REPORT

AEBS and trucks

Practical Test of the Detection of Trucks for the Advanced Emergency Braking System

Client: Rijkswaterstaat – Water, Traffic & Environment

Reference: T&PBF7856R001F01

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1 Introduction

An Advanced Emergency Braking System (AEBS) is to be phased in for new trucks (Category M2, M3, N2 and N3 motorised vehicles)[1]. This system must prevent trucks from rear-ending a traffic jam and/or significantly reduce the severity of an incident. The system must also be capable of detecting a traffic jam with stationary passenger vehicles on a timely basis.
Similar systems are available for passenger vehicles. These are available under various names including City Advanced Emergency Braking (C-AEBS) for low speeds and Urban AEBS for high speeds.

Manufacturers are using different methods to detect traffic jams. Generally, these are radar-based and may or may not be combined with a camera. When an object with which a collision is probable is detected, the driver receives a warning signal. This signal may be visual, acoustic or a combination of the two. This warning system is called Forward Collision Warning (FCW). If the situation persists and the driver fails to intervene, the system must intervene. In a number of systems used, the system first brakes the vehicle lightly (approx. 3 m/s^2) to attract the driver's attention. After this, the system intervenes within 1.4 seconds through means of an emergency stop. An emergency stop by the system (> 5 m/s^2) must reduce the speed by at least 20 km/h in order to as much as possible reduce the impact of a potential collision. This braking system actually is the AEBS. In other words, AEBS is always implemented in combination with FCW, where FCW warns and AEBS brakes.

Figure 1 – Radar and camera on test vehicles.

A few heavy accidents occurred between trucks in 2017. This led Rijkswaterstaat to ask to what extent the AEBS system of the trucks coming from behind detected the slow-moving or stationary truck in front. By testing trucks with AEBS on various types of trucks, Rijkswaterstaat wants to increase the insight into the operation of AEBS.
The objective of this test is to assess in actual practice if and under which conditions the trucks are detected by the FCW/AEBS systems currently in common use.

This test is a follow-up to a performed comparable test in February, during which various traffic control measures were tested. A separate report has been drawn up of this test. During the test in February, a collision absorber was tested, which was hardly observed at all by the test vehicles. During this test, it will also be investigated whether a new type of collision absorber is easier to detect for trucks.
Rijkswaterstaat has commissioned Royal HaskoningDHV to orchestrate this test, and to analyse and report on the results. This report covers the design of the study (Chapter 2) and the test results (Chapter 3), while Chapter 4 sets out the conclusions and recommendations.

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[1] Effective from 01-10-2016 AEBS Level 01 must be present in all new type approvals. The existing type approvals will expire on 01-10-2018. Effective dates are extracted from Regulation 347/2012, associated performance levels are listed in Regulation 2015/562 - Source: National Vehicle and Driving Licence Registration Authority (RDW).

2 Study Design

To answer the study's basic question, we had test vehicles drive towards various types of trucks under controlled conditions. The system was also tested for a number of passenger cars, and some traffic control measures and other reflection systems were included in the test.
Upon approaching the test object, we determined whether the driver received a timely warning from the Forward Collision Warning System and was able to safely avoid the traffic control measure. We did not test the actual intervention of the vehicle – the Advanced Emergency Braking System – for safety reasons.

The entire test was prepared and recorded in advance in a script (see Appendix A1). This script also includes a large number of safety measures. During the test, compliance with the safety measures from the script was monitored.

2.1 Trucks and traffic control measures to be tested

The AEBS system was tested on various types of trucks, with different rear layouts. The following trucks were used as a test object:

- Tilt semi-trailer with and without a forklift
- Container truck with and without container
- Flatbed trailer
- Tank truck
- Road tractor
- Collision absorber

Some reflection systems were also tested.
To check whether the AEBS systems actually function, a reference test (see Section 3.1) was performed using three different passenger cars (Volvo V40, Suzuki Alto and Toyota Prius, where the Prius was positioned opposite, with the front facing the oncoming truck).

2.2 Test Vehicles

Six different trucks equipped with AEBS were used for the test (see the figure below). It concerns trucks of the following brands:

- DAF
- Iveco
- MAN
- Mercedes
- Scania
- Volvo

These brands form a good cross-section of the types of trucks operational in the Netherlands. The goal of this study is not to test different truck brands, but to get an overall picture of the performance of AEBS. That is why the trucks are randomly numbered in the results section of the report. The results can't be traced back to individual brands.

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Figure 2 – Test Vehicles.

2.3 Test Site and Date

The tests were carried out on the Police Academy's test track in Lelystad, the Netherlands. The test track includes a straight section approximately 700 m in length along which various traffic control measures were placed.

The tests took place on Tuesday, 19 December 2017. This was a clouded and cold day with an average temperature of 6°C, 10 km visibility and an average wind speed of 2-3 BFT from the south-east (source: historical data Royal Netherlands Meteorological Institute (KNMI)).

A plenary briefing was held with all participants prior to conducting the test. The results were discussed with all participants at the end of the test.

