive functionality updates, based on camera and GPS capability.

(m) New AEB Junction Assist test for car to car: turn across path testing.

(n) AEB City and Interurban are combined into AEB/AES CCR, allowing for both braking (AEB) and driver initiated steering (AES) interventions. Scoring points in the AEB City (CCRs) scenarios, addressing Whiplash injuries, is subject to a good Whiplash front seat score (75% = 2.25 points).

Thresholds

The Balance thresholds for the individual boxes are unchanged compared to 2018, except for the thresholds for Vulnerable Road Users. The latter limits are adjusted to reflect the additional content in the box.

Detailed limits are provided in Appendix A, Table 9. The Weights and Overall thresholds are used solely to determine the "Best in Class" ranking.

2022/2023

Scheduled content updates

Adult Occupant Protection – Update of post-crash (rescue) assessment.

Child Occupant Protection – Introduction of Child Presence Detection.

VRU Protection – (1) Revision of subsystem tests covering pedestrians and cyclists and a redistribution of points; (2) Junction Assist for PTW, turn across path and junction crossing scenarios; (3) LSS PTW: ELK testing in PTW overtaking and oncoming scenarios. See Appendix B for more details.

Safety Assist – (1) Updated Occupant Status assessment; (2) Updated AEB/AES CCR testing (3) Junction Assist for cars, added junction crossing scenario; AEB/AES head-on scenarios.

Rating scheme

Table 3. 2022/2023 Points allocation

AOP (40%)		COP (20%)		VRU (20%)		SA (20%)	
8	Front MPDB	16	Dynamic front	6	Adult head form[(c)]	3	Occupant Status[(h)]
8	Front FW	8	Dynamic side	6	Child head form[(c)]	3	SAS
6	Side AMDB	12	CRS installation	6	Cyclist head[(c)]		
6	Side pole	13	Vehicle based[(b)]	18	Leg form[(c)]	3	AEB/AES Head-on[(i)]
4	Far side			3	*LSS PTW[(d)]	3	LSS C2C
4	Whiplash F/R			6	*AEB JA PTW[(e)]	3	AEB JA C2C[(j)]
				7	*AEB/AES Pe[(f)]	3	AEB/AES CCR[(k)]
4	Rescue[(a)]			2	*AEB Reverse Pe[(f)]		
				9	*AEB/AES Cy		
40	**Total AOP**	**49**	**Total COP**	**63**	**Total VRU[(g)]**	**18**	**Total SA**

Notes

(a) Increase incentives for post-crash safety technology, among others related to new energy vehicles, provided pre-conditions (see notes under 2020/2021) are met.

(b) Child Presence Detection (CPD) technology rewarded as part of a revised Vehicle Based Assessment. Point allocation is as follows: 4 points for COPD, 9 points for other vehicle provisions.

(c) Update to the pedestrian subsystem tests, including, among others, improved consideration of cyclist head impacts and enhanced leg impact assessment. Points are redistributed.

(d) ELK testing for PTW in overtaking and oncoming scenarios.

(e) New AEB Junction Assist test for car to PTW: turn across path and junction crossing scenarios.

Notes (continued)

(f) Updated AEB/AES Pedestrian testing, allowing for braking (AEB) and steering (AES) interventions. Additional test scenarios for AEB Reverse Pedestrian.

(g) Only vehicles that achieve a score of 22 points or more in the subsystem tests are eligible for scoring active safety points (marked by an asterisk in the table above).

(h) Euro NCAP compliant front and rear seat SBR is a pre-condition for Driver Monitoring scoring as part of OSM.

(i) AEB for oncoming, head-on traffic. Braking and steering interventions.

(j) New AEB Junction Assist test for car to car: added junction crossing scenario.

(k) AEB City and Interurban are combined into AEB/AES CCR, allowing for both braking (AEB) and driver initiated or (if legally allowed) automatic steering interventions. Scoring points in the AEB City (CCRs) scenarios, addressing Whiplash injuries, is subject to a good Whiplash front seat score (75% = 2.25 points).