2.4 Test Preparation: Determining the Swerving Distance

This test determined whether the driver received a timely warning from the AEBS system. If this is not the case, the test vehicle will collide with the test object if no action is taken. To prevent this from happening, the test vehicle did not drive all the way up to the test object, but instead swerved around the test object. During the previous test in January 2017, we determined the critical swerving distance. The swerving distance is the minimum distance to the test object a driver requires to be able to safely swerve. The swerving distance is determined as follows:

- Pylons are placed at 10 m intervals;
- A truck approaches at 80 km/h and initiates a swerving manoeuvre when it reaches the first pylon;
- A readout is then taken to determine the number of metres required for the truck to have swerved into the adjacent lane.

This manoeuvre was carried out five times. Each time, the truck required approximately 40 m to change lanes. This distance plus a safety margin of 10 m was maintained as the space between the spot where the truck was to commence swerving and the traffic control measure. The swerving distance was therefore set at 50 m.

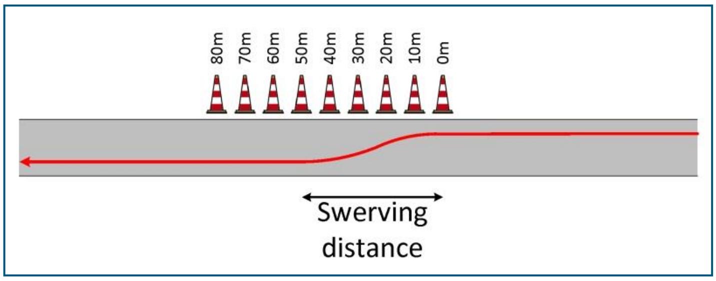

Figure 3 – Determining the swerving distance.

2.5 Test Method

Three trucks or traffic measures were placed in three series on the test track each time. The test vehicles each drove 5 laps. The test vehicles drove these laps 'solo' to ensure the test objects were not shielded by the vehicle in front.
Aside from the driver, each vehicle included a co-driver to record information. The co-driver recorded the following information for each traffic control measure:

- Was the ride a steady 80 km/h;
- Did the driver receive a warning signal (Y/N);

The results were recorded in a log.

2.5.1 Test Set-Up

Figure 5 depicts the test set-up. The test vehicles were parked in the storage lane, designated in red. The test vehicles completed the blue circuit five times. The circuit time was approximately 2:30 minutes.
Observers/spectators were located on the hill, designated in purple, from which the three test sites were clearly observable.

Figure 4 – Observers/spectators on the hill.

The trucks that were not tested in the relevant series were also parked in the storage lane.

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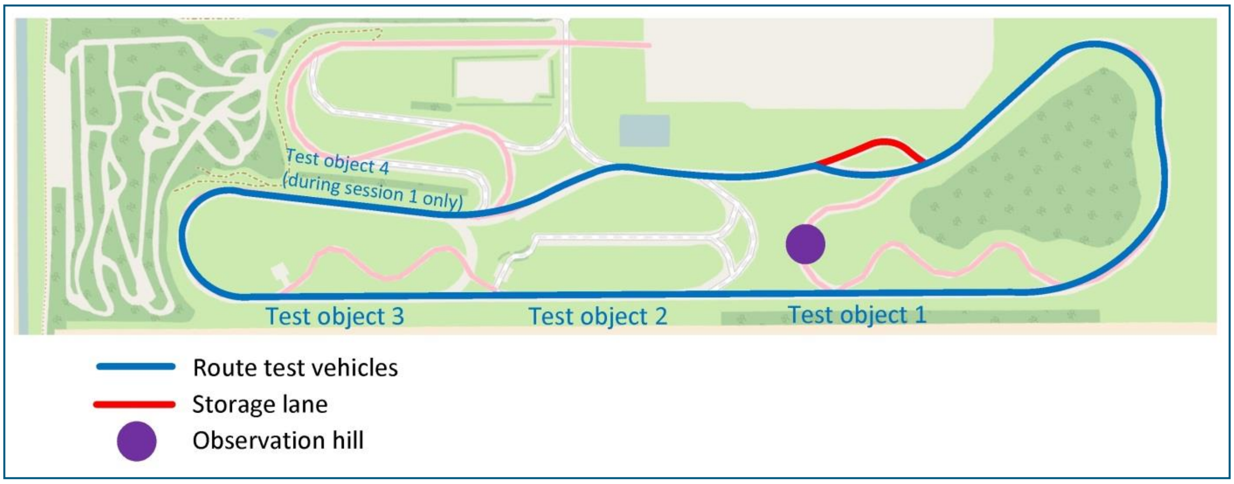

Figure 5 – Set up of traffic control measures, test vehicles and observers

2.5.2 Determining the Detection of Test Objects

With the help of the set-up below, tests were conducted to determine whether the test vehicles reacted to the stationary objects in a timely manner.

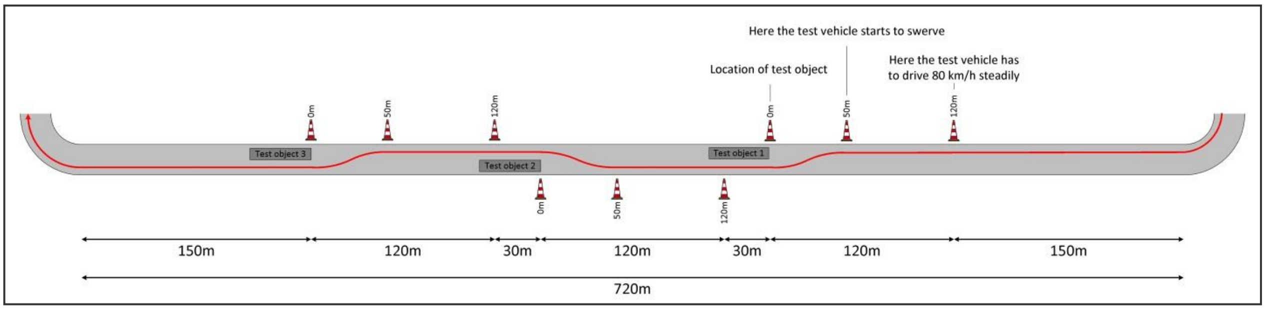

Figure 6 – Test set-up on the long straight.

For an acceptable test, the test vehicle was required to be driving at a steady speed of 80 km/h at a distance of 120 m from the test object.[2] The co-driver checked this. When this was not the case, the test was rejected. The driver continued driving up to the last pylon positioned at the swerving distance (50 m) from the test object and then swerved to the other side of the lane. The co-driver recorded whether the driver received a warning signal.
The truck continued driving up to the pylon located 120 m from the second object and the process was then repeated. Ditto for object 3. At the end, the driver had a 150m distance available for braking and safely steering into the bend. No unsafe situations occurred during the tests.

During the first session, an additional test set-up was placed on the short straight for the verification test[3]. Two cars were parked 4.5m apart.

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[2] The approach distance and speed correspond to the test on passenger vehicles from Appendix II Article 2.4 of Regulation (EU) No. 346/2012 - 16 April 2012
[3] The set-up of the verification test corresponds to Appendix II Article 2.8 of Regulation (EU) No. 346/2012 - 16 April 2012

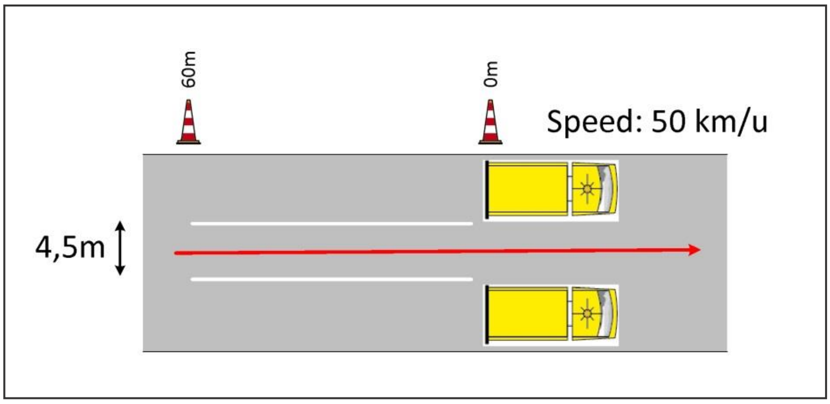

Figure 7 – Test set-up on the short straight.

For an acceptable test, the test vehicle was required to be driving at a steady speed of 50 km/h at a distance of 60 m from the test objects. This too was monitored by the co-driver and when this was not the case, the test was rejected. If the system functions properly, AEBS may not intervene if the test vehicle passes between the two passenger cars. The co-driver recorded whether the driver received no warning signal.

3 Test Results

This chapter describes the test results of the reference test and the different trucks and traffic control measures. The following was recorded for each object:

- Number of tests
- Number of times that the truck, traffic control measure or reflective object was detected by the FCW/AEBS.

It should be noted that 5 laps were driven per test. The results must therefore also be regarded as indicative and the results must be interpreted with some caution. The tables indicate the scores from 0 to 5 in colour.

0-1
2-3
4-5

3.1 Reference tests using passenger cars

To verify the functioning of the AEBS systems, these were tested on some passenger cars.

	Passenger Car 1		Passenger Car 2	
	Total Number of Tests	Number of Times Detected	Total Number of Tests	Number of Times Detected
Test vehicle 1	5	0	5	3
Test vehicle 2	5	3	4	4
Test vehicle 3	5	4	5	4
Test vehicle 4	5	1	5	3
Test vehicle 5	5	0	4	2
Test vehicle 6	5	1	5	0
Total	**30**	**30%**	**28**	**57%**

Table 1 – Reference test 1 using passenger cars.

Figure 8 – Passenger car 1 (left) and passenger car 2 (right).

Car 1 was parked very far to the right (tightly against the roadside). This made it difficult for the trucks to approach straight from behind. This probably affected the test. Therefore, car 2 was parked a bit further from the roadside, which resulted in a higher score for some test vehicles.

The system was tested on a third passenger car, which was parked facing traffic. A verification test was also conducted to verify the system does not respond to a false observation.