Thresholds

The Balance thresholds for AOP, COP, PP and SA are equal to those applied in 2020/2021.

Detailed limits are provided in Appendix A, Table 9. The Weights and Overall thresholds are used solely to determine the “Best in Class” ranking.

Beyond 2023

The Roadmap projects further content changes beyond 2023, most importantly the first application of connected safety technologies. Euro NCAP recognises the safety potential of V2v and V2x technologies for car occupants, vulnerable road users and powered two wheelers, yet their true safety benefit can only be realised when a sufficient number of vehicles in the fleet (passenger cars, trucks, PTWs, etc.) will be able to seamlessly communicate with each other and/or with the infrastructure. While the vehicle industry has a large stake in making this happen, it is clearly not in their hands alone. This means that the path to market of connected safety technologies may not follow the usual supply and demand model of more traditional safety technology. Euro NCAP will monitor the development and availability of these systems in the coming period and take a decision on what functionality to adopt in the safety rating once the situation is clearer.

Starting 2025, Euro NCAP plans to make more significant changes to the rating scheme with regards to the method by which the various components are combined, favouring a more scenario-based approach over the technology approach of today. At the same time, the scope of the program will be reassessed, considering the scheduled update of the General Safety Regulation and the Pedestrian Safety Regulation.

Dual Rating

From 2016 Euro NCAP only allows standard safety equipment on the tested variant to generate the “base” rating. The vehicle manufacturer can request a second (“dual”) rating with optional active safety systems included, provided these are offered as a safety pack on all variants in all European markets and the basic rating is at least three stars. The safety pack must be installed on 25% and 55% of model sales calculated over the first and second three years period of sales, respectively. Which optional technologies are eligible in which publication years are detailed in the table in the Appendix A, Table 8.

Appendix A

To be eligible for scoring under the basic rating scheme, all tested safety equipment must be fitted as standard across EU-28 (or EU-27 and the UK), unless specified otherwise. See the "Vehicle Specification, Sponsorship, Testing and Retesting" (VSSTR) protocol for more information about test variants and fitment requirements.

Summary points tables

Table 4. Adult Occupant Protection

Test	2018	2019	2020	2021	2022	2023
Frontal ODB	8	8				
Frontal MPDB			8	8	8	8
Frontal FW	8	8	8	8	8	8
Side MDB	8	8	6	6	6	6
Side pole	8	8	6	6	6	6
Far-side			4	4	4	4
Whiplash front/rear	2	2	4	4	4	4
AEB (City)	4	4				
Rescue			2	2	4	4
Total	**38**	**38**	**38**	**38**	**40**	**40**

Table 5. Child Occupant Protection

Test	2018	2019	2020	2021	2022	2023
Dynamic performance	24	24	24	24	24	24
Vehicle-CRS compatibility	12	12	12	12	12	12
Vehicle based assessment	13	13	13	13	13	13
Total	**49**	**49**	**49**	**49**	**49**	**49**

Table 6. Vulnerable Road User Protection

Test	2018	2019	2020	2021	2022	2023
Headform	24	24	24	24	18	18
Lower & Upper Legform	12	12	12	12	18	18
AEB/AES Pedestrian	6	6	9	9	9	9
AEB/AES Cyclist	6	6	9	9	9	9
AEB/LSS PTW					9	9
Total	**48**	**48**	**54**	**54**	**63**	**63**

Table 7. Safety Assist

Test	2018	2019	2020	2021	2022	2023
SBR / Occupant Status	3	3	3	3	3	3
SAS	3	3	3	3	3	3
AEB C2C	3	3	6	6	9	9
LSS	4	4	4	4	3	3
Total	**13**	**13**	**16**	**16**	**18**	**18**

List of eligible technologies for dual rating

Table 8. Required system functionality for safety pack technologies

Box	Eligible technologies	2018	2019	2020	2021	2022	2023	2024
AOP	AEB City							
AOP	eCall+							
VRU	AEB/AES Pe	Crossing and longitudinal		Crossing, longitudinal and turning. Braking and/or steering				
VRU	AEB Pe Reverse							
VRU	AEB/AES Cy	Braking and/or steering						
VRU	LSS VRU					ELK with PTW detection		
SA	AEB/AES C2C	Braking		Braking and steering, low and high speed				
SA	AEB JA							
SA	LSS C2C	ELK						
SA	Occupant Status					Driver Monitoring		
SA	SAS	ISA						