	Passenger Car 3 (In Reversed Position)		Verification Test (between 2 passenger cars by)	
	Total Number of Tests	Number of Times Detected	Total Number of Tests	Number of Times Not Detected
Test vehicle 1	5	5	5	5
Test vehicle 2	5	5	5	5
Test vehicle 3	5	5	5	5
Test vehicle 4	5	5	5	5
Test vehicle 5	5	1	5	5
Test vehicle 6	5	0	5	5
Total	**30**	**70%**	**30**	**100%**

Table 2 – Reference tests with passenger car 3 and passing between 2 passenger cars.


Figure 9 – Passenger car 3 (left) and the parked passenger cars (right).

Contrary to passenger cars 1 and 2, passenger car 3 was parked facing forward. The low scores of test vehicles 5 and 6 stand out in this situation.
During the verification test, the systems must not respond when the trucks drive between two vehicles, which are 4.50m apart. During the test, all systems met this requirement.

3.2 Test with Tilt Semi-Trailer with and without a Forklift

	Tilt Semi-Trailer with a Forklift		Tilt Semi-Trailer without a Forklift	
	Total Number of Tests	Number of Times Detected	Total Number of Tests	Number of Times Detected
Test vehicle 1	5	1	5	2
Test vehicle 2	5	5	4	3
Test vehicle 3	5	5	5	4
Test vehicle 4	5	5	5	5
Test vehicle 5	5	5	5	5
Test vehicle 6	5	2	5	4
Total	**30**	**77%**	**29**	**79%**

Table 3 – Test with tilt semi-trailer with and without a forklift.

Figure 10 – Tilt semi-trailer with (left) and without (right) forklift.

The low score of test vehicle 1 stands out. 4 out of 6 vehicles score 80% or higher. We also observe that test vehicle 6 detects the trailer better without the forklift in place, while the other test vehicles detect the object better with the forklift in place.

3.3 Test with Container Truck with and without Container

	Container Truck with Container		Container Truck without Container	
	Total Number of Tests	Number of Times Detected	Total Number of Tests	Number of Times Detected
Test vehicle 1	5	0	5	2
Test vehicle 2	5	4	4	1
Test vehicle 3	5	5	5	0
Test vehicle 4	5	0	5	0
Test vehicle 5	4	0	5	2
Test vehicle 6	5	0	5	1
Total	**29**	**31%**	**29**	**21%**

Table 4 – Test with container truck with and without container.

Figure 11 – Container truck with (left) and without (right) container.

The fact that 5 of the 6 test vehicles do not or barely detect the container truck with and without the container is remarkable. Test vehicles 2 and 3 detect the container truck with container and score 80-100%, but without the container the scores are 20 and 0%.

3.4 Test with Tank Truck and Road Tractor

	Tank Truck		Road Tractor	
	Total Number of Tests	Number of Times Detected	Total Number of Tests	Number of Times Detected
Test vehicle 1	5	3	5	0
Test vehicle 2	5	5	5	1
Test vehicle 3	5	2	5	4
Test vehicle 4	5	0	5	1
Test vehicle 5	5	5	5	0
Test vehicle 6	5	3	5	3
Total	**30**	**60%**	**30**	**30%**

Table 5 – Test with tank truck and road tractor.

Figure 12 – Tank truck (left) and road tractor (right).

The low score of test vehicle 4 stands out in the test with the tank truck. With only the road tractor in position, only test vehicle 3 obtains a high score (80%). The AEBS systems of the other vehicles gave (almost) no warning for the separate tractor.

3.5 Test with Flatbed Trailer and Motorcycle

	Flatbed trailer		Motorcycle	
	Total Number of Tests	Number of Times Detected	Total Number of Tests	Number of Times Detected
Test vehicle 1	5	0	5	0
Test vehicle 2	5	2	5	0
Test vehicle 3	4	3	5	0
Test vehicle 4	5	1	5	0
Test vehicle 5	5	0	5	0
Test vehicle 6	5	0	5	0
Total	**29**	**21%**	**30**	**0%**

Table 6 – Test with flatbed trailer and motorcycle.

Figure 13 – Flatbed trailer (left) and motorcycle (right).

The flatbed trailer is hardly detected. Only test vehicle 3 scores 75%.
The motorcycle was in a fend-off position and was not detected by any truck.

3.6 Test with Mobile Road Sign and Collision Absorber

	Mobile Road Sign		Collision Absorber	
	Total Number of Tests	Number of Times Detected	Total Number of Tests	Number of Times Detected
Test vehicle 1	5	4	5	4
Test vehicle 2	5	0	5	5
Test vehicle 3	5	0	5	3
Test vehicle 4	5	5	5	1
Test vehicle 5	5	0	3	2
Test vehicle 6	5	2	5	4
Total	**30**	**37%**	**28**	**68%**

Table 7 – Test with mobile road sign and collision absorber

Figure 14 – Mobile road sign (left) and collision absorber (right).

The mobile road sign is almost always detected by test vehicles 1 and 4, but not by the other trucks.
The collision absorber obtains varying scores. It should be noted that the scores are considerably higher than those obtained during the test in January 2017. This can be explained by either the improvement of the AEBS systems used and/or by the other type of collision absorber used.
Please note: test vehicle 5 stopped the test with the collision absorber after 3 laps because the AEBS system stopped working. The vehicle probably switched off the AEBS after detecting that the AEBS was activated unusually often that day.

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3.7 Moshon Data Test

	Moshon Data Slab Foam Target		Moshon Data Delineator	
	Total Number of Tests	Number of Times Detected	Total Number of Tests	Number of Times Detected
Test vehicle 1	5	4	5	2
Test vehicle 2	5	5	5	0
Test vehicle 3	5	4	5	0
Test vehicle 4	5	5	5	4
Test vehicle 5	2	2	3	0
Test vehicle 6	5	2	5	5
Total	**27**	**81%**	**28**	**39%**

Table 8 – Moshon Data Objects Test.

Figure 15 – Moshon Data Slab Foam Target (left and centre) and Moshon Data Delineator (right).

A foam test target was also tested. The target consisted of a foam shape with a print of the back of a passenger car, including lighting and licence plate. A reflective surface and a prism-shaped reflector were applied on the test target below the print. The test target is a flat copy of the Global Vehicle Target as applied in the Euro NCAP test protocol. 5 out of 6 vehicles properly detect this test target (80% or higher). Only test vehicle 6 obtains a lower score (40%).
The prism-shaped reflector from the test target was also tested separately. It is properly detected by test vehicles 4 and 6, and barely by the other test vehicles.
Please note: test vehicle 5 stopped the tests after 3 laps because the AEBS system stopped working. The vehicle probably switched off the AEBS after detecting that the AEBS was activated unusually often that day.

4 Conclusions en recommendations

4.1 Segmented Conclusions different Test Vehicles

From the tests, we can conclude that the AEBS systems warned the driver of an object on the traffic lane in almost half of the cases. There is, however, a great diversity of outcomes for which we cannot find a clear explanation.
The table below shows the scores for the various tests per test vehicle.

Truck Brand	Total Number of Tests	Number of Times Detected	Total per Brand
Test vehicle 1	75	30	40%
Test vehicle 2	72	43	60%
Test vehicle 3	74	43	58%
Test vehicle 4	75	36	48%
Test vehicle 5	66	24	36%
Test vehicle 6	75	27	36%
Total of all brands	**437**	**203**	**46%**

Table 9 – Results of all test drives per truck brand.

These results are partly influenced by the different objects that were also tested. If we only look at the results of the trucks that are commonly used in traffic, the results are as follows:

Truck Brand	Total Number of Tests	Number of Times Detected	Total per Brand
Test vehicle 1	40	12	30%
Test vehicle 2	38	26	68%
Test vehicle 3	39	26	67%
Test vehicle 4	40	13	33%
Test vehicle 5	37	19	51%
Test vehicle 6	40	17	43%
Total of All Brands	**234**	**113**	**48%**

Table 10 – Results of all test drives per truck brand.

Table 10 shows the test results per test vehicle for the tests: tilt semi-trailer (with and without a forklift), container truck (with and without container), tank truck, road tractor, flatbed trailer and collision absorber. The end result for all brands together does not differ much from the results of all tests (see Table 9), but you can now see that some brands respond better to these trucks than to the other objects. Test vehicle 5, for instance, scores 51% now while for all test objects combined, this score was only 36%.
In contrast, with 33%, test vehicle 4 obtains a lower score compared to the 48% if all test objects are included.

4.1.1 Segmented Conclusions tested trucks en objects

We can conclude that the different trucks are better detected by the AEBS system than the traffic control measures tested earlier this year.
Test vehicles 2 and 3 scored relatively high during the test with 60% and 58%. Test vehicles 1, 5 and 6 scored around 40%, and with 48% testvehicle 4 scored in the middle of the ranking.

What is also striking is the difference in score for 'comparable' objects. In the test with the tilt semi-trailer with and without a forklift, for instance, the vehicles score almost 80%, the collision absorber scores 68%, the tank truck 60%, while the container only scores 31%. The separate road tractor (30%), the container truck without container and the flatbed trailer (both 21%) score low.

If we look at the other objects that were tested, it stands out that the test target is well detected with a score of 81%. The mobile road sign and the delineator score significantly lower with 37 and 39% respectively.

The conclusion is while the tested vehicles with AEBS often detect the objects, they also often fail to do so. The information available to us does not provide us with a logical explanation as to why there are differences between vehicles and between the tested objects.

4.1.2 Final Conclusion Relating to the FWC and AEBS Used

In more than half of the cases, the FWC and AEBS in trucks do not warn the driver within the safe swerving distances used in the tests. This swerving distance was used to prevent vehicles from (the risk of) colliding with the placed object. In principle, it is possible that the vehicles that did not issue a warning within the applicable 50-metre swerving distance would nevertheless have issued a warning and activated a braking action at a later time. However, it seems unlikely that at this speed the emergency stop would have fully avoided a collision.
The regulations for type approval requirements for advanced emergency systems on trucks (Regulations (EU) No. 347/2012 and (EU) 2015/562) are aimed at preventing collisions between trucks and passenger cars or reducing their severity[4]. In other words, no requirements for the detection of objects other than standard sedan passenger cars, such as trucks or traffic control measures, are imposed. The systems may therefore have been developed to detect only passenger cars. This may explain the fact that many trucks and traffic control measures are not or rarely detected.