Rating scheme thresholds and weights

Table 9. Thresholds and weights

	AOP	COP	PP	SA	Overall
2018/2019					
For five stars, at least:	80%	80%	60%	70%	74%
For four stars, at least:	70%	70%	50%	60%	64%
For three stars, at least:	60%	60%	40%	50%	54%
For two stars, at least:	50%	50%	30%	40%	44%
For one star, at least:	40%	40%	20%	30%	34%
Weight	**40%**	**20%**	**20%**	**20%**	
2020/2021					
For five stars, at least:	80%	80%	70%	70%	76%
For four stars, at least:	70%	70%	60%	60%	66%
For three stars, at least:	60%	60%	50%	50%	56%
For two stars, at least:	50%	50%	40%	40%	46%
For one star, at least:	40%	40%	30%	30%	36%
Weight	**40%**	**20%**	**20%**	**20%**	
2022/2023					
For five stars, at least:	80%	80%	70%	70%	76%
For four stars, at least:	70%	70%	60%	60%	66%
For three stars, at least:	60%	60%	50%	50%	56%
For two stars, at least:	50%	50%	40%	40%	46%
For one star, at least:	40%	40%	30%	30%	36%
Weight	**40%**	**20%**	**20%**	**20%**	

Appendix B

VRU test scenarios

The table below provides guidance on the VRU test scenarios, that are currently foreseen for the upcoming period, and on their tentatively allocated points in the rating system. The details of the procedures and the final points will be confirmed during the development phase of the protocols.

Table 10. Tentative point distribution for future VRU test scenarios

2018/2019	☀	🌙	2020/2021	☀	🌙	2022/2023	☀	🌙
AEB Pedestrian	**3.0**	**3.0**	**AEB Pedestrian**	**6.0**	**3.0**	**AEB Pedestrian**	**6.0**	**3.0**
– CPFA	0.6		– CPFA	0.5		– CPFA	0.5	
– CPNA	1.2	2.0	– CPNA	0.5	2.0	– CPNA	0.5	2.0
– CPNC	0.6		– CPNC	1.0		– CPNC	1.0	
– CPLA	0.6	1.0	– CPLA (incl. AES)	1.0	1.0	– CPLA	1.0	1.0
			– CPTA	1.0		– CPTA	1.0	
			– CPRC	2.0		– CPRC	2.0	
AEB Cyclist	**6.0**		**AEB Cyclist**	**9.0**		**AEB Cyclist**	**9.0**	
– CBNA	3.0		– CBNA(-O)	3.0		– CBNA(-O)	3.0	
– CBLA	3.0		– CBLA (incl. AES)	3.0		– CBLA	3.0	
			– CBFA	3.0		– CBFA	3.0	
						AEB/LSS PTW	**9.0**	
						– CMTA (TAP)	3.0	
						– CMTA (Xing)	3.0	
						– LSS	3.0	
Total	**12**		**Total**	**18**		**Total**	**27**	

Legend

CPFA:	Car to Pedestrian Far-side Adult	CBNA:	Car to Bicycle Near-side Adult
CPNA:	Car to Pedestrian Near-side Adult	CBNAO:	Car to Bicycle Near-side Adult (Obstructed)
CPNC:	Car to Pedestrian Near-side Child	CBLA:	Car to Bicycle Longitudinal Adult
CPLA:	Car to Pedestrian Longitudinal Adult	CBFA:	Car to Bicycle Far-side Adult
CPTA:	Car to Pedestrian Turning Adult	CMTA (TAP):	Car to Motorcycle Turning Adult (Turn Across Path)
CPRC:	Car to Pedestrian Reverse Child	CMTA (Xing):	Car to Motorcycle Turning Adult (Crossing)