In assessing the performance of AEBS and emergency braking systems, due consideration must be provided to the fact that an unjustified emergency intervention can also result in severe accidents due to the traffic coming from behind. Therefore, manufacturers configure the systems ‘cautiously’.

[4] R131.00 en 01.uit: https://www.unece.org/trans/main/wp29/wp29regs121-140.html see also EuroNCAP testprotocol AEB systems v1.1 June 2015

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4.2 Recommendations and discussion

The test raises a few additional questions. Why is an object detected by one test vehicle and not by the other test vehicle? Why does a test vehicle detect a delineator but not a tank truck? What is the influence of the response on three consecutive objects?

The test set-up was chosen in such a manner that the system does not actually intervene. Therefore, we cannot verify whether AEBS actually intervenes sufficiently to avoid a collision. We were, however, able to verify whether FCW, the warning system, works within the test conditions we used (up to 50 metres before the test object).

During the test set-up used, three test objects were tested in a single lap. It is possible that one or more test vehicles present an insensitivity period immediately after the occurrence of the FCW warning of the first test, as a result of which the consecutive warnings are not issued. This would mean that for those vehicles the second and third tests of a lap, no warning would be issued. The analysis of the results found shows that this is not disproportionately common in the various test vehicles. The data therefore give no reason to assume this; however, we cannot exclude it either.

It is advisable to consult with importers and manufacturers of vehicles and the AEBS system. Insight into the functioning of the various systems and answers to the above questions can lead to targeted measures in a joint approach to further increase the quality and reliability of the AEBS system. This action is feasible in the short term and can contribute to improving road safety within a few years.

Appendices

A1 Script for 19 December Test Day

A2 Log for Recording Test Results

Praktische informatie

- De test heeft als doel om te onderzoeken in hoeverre verschillende typen vrachtwagens gedetecteerd worden door AEBS-systemen in vrachtauto's.
- We testen of de AEBS op tijd een waarschuwingssignaal geeft, maar testen niet of het voertuig daadwerkelijk remt voor het testobject, vanuit veiligheidsoverwegingen.
- De test vindt plaats op dinsdag 19 december op de testbaan van de politieacademie in Lelystad (Eendenweg 12, Lelystad).
- We verzamelen om 8:00 voor de briefing in één van de lokalen.
- Naar verwachting is de testdag rond 17:00 afgelopen.
- Voor een lunch wordt gezorgd.
- Deelnemers en toeschouwers kunnen zich melden aan de poort.
- Toeschouwers die later op de dag aankomen kunnen zich melden bij de poort. Als ze op het terrein zijn kunnen ze bellen met Jan van Hattem (0646732271) die ze verder naar het testterrein zal begeleiden.

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Programma

Tijd Activiteit

- 08.00 Start briefing door Jan van Hattem en Evert Klem
- 09:00 voertuigen naar opstelruimte op testbaan
- 09.30 eerste test (zie schema volgende pagina)
- 10:15 wisselen testobjecten ronde 2
- 10:45 tweede test (zie schema volgende pagina)
- 11.30 wisselen testobjecten ronde 3
- 12:00 lunch
- 13:00 derde test (zie schema volgende pagina)
- 13:45 wisselen testobjecten ronde 4
- 14:15 vierde test (zie schema volgende pagina)
- 15:00 wisselen testobjecten ronde 5
- 15:30 vijfde test (zie schema volgende pagina)
- 16:15 afronden en afbreken
- 16.30 ervaringen delen, nabespreking
- 17:00 einde sessie

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Testschema

Testsessie	Testobject 1	Testobject 2	Testobject 3	Test-nummer	Voertuig 1	Voertuig 2	Voertuig 3
Sessie 1 9:30 – 10:15	Huifwagen met kooiaap	Container-wagen met container	Personen-auto 1	1.1	DAF	Scania	Volvo
				1.2	Mercedes	MAN	Iveco
Sessie 2 10:45-11:30	Huifwagen	Containerwa-gen zonder container	Personen-auto 2	2.1	DAF	Scania	Volvo
				2.2	Mercedes	MAN	Iveco
Sessie 3 13:00-13:45	Tankwagen	Trekker	TNO-perso-nenauto (omgedraaid)	3.1	DAF	Scania	Volvo
				3.2	Mercedes	MAN	Iveco
Sessie 4 14:15-15:00	Botsabsorber	Dieplader	Motor	4.1	DAF	Scania	Volvo
				4.2	Mercedes	MAN	Iveco
Sessie 5 15:30-16:15	Radarschild	Moshon Data Reflectorpaal	Moshon Data Slab Foam Target	5.1	DAF	Scania	Volvo
				5.2	Mercedes	MAN	Iveco

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Testschema

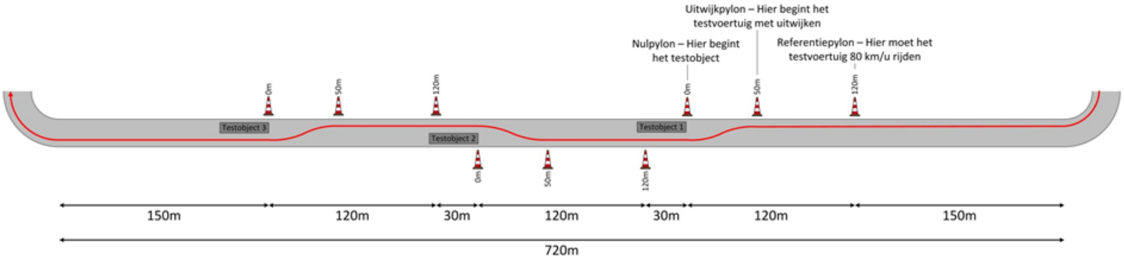
- Een testsessie bestaat uit 5 rondes waarbij de drie voertuigen op ruime afstand van elkaar rijden. De voertuigen vertrekken 50 seconden na elkaar om geen last van elkaar te hebben.
- Na de test stellen de drie voertuigen op opstelterrein op en de volgende drie voertuigen vertrekken. De test herhaalt zich met de andere voertuigen.

- Het testvoertuig rijdt stabiel met 80 km/u op het testobject af, en rijdt door tot de laatste pylon voor het testobject (op 50m). Daar stuurt de chauffeur het voertuig veilig langs het testobject. Dit gebeurt drie keer per ronde, en dan remt het voertuig af voor de bocht.
- De bijrijder noteert of het voertuig stabiel 80 km/u reed, en of de AEBS vóór het uitvoegen een waarschuwingssignaal gegeven heeft.

Testopstelling - tests

Opstelling zoals in onderstaand schema:

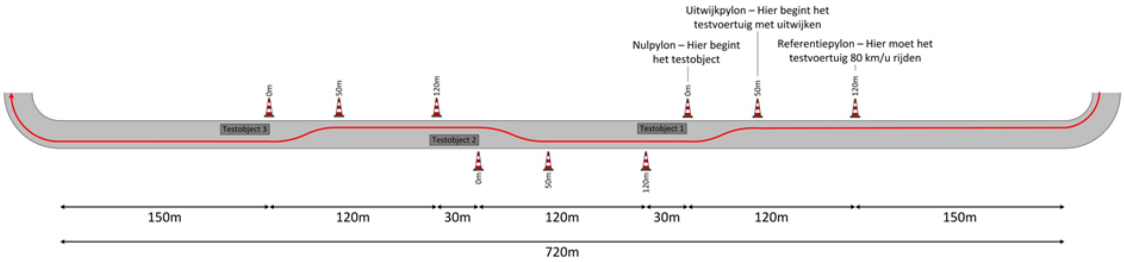
- Nadat testvoertuig bocht uitkomt is 150m beschikbaar om stabiel 80 km/u te rijden. Ter hoogte van pylon '120m' moet testvoertuig dus 80 km/u rijden. De observant controleert dit, anders wordt de test afgekeurd.
- De chauffeur rijdt door tot de pylon op 50m vóór het testobject. Dan wijkt hij uit naar de andere zijde van de rijbaan.
- Geregistreerd wordt of de AEBS een waarschuwingssignaal geeft.
- Vrachtwagen rijdt door tot pylon die 120m voor tweede testobject staat en het proces herhaalt zich, en evenzo voor testopstelling 3.
- Dan heeft de chauffeur nog 150m beschikbaar om af te remmen en veilig de bocht in te sturen.



Testopstelling – tests (2)

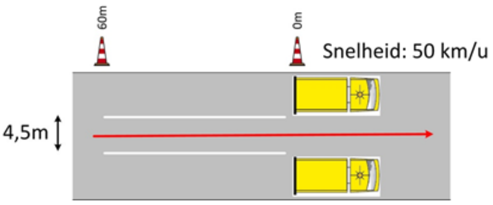
- Per test zijn er drie voertuigen op de baan, die 50 seconden na elkaar vertrekken. Zo rijden ze op veilige afstand van elkaar.
- Alle voertuigen rijden vijf ronden.
- Na vijfronden wisselen de voertuigen, observanten stappen over in volgende voertuig
- Als alle voertuigen geweest zijn wisselen de testobjecten.

- Tijdens de test wordt op testlocatie 1 permanent een Semtech LeddarTech-apparaat geplaatst. Hiermee kan in kaart gebracht worden hoe dichtbij de vrachtwagens komen.



Tijdens eerste test

- Tijdens eerste test met personenauto's worden na de bocht twee voertuigen opgesteld met 4,5m tussenruimte. Hier moeten alle vrachtwagens tussendoor met een snelheid van 50 km/u.
- 60m vóór de twee personenauto's, ter hoogte van de eerste pylon, moet het testvoertuig constant 50 km/u rijden.
- Het AEBS-systeem mag geen melding geven en niet ingrijpen. Of dit gebeurt wordt door de bijrijder genoteerd.



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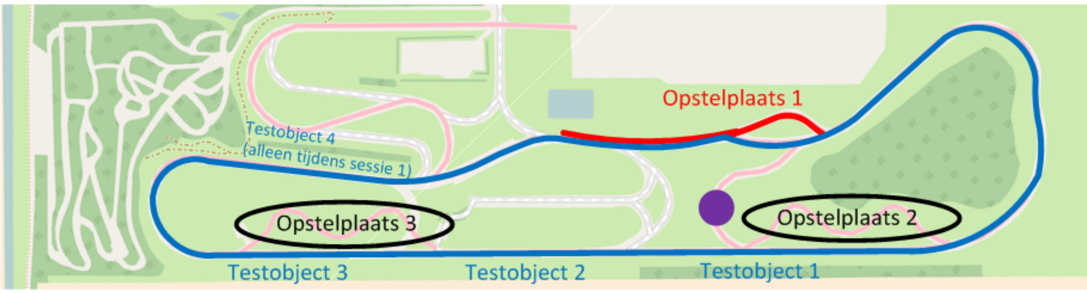
Testopstelling - bovenaanzicht

- Voertuigen stellen op in rode gebied.
- Testende voertuigen rijden blauwe ronde, vijf keer. Rondetijd is ongeveer 2:30 minuten
- Observanten staan op de heuvel, aangegeven in paars
- Testobjecten die niet getest worden, worden in de zwart omcirkelde gebieden opgesteld.



Route testvoertuigen
Opstelvak testvoertuigen
Observatieplek
Opstelvak testobjecten

Veiligheid

- Evert Klem is testleider.
- Testleider heeft overzicht vanaf heuvel op testopstellingen en opstelterreinen
- Elk voertuig heeft een portofoon, evenals de mensen die de testopstellingen beheren.
- Elke aanwezige draagt een reflecterend jas/hesje, te verkrijgen bij Jan van Hattem
- Elke aanwezige heeft de plicht onveilige situaties te melden aan de testleiding
- Als de testen bezig zijn verzamelt iedereen die niet in een voertuig zit op de observatieheuvel, op het opstelterrein of op veilige afstand van het circuit.
- Voordat de voertuigen het circuit opgaan controleert Evert of de baan vrij is.
- Elk voertuig wordt bestuurd door een bestuurder die als enige taak heeft op de testobjecten af te rijden en ter hoogte van de uitwijk-pylon uit te wijken. Loggen of AEBS werkt wordt door een bijrijder gedaan, die ook het portoverkeer voor zijn rekening neemt. Als back-up en ter controle nadien wordt elk voertuig uitgerust met een GoPro-camera.
- Op de baan zijn EHBO'ers en BHV'ers aanwezig. Bij een incident of calamiteit wordt dit gemeld aan testleider Evert.

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Veiligheid – checks vooraf en tijdens test

- Deelnemende trucks:
  - vooraf: controle werking AEBS systeem (geen storingslampje)
  - controle banden op inrijdingen/ beschadigingen
  - rondlopen voertuig op algemene zaken
- Chauffeurs:
  - Of zij bekend zijn met deze truck, de manier van waarschuwen kennen, weten hoe waarschuwingssignalen uit te zetten zijn (niet toepassen!), Weten hoe een noodremingreep overruled kan worden
  - verplicht gebruik gordel
- Op te stellen objecten:
  - check op breedte en exacte locatie i.v.m. ontwijken door trucks.
- Baan-, weersomstandigheden:
  - baanconditie: stroefheid, nat, sneeuw
  - Mogelijke maatregelen: lagere testsnelheid bijvoorbeeld 60km/u
  - Weersomstandigheden: zware neerslag, mist of andere zicht belemmering
- Bijrijders:
  - Eén bijrijder per truck
  - Gordel verplicht
  - Duidelijkheid over rol bijrijders: contact met testleiding, controle of valide meting, noteren resultaat, check veilige uitvoering proef
- Deelnemers:
  - Veiligheidshesje aan
  - Veilige positie tijdens testen. Communiceren positie aan testleider
  - Melden issues, ook melden toilet/koffiebezoek.
  - Verlaten en binnenkomen testterrein in een voertuig
  - Geen personen in of om de opgestelde voertuigen tijdens de test

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Rolverdeling en belangrijke telefoonnummers

Wie	Rol	Locatie	Telefoonnummer
Evert Klem	Testleider	Heuvel	0652018713
Jan van Hattem	Co-testleider	Heuvel	0646732271
Jan Nieuwelink	Co-testleider	Heuvel	0643032931
Mark Gorter	Bijrijder/testobjecten plaatsen	Opstelplaats Testobjecten	0629498548
Mathijs Huisman	Bijrijder/testobjecten plaatsen	Voertuigen	0630176765
Jelmer Droogsma	Bijrijder	Voertuigen	0683660367
Niels Barten	Bijrijder	Voertuigen	0657833718
Medewerkers Van Deuveren	Chauffeurs Vrachtwagens	Voertuigen	

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Logboek resultaten test AEBS Sessie 1

Observant: ....

		Huifwagen met Kooiaap		Containerwagen met container		Personenauto 1	
		Test valide?	AEBS-melding?	Test valide?	AEBS-melding?	Test valide?	AEBS-melding?
1.1	DAF						
1.1	Scania						
1.1	Volvo						
1.2	Mercedes						
1.2	MAN						
1.2	Iveco						

Ruimte voor opmerkingen: