2020 EUDARTS SLOVENIA

After the CrashCube project, the interest remained high and the amount of new developed technologies increased.

March 2014 we founded

D A R T S

***D**ATA **A**NALYSIS **R**ESEARCH **T**RAINING **S**ERVICES*

ASDARTS & TRDARTS

We started with two partners:

ASDARTS

Automotive Support in Germany

- Hard & software -

TRDARTS

Training & Research in the Netherlands

-European Training-

From the start, the interest of police, public and private scientists were high and they requested the establishment of a partner group.

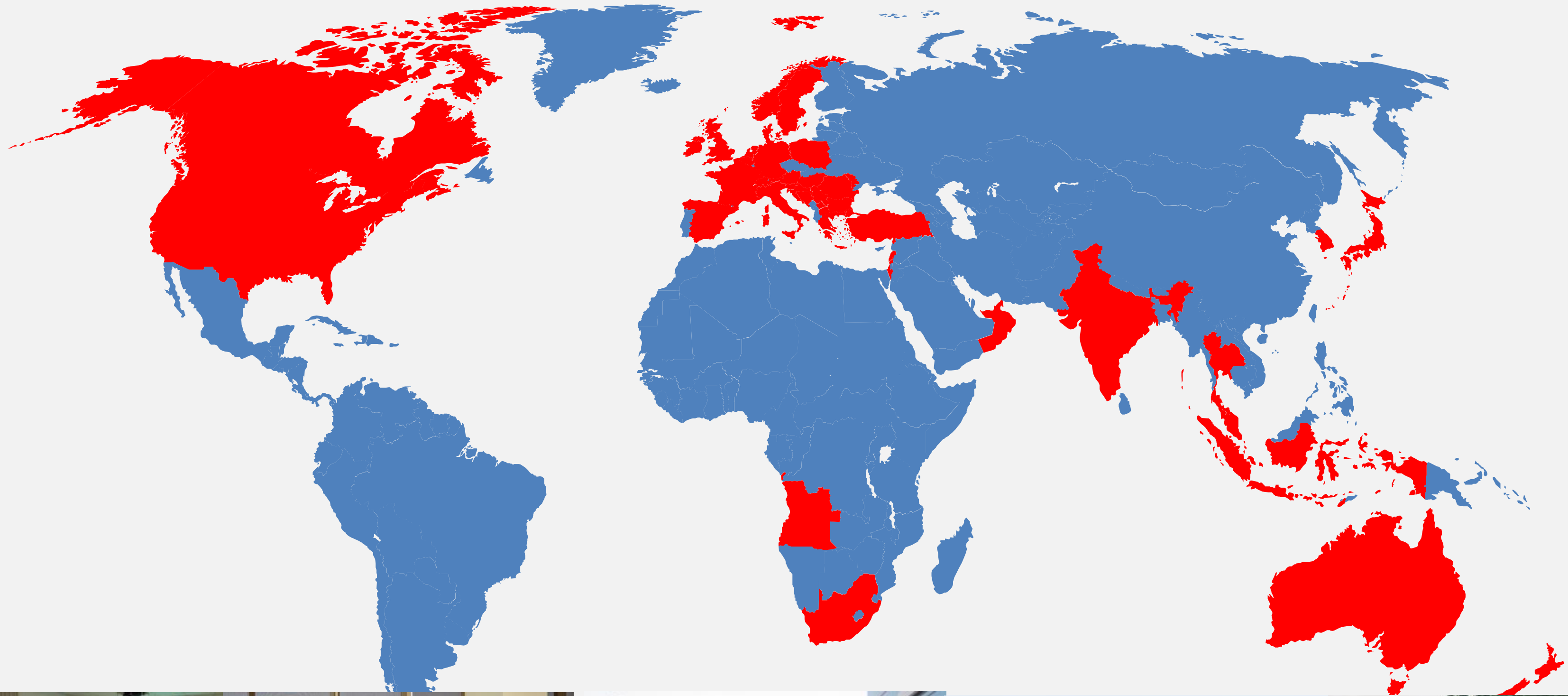
That's why we setup the

EUDARTS GROUP

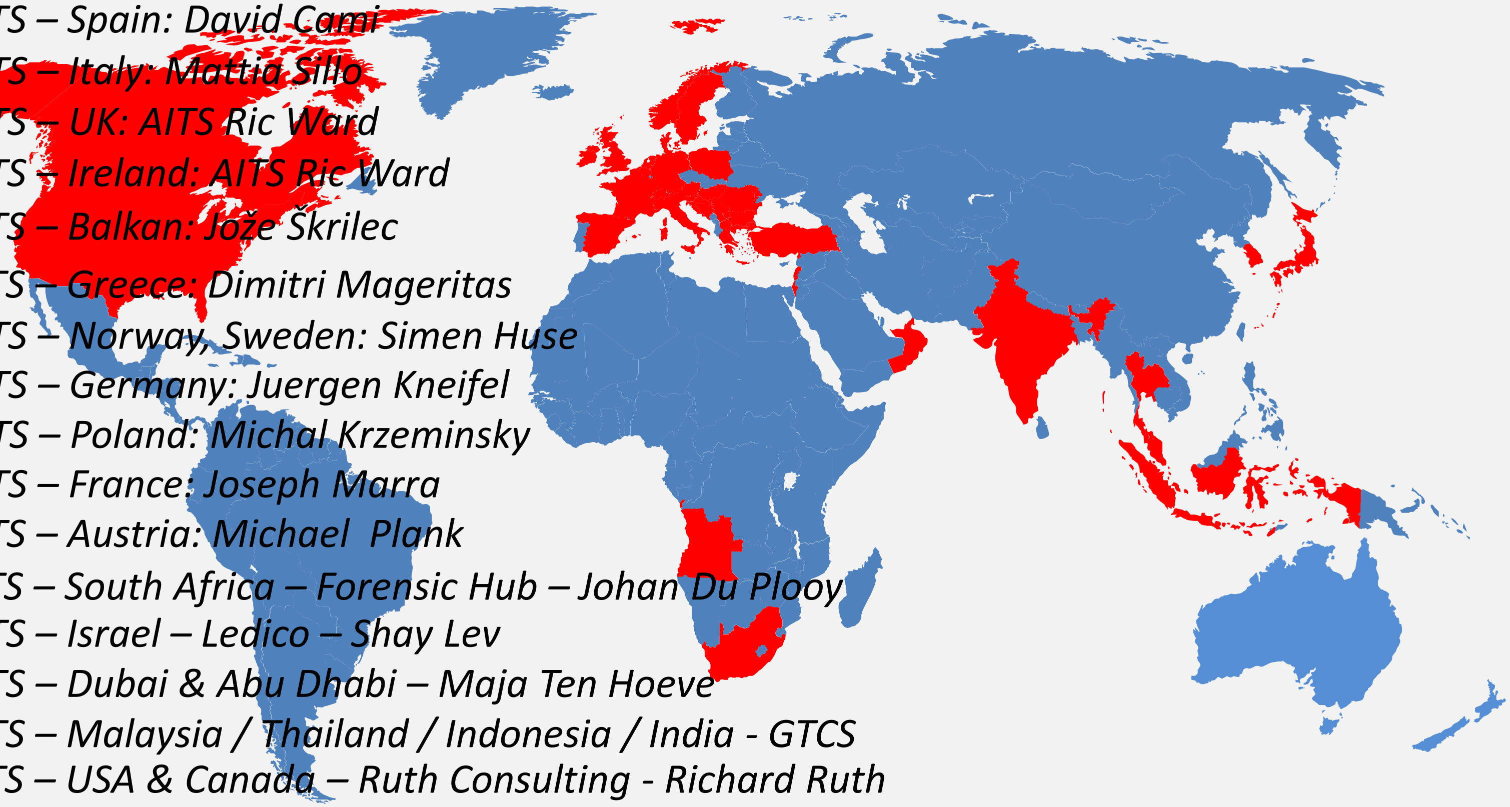
a European Network of trainers-members-followers-students

January 2020: 1.943 members and still growing.

EUDARTS GROUP Worldwide



EUDARTS GROUP Worldwide



NLDARTS – Netherlands & Belgium: Jeroen van Essen
SPDARTS – Spain: David Cami
ITDARTS – Italy: Mattia Sillo
UKDARTS – UK: AITS Ric Ward
IRDARTS – Ireland: AITS Ric Ward
SLDARTS – Balkan: Jože Škrilec
GRDARTS – Greece: Dimitri Mageritas
NODARTS – Norway, Sweden: Simen Huse
GEDARTS – Germany: Juergen Kneifel
PLDARTS – Poland: Michal Krzeminsky
FADARTS – France: Joseph Marra
AUDARTS – Austria: Michael Plank
SADARTS – South Africa – Forensic Hub – Johan Du Plooy
ILDARTS – Israel – Ledico – Shay Lev
AEDARTS – Dubai & Abu Dhabi – Maja Ten Hoeve
ASIADARTS – Malaysia / Thailand / Indonesia / India - GTCS
USDARTS – USA & Canada – Ruth Consulting - Richard Ruth

DARTS GROUP

EDR HISTORY EUROPE

***2011.01.26**: TRAN committee (presentation)*

***2011.03.03**: Draft by Hans Bot, Cristian van Glasner and Ralf Roland Schmidt Gotta.*

***2011.04.01**: Amendment by Germany – Dr. Koch*

***2011.09.26**: EP plenary sitting. (discussion)*

VIDEO

***2011.09.27**: EP plenary sitting (voting)*

***2012.01.01**: DG Move – preparation*

***2012.01.01**:TISPOL Report to DG MOVE*

***2013.00.00:** TRL London – research*

***2014.06.05:** Stakeholders meeting – Brussels*

***2014.10.00:** Final report TRL to DG Move / Enterprises*

DARTS GROUP

EDR POSITION

In 2015 the New European Commissioner for Transport Violeta Bulc made EDR a priority for road safety.
July 2016: the Motor Vehicle Working Group (MVWG) presented the final version of the list discussed in the MVWG.
2017: Organizations active in the field of Consumers (ANWB, ADAC, FIA), safety (ETSC), traffic casualties (FEVR), traffic police (TISPOL) and insurers are in favor to equip vehicles with EDR.
2017: The European Automobile Manufacturers Association (ACEA) supports the inclusion of EDR in the General Safety Regulation.

DARTS GROUP

EDR SUPPORT TODAY

The unofficially called General Safety Regulation has been published as regulation (EU)2019/2144 in the Official Journal of the EU L325 on 16 December 2019. According to article 20, the Regulation will enter into force the 20th day after the publication.

That means that from the 5th of January 2020 the Regulation is directly applicable to all citizens and enterprises in the EU as European law. The regulation will require the equipment of ADAS systems, pedestrian protection and Event Data Recorders (EDR) in new motor vehicles.

EDR SUPPORT TODAY

The regulation has foreseen a number of transition periods. The first phase including EDR will enter into force for new type-approvals from 6 July 2022 and for new registrations from 7 July 2024 as far as passenger cars and vans concerned.
For trucks and buses, these dates are 7 January 2026 and 7 January 2029.

For the second phase, applicable to advanced emergency braking for pedestrian and cyclist and for advanced driver distraction warning systems, the dates are 7 July 2024 resp. 7 July 2026 for all categories. The technical requirements for EDR and the different ADAS systems will be published later by the European Commission in a so-called delegated act.

Article 6 of the Regulation stipulates that these technical requirements have to be ready 15 months before the first application date, which is 7 April 2021.

The technical requirements for EDR are at this moment prepared by an informal working group at the UNECE World Forum for Harmonization of Vehicle Regulations (WP.29).

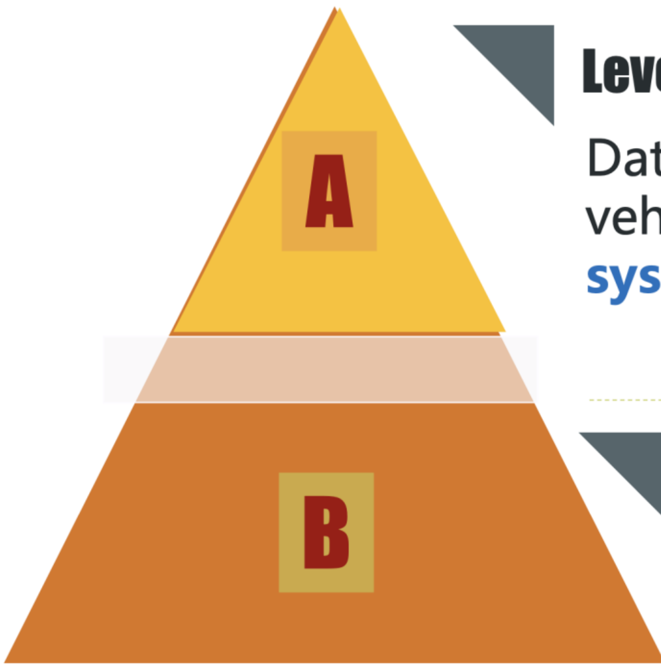
The European Commission, as well as the authorities from many countries, including EU Member States, the USA, China, Japan, NGO’s and Manufacturers, participate in this working group.

EDR SUPPORT TODAY

The aim is that the draft requirements are ready for adoption by WP29 in November 2020. That would allow adoption as a delegated act by the European Commission, before the date required by the regulation (April 2021).

To achieve this schedule and avoid a delay in the introduction of EDR, the working group is discussing a two-phase introduction of EDR: in 2022 a first phase based on the current US requirements plus some easy to agree on amendments and the second phase with all parameters for ADAS systems in 2025.

EDR CHINA TODAY



Level A (17)

Data that shall be recorded when vehicles are **equipped with EDR system**.

Level B (43)

Relevant data that should be recorded when **vehicles with EDR system** are **equipped with relevant devices** or **have relevant functions.**

DARTS GROUP

EDR CHINA TODAY

A

Level A Data Element

Lateral delta-V	Maximum Recorded Lateral delta-V	Time to Maximum Recorded delta-V
Clipping Flag	Vehicle Velocity	Service brake, on or off
Acceleration pedal position%	Revolution per minute	Driver seatbelt status
Power-on cycle at event	Power-on cycle at retrieving	Complete status of event data record
Time interval from this event to the last event	VIN	
ECU hardware number that records EDR data	ECU software number that records EDR data	ECU serial number that records EDR data

DARTS GROUP

EDR CHINA TODAY

B

Level B Data Element

Working status and event status

- Longitudinal acceleration
- Lateral acceleration
- Lateral delta-V
- Maximum Recorded Lateral delta-V
- Square of Maximum Recorded Resultant delta-V
- Time to Maximum Recorded delta-V lateral
- Time to Maximum Recorded delta-V, Resultant
- Tend
- Pre-event synchronization timing time
- Yaw Angle Velocity
- Steering Angle
- Steering Lamp Status
- Gear Position
- Engine Throttle Position
- Brake Pedal Position
- Parking System Status
- Occupant Protection System Warning Status
- Tire Pressure Monitoring System Warning Status
- Braking System Warning Status

Restraint system

- Driver's seat belt pretensioner Deployment time
- Driver's front airbag Deployment time (phase I)
- Driver's front airbag Deployment time (phase II)
- Driver's side airbag Deployment time
- Driver's side air curtain Deployment time
- Front-row passenger seat belt Status
- Front-row passenger seat belt pretensioner Deployment time
- Front-row passenger 's front airbag suppression status
- Front-row passenger 's front airbag Deployment time(phase I)
- Front-row passenger 's front airbag Deployment time (phase II)
- Front-row passenger's side airbag Deployment time
- Front-row passenger's side air curtain Deployment time

Active system

- Cruise Control system status
- Adaptive Cruise Control system status
- Anti-brake system status
- AEB status
- Electronic stability control system status
- Traction control system status

Time

- Year
- Month
- Day
- Hour
- Minute
- Second

DATA RECORD FUNCTION REQUIREMENTS

Storage media and storage frequency requirements

- Non-volatile storage medium
- At least **3** times of impact event data.

Storage coverage mechanism requirements

- **Unlocked event** data should be overwritten by subsequent un-locked event data, in chronological order.
- **Locked event** data should not be overwritten by data from subsequent events.
- **For unlocked events**, the manufacturer is allowed to set other storage coverage mechanisms.

Power-off storage requirements

- data **before T_0 and after T_0 to (150±10) ms** should be recorded.

EDR EUROPE TODAY

Consolidated TRL list with all attributes suggested by participants. Chairman Europe: Status is that there is agreement on the first 47 attributes, let's say the USA version ... USA also doesn't want anything at all, so that will lead to difficult negotiations.

Every attribute must be provided with good argumentation and proof why this attribute is needed (that is the attitude of the USA). In March in Washington we have to make good meters, so that it can go to GRSG and WP.29 for the rest of the year.

EDR SUPPORT TODAY

*The Commission proposal is entirely focused on obtaining data for **scientific research**.*

We are involved to rewrite this section of the proposal in comité GRSG comité WP29.
Other comments you can find on www.eudarts-group.com.

The rest of the world is also busy

SITUATION NORTH AMERICA

SITUATION JAPAN

EUDARTS MOTORCYCLES

On our site we placed a call for participation to realize a position paper intended to inform the parliamentary debate with a clear and comprehensive overview of the technical development and implementation of EDR devices not only in cars and commercial transport vehicles buts also in

***motorcycles*.**

EUDARTS MOTORCYCLES

Most modern vehicles and some bikes have comprehensive event data recorders. Some already record speed, throttle position, lean angles, brake application, revs, and gear changes.

Kawasaki

Event Data Recorder

In common with many other vehicle manufacturers, Kawasaki has equipped this motorcycle with an event data recorder (EDR). The purpose of this device is to record data that assists with understanding of how some of the vehicle's systems were performing during a short period of time immediately before and during an accident or

HONDA

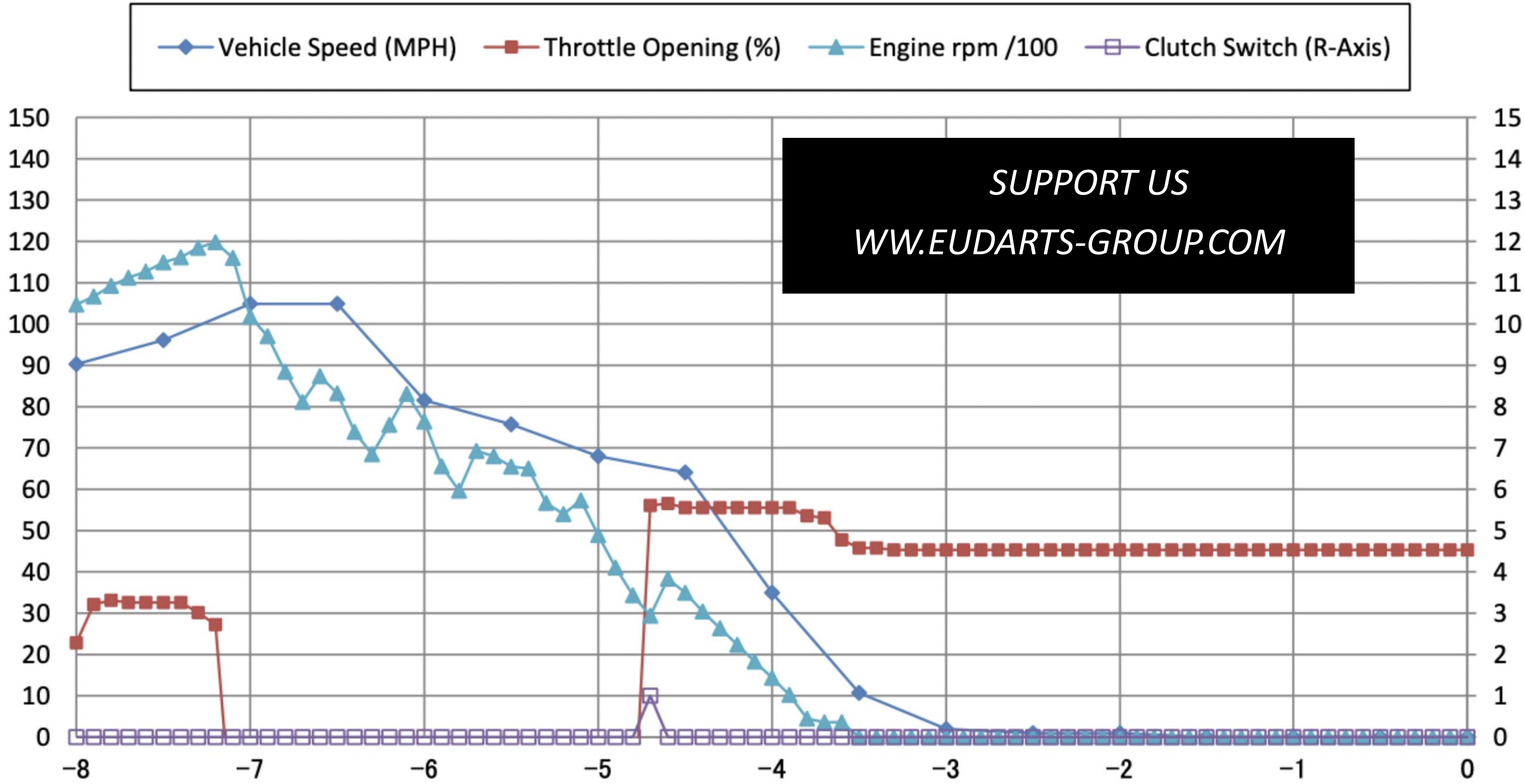
GL1800DA

Event Data Recorders

Your motorcycle is equipped with one or more devices commonly referred to as event data recorders.
These devices record airbag deployment data, and the failure of any airbag system component.

This data belongs to the vehicle owner and may not be accessed by anyone else except as legally required or with the permission of the vehicle owner.

DATA KAWASAKY MOTORCYCLE



SUPPORT US

WW.EUDARTS-GROUP.COM

EDR SUPPORT TODAY

To early?

No, some car manufacturers has already activate their EDR.

US – BRANDS in EUROPE

DARTS GROUP

EUROPEAN ACTIVATION

EUROPEAN ACTIVATION

We know that Mercedes, Mazda and Nissan in Europe have an EDR. With CDR we already read their DID (Digital Identity Data). We asked the OEM's at the Bosch Stakeholder meeting in the US to make some of them active (step by step).

EUROPEAN ACTIVATION

Ventures vehicles with EDR's in Europe

TPCA is joint venture between Toyota Motor Corporation of Japan and PSA Peugeot Citroën of France.

These models have activated EDR's and are readable with Bosch CDR. Past year we downloaded the data from these type of cars and the results were good and reliable.

EUROPEAN ACTIVATION

2018

TESLA

Not with Bosch but with their own hard & software Tesla made their EDR public.
EUDARTS is official servicing this technology in Europe.

EUROPEAN ACTIVATION

- What coverage/years and models?
  - The Roadster (2008-2012) will **not** be supported
  - 2012 and newer Model S
  - 2016 and newer Model X
  - 2017 and newer Model 3
  - Covers all years for the S, X production started in 2015
  - The system is designed for North America only and some translated elements may not be correct in other markets

ARE WE READY?

ADAS *EDR*

- *Adaptive cruise control (ACC)*
- *Adaptive high beam*
- *Alcohol ignition interlock*
- *Glare-free high beam and pixel light*
- *Adaptive light control: swiveling curve lights*
- *Automatic parking*
- *Automotive navigation system*
- *Automotive night vision*
- *Blind spot monitor*
- *Collision avoidance system (Pre-crash system) Crosswind stabilization*
- *Cruise control*
- *Driver drowsiness detection*
- *Driver Monitoring System*
- *Electric vehicle warning sounds used in*
- *hybrids and plug-in electric vehicles*
- *Emergency driver assistant*
- *Forward Collision Warning*
- *Intersection assistant*
- *Hill descent control*
- *Intelligent speed adaptation or intelligent speed advice (ISA)*
- *Lane departure warning system*
- *Lane change assistance*
- *Parking sensor*
- *Pedestrian protection system*
- *Rain sensor*
- *Surround View system*
- *Traffic sign recognition*
- *Turning assistant*
- *Vehicular communication systems*
- *Wrong-way driving warning*

ADAS EDR (ADS)

Vehicles should record, at a minimum, all available information relevant to the crash, so that the circumstances of the crash can be reconstructed. These data should also contain the status of the ADS and whether the ADS or the human driver was in control of the vehicle leading up to, during, and immediately following a crash. Entities should have the technical and legal capability to share with government authorities the relevant recorded information as necessary for crash reconstruction purposes. NHTSA will continue working with SAE International to begin the work necessary to establish uniform data elements for ADS crash reconstruction.

SAE USA

DARTS GROUP

ADAS EDR

When something went wrong?

Who's responsible?

The Driver, The Manufacturer or The Government

'Sigh of relief' for self-driving cars after Tesla cleared

January 20, 2017 @ 9:14 am Alan Levin and Ryan Beene Bloomberg

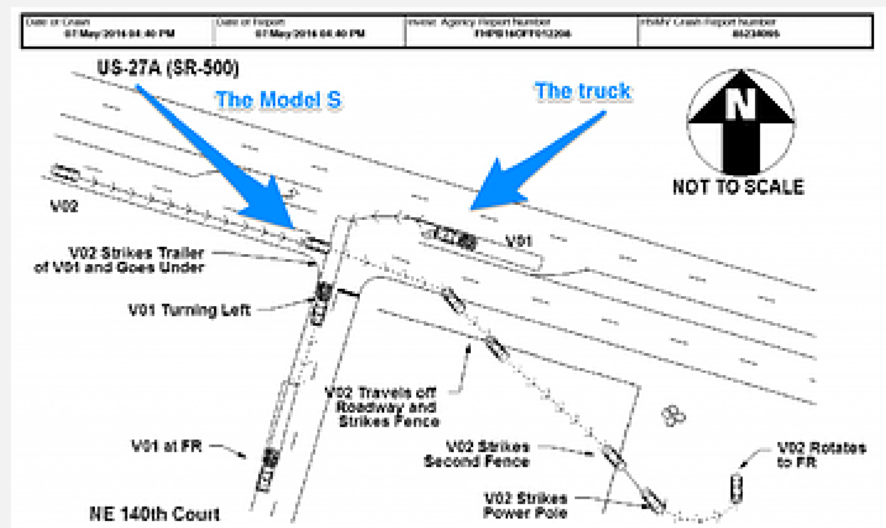
WASHINGTON -- The push to bring self-driving cars to American roads got a significant boost on Thursday when the nation's chief auto safety regulator essentially cleared Tesla Motors Inc.'s Autopilot system of fault in a fatal 2016 crash.
The U.S. National Highway Traffic Safety Administration found that the owner of a Tesla Motors Inc. Model S sedan that drove itself into the side of a truck in May had ignored the manufacturer's warnings to maintain control even while using the driver-assist function.
The agency said it found no defect in the vehicle and wouldn't issue a recall.
"The auto industry just let out a giant sigh of relief," said Dave Sullivan, an analyst at consultancy AutoPacific Inc. "This could have started a snowball effect of letting automakers and suppliers become liable for human error."

The responsibility of a government is evidenced by the following research published in 2017 by the NATIONAL TRANSPORTATION SAFETY BOARD.

DARTS GROUP

ADAS EDR

The NTSB has published their report on an accident between an autonomous Tesla and a truck.



One of the conclusions is that the auto pilot continued to work under conditions that he could not detect properly.

The government must make legislation for automobile vehicles, which limits autonomous driving to the circumstances for which it was designed.

The summary of 4 pages and all technical reports on

www.eudarts-group.com

VOA FUTURE

So the future statement of a suspect will be:

MY CAR IS HACKED

*Can you hack a car: **YES***

*Can we find evidence of this? **No***

HACKING PROJECT

DARTS GROUP

TAKE OVER

International Security Program

Indexing, initiating, updating and repairing

HACK SENSITIVE

infrastructural and special locations, future automotive applications and present communications.

Expected start date:

1st of July 2020

Expected end date:

1st of July 2023

TAKE OVER

Project participants:

Hans Erik Kraan, Networks.
Hans Bot, EUDARTS
Lucien van Linden, Gaming Support
Henny de Valk, The Falcon Chain
Dick Drent
Jeroen de Rijke, Global S.I. Group
Rijkswaterstaat
City of Rotterdam
Port of Rotterdam Authority
National Police Netherlands and Dubai

2020 CDR TOOLS

The CDR System Starter Kit includes all cables and hardware needed to retrieve crash data from vehicles in Europe through the vehicle's DLC connector [1]. It does not include CDR direct connect cables and adapters required for connecting directly to an ACM or PCM. The CDR System Starter Kit was developed specifically as a low-cost entry to allow for the growing need for police departments, private-practice re-constructionist and insurance agencies to collect the crash data when inspecting vehicles.

2020 CDR TOOLS

2019 CDR UPDATES

ASK FOR A DEMO

2020 CDR TOOLS

Is Bosch the only one:

No, so far Mitsubishi and KIA / Hyundai have their own tool & as mentioned before TESLA

MITSUBISHI

- HEY! ISN'T THIS A BOSCH PRODUCT??
- $6800 THEN $1200/YEAR
- SOME VEHICLES TO 2011
- DLC ONLY

HYUNDAI / KIA

- ARGUABLY THE SECOND MOST POPULAR EDR TOOL!
- $12,000.00 FOR BOTH & $250 EA. / YEAR
- ~ 18 D2M CABLES SO FAR
- MUST PURCHASE BOTH KITS FOR SOFTWARE
- MANY COMMON CABLES
- INTERFACE IS THE SAME! (EXCEPT FOR THE COLOUR)

HYUNDAI

KIA MOTORS

DARTS GROUP

2020 CDR TOOLS

the EDR Retrieval Hardware Kit for Tesla vehicles.

This kit contains all the hardware required to download the Event Data Recorder (EDR) data that may be stored in Tesla Model 3, Model S and Model X vehicles

TESLA

TRAINING EUDARTS

Training

What do you need

Knowledge, skills and expertise are required.

Researchers need training: To image the data is easy, but to analyze the data isn’t a simple "trick".

They need to understand anomalies & faults to explain their road safety studies

They need shared validations or pre-validations by NCAP.

Norway NPRA

The Norwegian Public Roads Administration is seriously considering that the investigators have used a tool that shows errors.

This is also the reason why they immediately stopped using the CrashCube when we became aware of this.

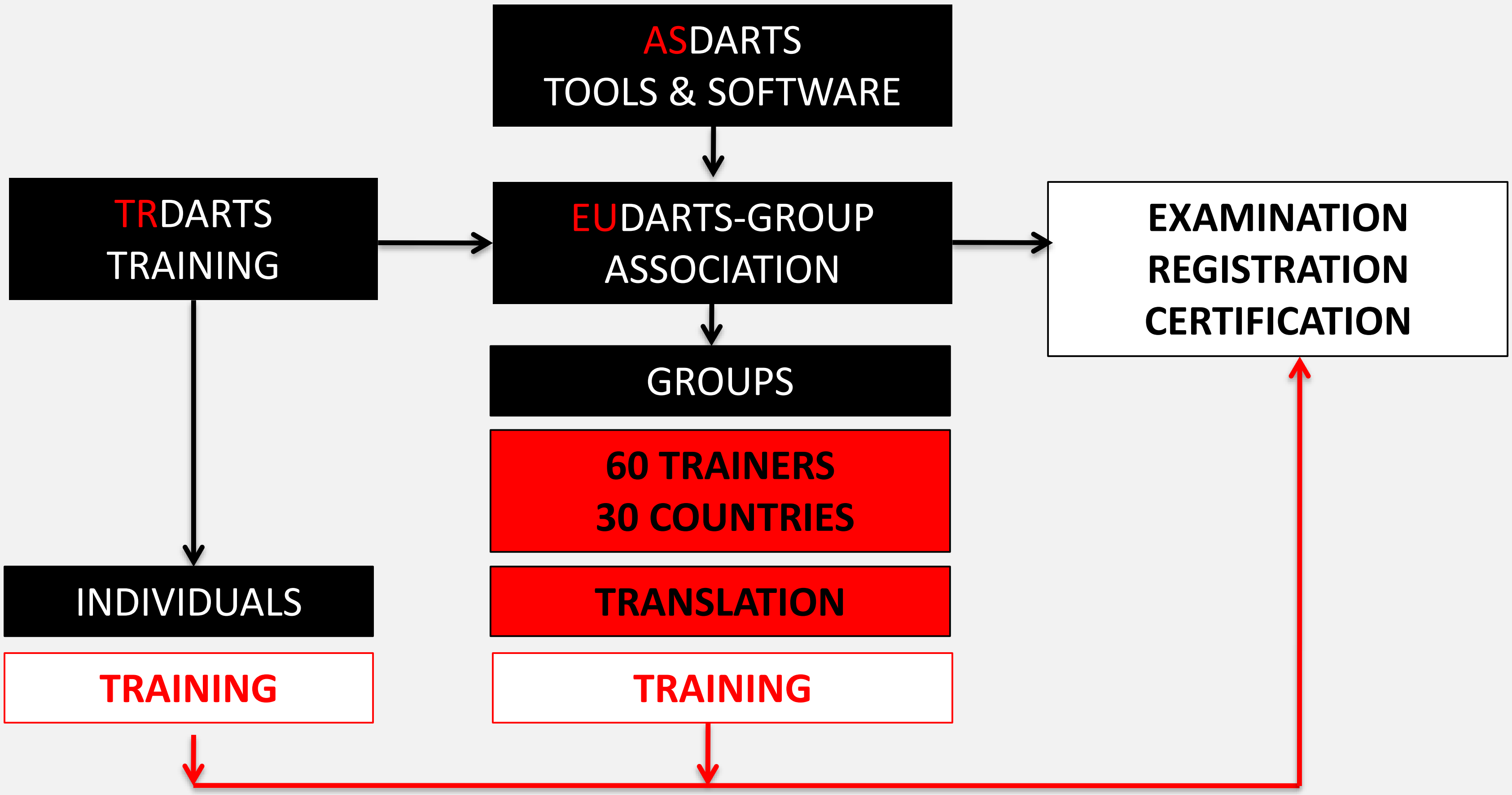
The problem was that the researchers involved were not trained when they used the CrashCube in two cases - they could therefore not recognize the error messages and / or abnormalities.

The NPRA map all accident analysis work reports in 2017 to check whether CrashCube has not been used in various cases

The European CDR training is written specifically with an European application, European validations and European legislation and contains mostly European and some US examples.

A part of the course will give the students the necessary information; to describe the EDR system to European laymen (i.e. client, court, public); to explain the CDR report and collected data in the context of the case or study; to identify any case-critical information and to judge/assess the reliability and accuracy of this information.

EDUCATION STRUCTURE



VALIDATION EUDARTS

2017: With crash test in Slovenia we validate the latest obtained data in Europe.

In the past we organized crash-tests to validate the data from Bosch CDR in cooperation with TNO / CARS / the OEM's / module-suppliers,

Right now we are developing cheaper tests.

We always share the outcomes & reports with our students

VALIDATION PROGRAM

EXAMPLES

EDR CASE

Information retrieved from Crime scene

- 4 deceased
- 1 injured
- Maximum speed: 30 km/h

Information retrieved from the CDR in the Dodge Ram

- Speed 5 seconds before impact
- 147 km/h
- Impact speed: 86 km/h

The driver of the Dodge is guilty

DARTS GROUP

EDR DATA

BOSCH

CDR CRASH DATA RETRIEVAL SYSTEM

IMPORTANT NOTICE: Robert Bosch LLC and the manufacturers whose vehicles are accessible using the CDR System urge end users to use the latest production release of the Crash Data Retrieval system software when viewing, printing or exporting any retrieved data from within the CDR program. Using the latest version of the CDR software is the best way to ensure that retrieved data has been translated using the most current information provided by the manufacturers of the vehicles supported by this product.

CDR File Information

User Entered VIN	1D3HV13T69J506012
User	jeroen van Essen / hans Bot
Case Number	2009 438468-13
EDR Data Imaging Date	woensdag, januari 27 2010
Crash Date	zaterdag, december 26 2009
Filename	DODGE 4-VBH-27 1D3HV13T69J506012 ACM.CDR
Saved on	woensdag, januari 27 2010 at 10:43:05
Collected with CDR version	Crash Data Retrieval Tool 3.4
Reported with CDR version	Crash Data Retrieval Tool 3.4
EDR Device Type	airbag control module
Event(s) recovered	Most Recent Event

Comments

nieuwe uitlezing ivm softwareupdate 3.4

bandenmaat 275 / 60 R20

Data Limitations

AIRBAG CONTROL MODULE (ACM) DATA LIMITATIONS:

DARTS GROUP

Pre-Crash Data (Most Recent Event - table 1 of 5)

(the most recent sampled values are recorded prior to the event)

Time Stamp (sec)	[illegible]	[illegible]	Speed, Vehicle Indicated (MPH [km/h])	Engine Throttle, % Full	Accelerator Pedal, % Full	Raw Manifold Pressure (kPa)	Service Brake	Brake Switch #2 Status	Brake Lamps On
-5,0	[illegible]	[illegible]	[illegible]	9,8	0,0	54	Off	Open	No
-4,9	[illegible]	[illegible]	[illegible]	8,7	0,0	30	Off	Open	No
-4,8	[illegible]	[illegible]	91 [147]	8,3	0,0	22	Off	Open	No
-4,7	[illegible]	[illegible]	[illegible]	7,9	0,0	19	Off	Open	No
-4,6	[illegible]	[illegible]	91 [147]	7,5	0,0	18	On	Closed	Yes
-4,5	Complete	3.648	90 [145]	7,1	0,0	16	On	Closed	Yes
-4,4	Complete	3.552	89 [144]	6,7	0,0	15	On	Closed	Yes
-4,3	Complete	3.328	89 [143]	6,3	0,0	14	On	Closed	Yes
-4,2	Complete	3.072	88 [142]	5,5	0,0	14	On	Closed	Yes
-4,1	Complete	2.816	88 [141]	5,1	0,0	14	On	Closed	Yes
-4,0	Complete	2.560	86 [139]	4,3	0,0	14	On	Closed	Yes
-3,9	Complete	2.528	86 [138]	3,9	0,0	15	On	Closed	Yes
-3,8	Complete	2.496	85 [137]	3,9	0,0	15	On	Closed	Yes
-3,7	Complete	2.496	84 [135]	3,9	0,0	16	On	Closed	Yes
-3,6	Complete	2.496	83 [134]	3,9	0,0	16	On	Closed	Yes
-3,5	Complete	2.464	82 [132]	3,9	0,0	16	On	Closed	Yes
-3,4	Complete	2.400	81 [131]	3,9	0,0	16	On	Closed	Yes
-3,3	Complete	2.272	81 [130]	3,9	0,0	16	On	Closed	Yes
-3,2	Complete	2.176	80 [128]	3,5	0,0	17	On	Closed	Yes
-3,1	Complete	2.080	80 [128]	3,5	0,0	17	On	Closed	Yes
-3,0	Complete	2.016	80 [128]	3,5	0,0	18	On	Closed	Yes
-2,9	Complete	1.984	79 [127]	3,5	0,0	18	On	Open	Yes
-2,8	Complete	1.952	79 [127]	3,1	0,0	18	Off	Open	No
-2,7	Complete	1.952	79 [127]	3,1	0,0	18	Off	Open	No
-2,6	Complete	1.952	78 [126]	3,1	0,0	17	Off	Open	No
-2,5	Complete	1.920	78 [126]	5,9	4,7	18	Off	Open	No
-2,4	Complete	2.112	78 [126]	9,1	11,4	25	Off	Open	No
-2,3	Complete	2.240	78 [126]	10,2	12,6	34	Off	Open	No
-2,2	Complete	2.240	78 [126]	10,6	12,6	42	Off	Open	No
-2,1	Complete	2.208	78 [125]	10,6	12,6	46	Off	Open	No
-2,0	Complete	2.208	78 [125]	10,2	12,6	49	Off	Open	No
-1,9	Complete	2.144	78 [125]	10,2	12,6	[illegible]	[illegible]	[illegible]	[illegible]
-1,8	Complete	2.112	78 [125]	8,7	9,8	[illegible]	[illegible]	[illegible]	[illegible]
-1,7	Complete	2.112	78 [125]	4,3	0,0	[illegible]	[illegible]	[illegible]	[illegible]
-1,6	Complete	2.112	77 [124]	4,3	0,0	[illegible]	[illegible]	[illegible]	[illegible]
-1,5	Complete	2.080	76 [123]	3,9	0,0	[illegible]	[illegible]	[illegible]	[illegible]
-1,4	Complete	2.080	76 [122]	3,5	0,0	[illegible]	[illegible]	[illegible]	[illegible]
-1,3	Complete	2.016	74 [119]	3,1	0,0	[illegible]	[illegible]	[illegible]	[illegible]
-1,2	Complete	1.952	72 [116]	3,1	0,0	[illegible]	[illegible]	[illegible]	[illegible]
-1,1	Complete	1.888	69 [111]	3,1	0,0	19	On	Closed	Yes
-1,0	Complete	1.824	66 [106]	2,8	0,0	18	On	Closed	Yes
-0,9	Complete	1.760	67 [108]	2,8	0,0	18	On	Closed	Yes
-0,8	[illegible]	[illegible]	[illegible]	2,8	0,0	18	On	Closed	Yes
-0,7	[illegible]	[illegible]	[illegible]	2,8	0,0	18	On	Closed	Yes
-0,6	[illegible]	[illegible]	[illegible]	2,4	0,0	18	On	Closed	Yes
-0,5	[illegible]	[illegible]	[illegible]	2,4	0,0	18	On	Closed	Yes
-0,4	[illegible]	[illegible]	[illegible]	2,4	0,0	18	On	Closed	Yes
-0,3	[illegible]	[illegible]	[illegible]	2,4	0,0	18	On	Closed	Yes
-0,2	[illegible]	[illegible]	[illegible]	2,4	0,0	18	On	Closed	Yes
-0,1	[illegible]	[illegible]	[illegible]	2,4	0,0	19	On	Closed	Yes

43	Off	Open	No
35	Off	Open	No
30	On	Closed	Yes
26	On	Closed	Yes
22	On	Closed	Yes

58 [93]
56 [90]
53 [86]

DARTS GROUP

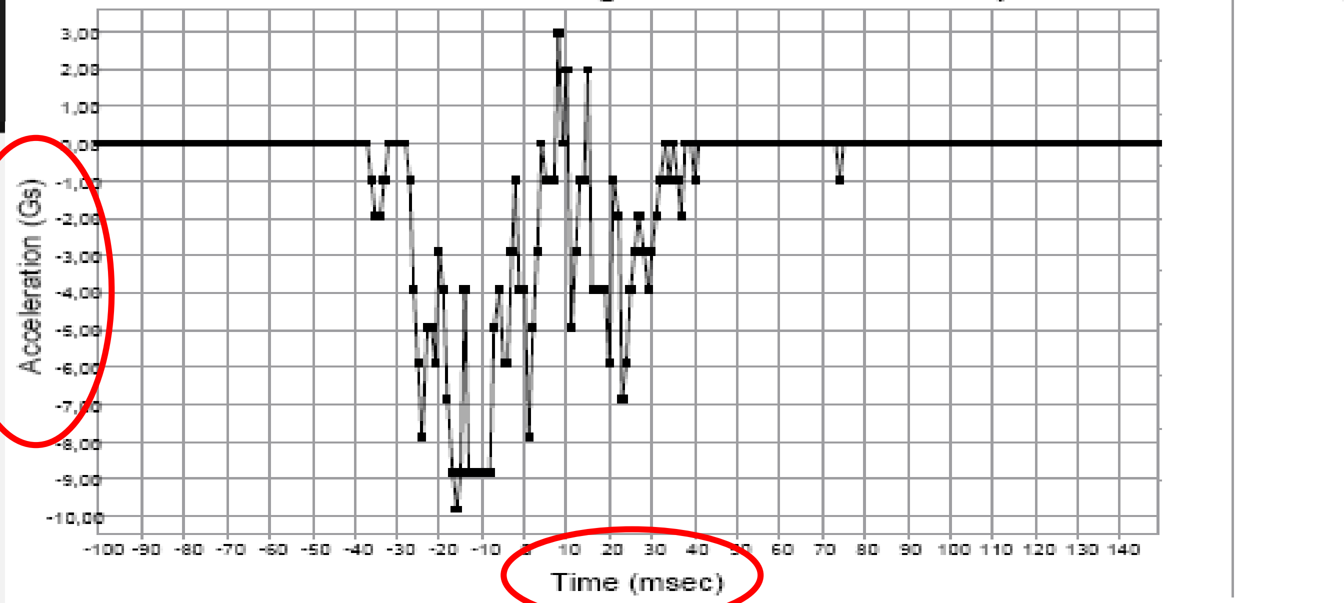
Pre-Crash Data (Most Recent Event - table 2 of 5)

(the most recent sampled values are recorded prior to the event)

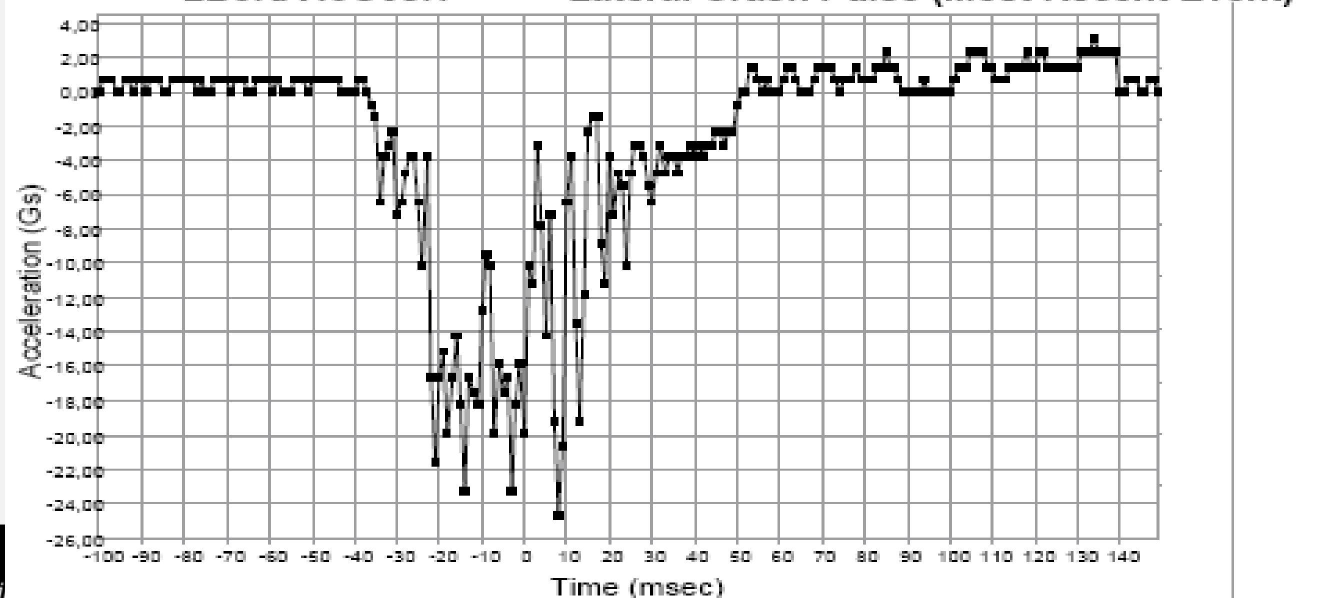
Time Stamp (sec)	Panic Brake Assist Active (If equip.)			ESP Lamp (If equip.)	ESP Lamp Flashing Requested (If equip.)	ESP Disabled (If equip.)	Traction Control Button (If equip.)	ESP Active (If equip.)
-5,0	No			No	No	No	Off	Yes
-4,9				No	No	No	Off	Yes
-4,8				No	No	No	Off	Yes
-4,7				No	No	No	Off	Yes
-4,6				No	No	No	Off	Yes
-4,5				No	No	No	Off	Yes
-4,4				No	No	No	Off	Yes
-4,3				No	No	No	Off	Yes
-4,2				No	No	No	Off	Yes
-4,1				No	No	No	Off	Yes
-4,0	No	Off	Off	No	No	No	Off	Yes
-3,9	No	Off	Off	No	No	No	Off	Yes
-3,8	No	Off	Off	No	No	No	Off	Yes
-3,7	No	Off	Off	No	No	No	Off	Yes
-3,6	No	Off	Off	No	No	No	Off	Yes
-3,5	No	Off	Off	No	No	No	Off	Yes
-3,4	No	Off	Off	No	No	No	Off	Yes
-3,3	No	Off	Off	No	No	No	Off	Yes
-3,2	No	Off	Off	No	No	No	Off	Yes
-3,1	No	Off	Off	No	No	No	Off	Yes
-3,0	No	Off	Off	No	No	No	Off	Yes
-2,9	No	Off	Off	No	No	No	Off	Yes
-2,8	No	Off	Off	No	No	No	Off	Yes
-2,7	No	Off	Off	No	No	No	Off	Yes
-2,6	No	Off	Off	No	No	No	Off	Yes
-2,5	No	Off	Off	No	No	No	Off	Yes
-2,4	No	Off	Off	No	No	No	Off	Yes
-2,3	No	Off	Off	No	No	No	Off	Yes
-2,2	No	Off	Off	No	No	No	Off	Yes
-2,1	No	Off	Off	No	No	No	Off	Yes
-2,0	No	Off	Off	No	No	No	Off	Yes
-1,9	No	Off	Off	No	No	No	Off	Yes
-1,8	No	Off	Off	No	No	No	Off	Yes
-1,7	No	Off	Off	No	No	No	Off	Yes
-1,6	No	Off	Off	No	No	No	Off	Yes
-1,5	No	Off	Off	No	No	No	Off	Yes
-1,4	No	Off	Off	No	No	No	Off	Yes
-1,3	No	Off	Off	No	No	No	Off	Yes
-1,2				No	No	No	Off	Yes
-1,1				No	No	No	Off	Yes
-1,0				No	No	No	Off	Yes
-0,9				No	No	No	Off	Yes
-0,8				No	No	No	Off	Yes
-0,7				No	No	No	Off	Yes
-0,6				No	No	No	Off	Yes
-0,5				No	No	No	Off	Yes
-0,4				No	No	No	Off	Yes
-0,3	Yes	Off	Off	No	No	No	Off	Yes
-0,2	Yes	Off	Off	No	No	No	Off	Yes
-0,1	No	Off	Off	No	No	No	Off	Yes

-1,1	No
-1,0	No
-0,9	No
-0,8	Yes
-0,7	Yes
-0,6	Yes

2B3KA43G08H****** Longitudinal Crash Pulse (Most Recent Event)



2B3KA43G08H****** Lateral Crash Pulse (Most Recent Event)



DATA VALIDATION

- *To validate the data from the EDR, a full scale reconstruction of the vehicle movements have been performed;*
- *Location: the runway of an old military airfield;*
- *In corporation with NFI, TRW (ECU supplier of Dodge);*
- *The investigating judge, the prosecutor and the lawyer of the accused were invited*

DATA VALIDATION

- *The exact data frames at 147 km/h were reproduced.*
- *Vehicle computers run at 500kps and transmit 16bit data frames*

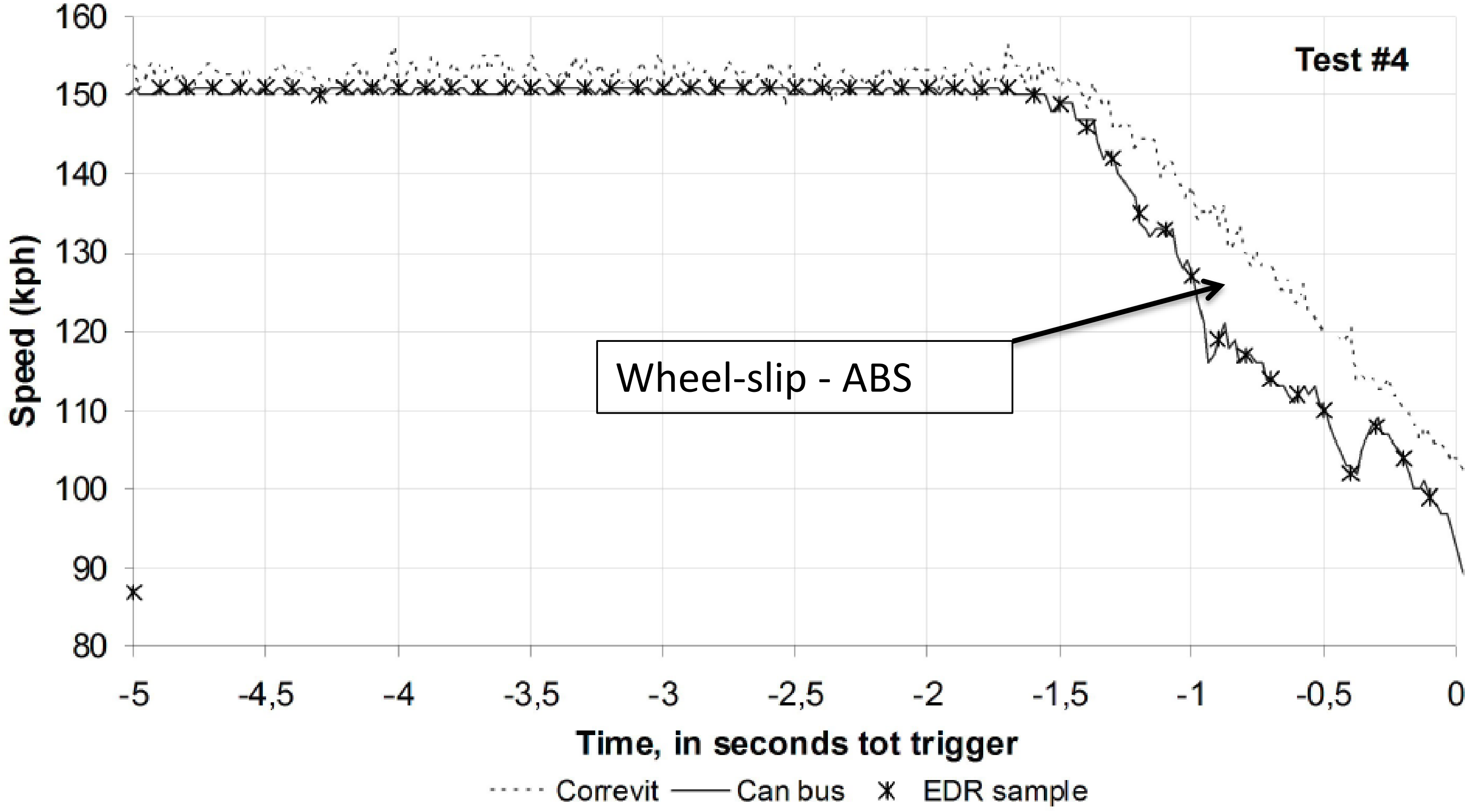
DATA VALIDATION

Data transfer of real-time speed within external CAN BUS network

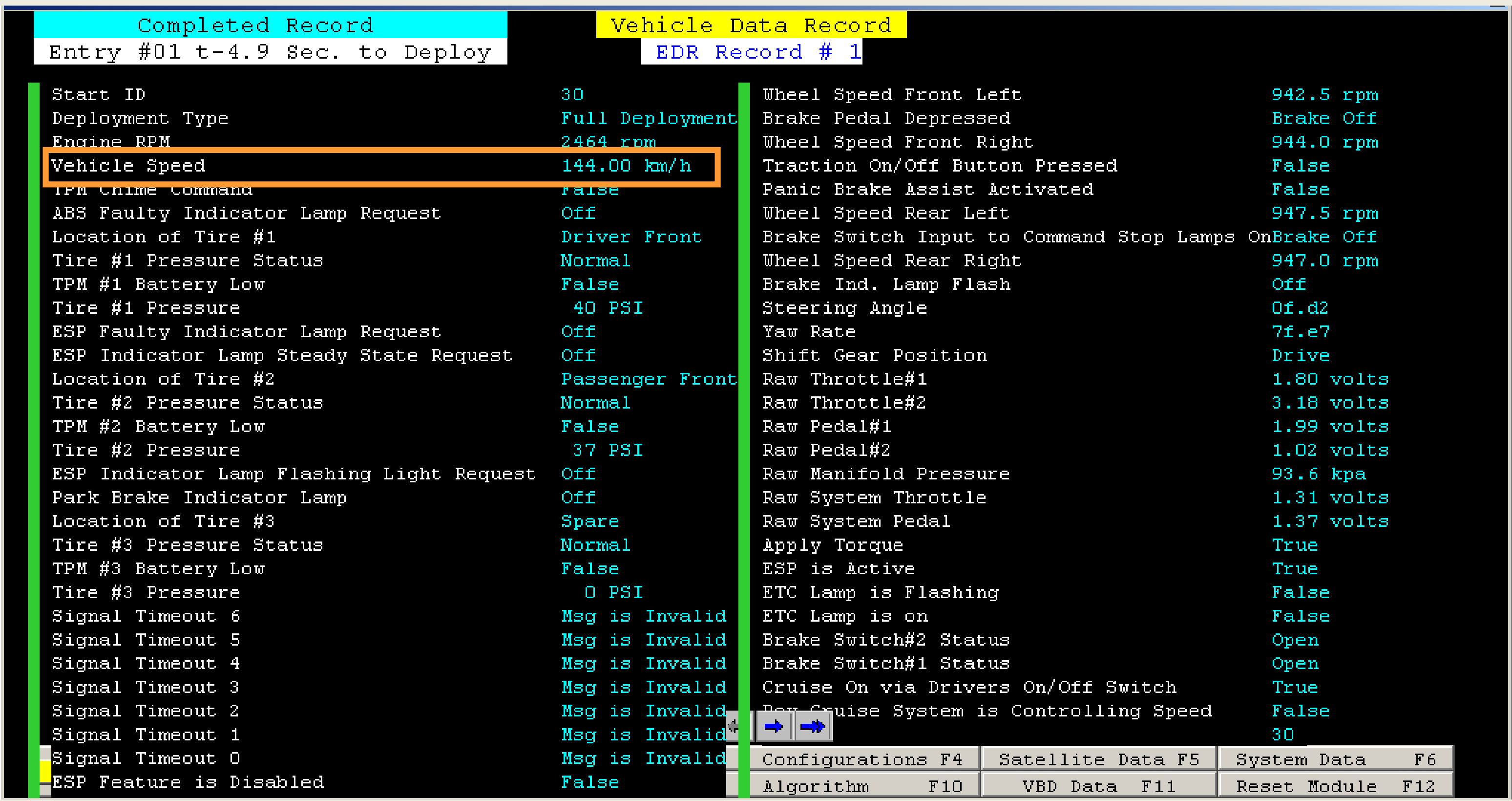
500KPS Optical speed

DATA VALIDATION

Data transfer of real-time speed within external CAN BUS network



TRW SOFTWARE



The above screen shot is an abstract of a TRW EDR from a detected crash with full deployment. The screen shot is from the TRW PTM Tool. In orange highlighted is the velocity of 144.0 km/h freeze at 4.9 ms prior crash discrimination.

DARTS GROUP

COURT JUDGEMENT

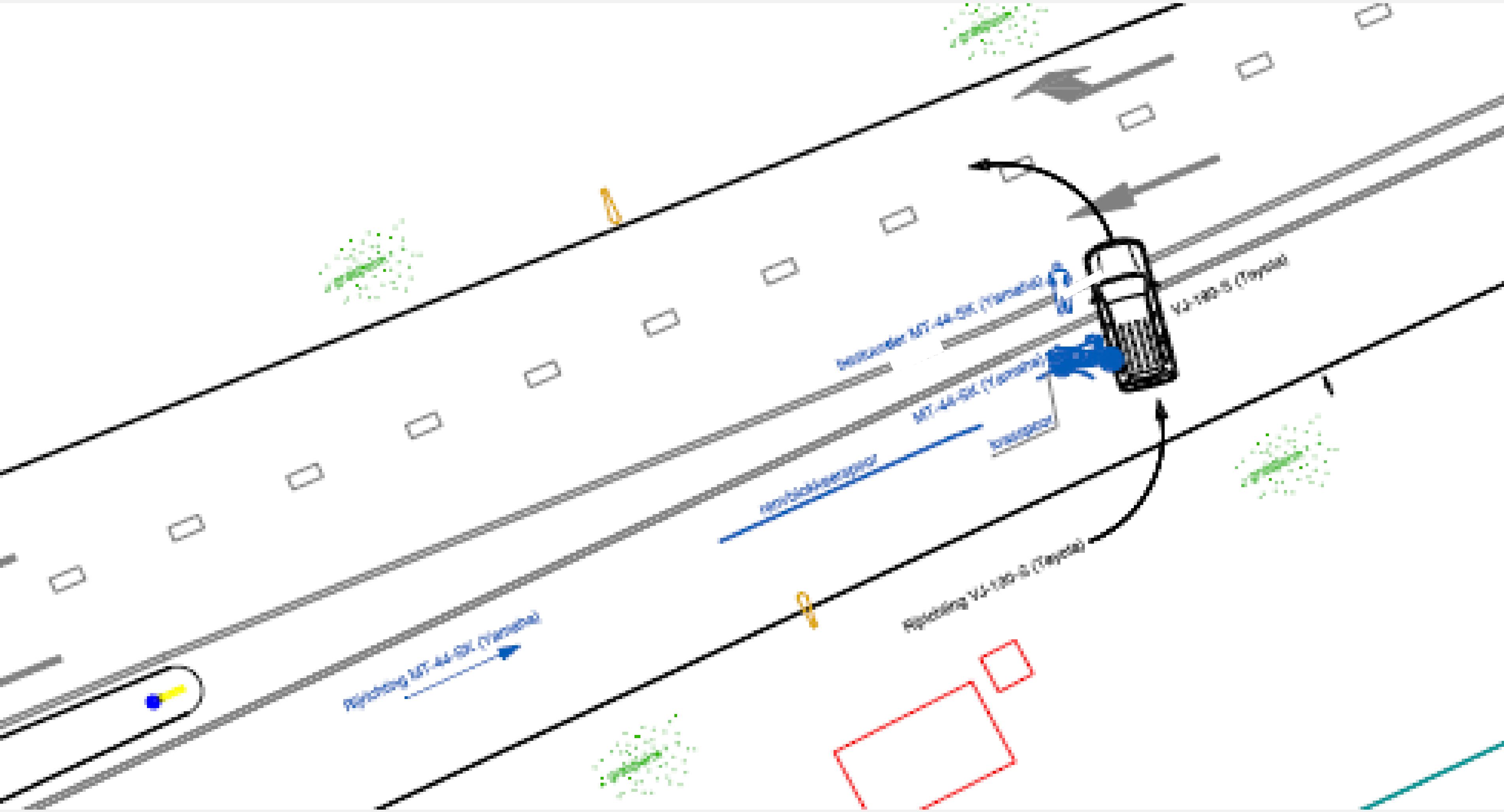
- *Data Accepted in Court as evidence*
  - *Speed of the Dodge: 147 km/h*
  - *Speed Limit: 30 km/h*
- *Verdict*
  - *The driver of the Dodge Ram is guilty*
  - *Sentence*
    - *9 Years Prison (8 year after appeal)*
    - *10 Years suspension of driving license*

EDR CASE 2

- *The Toyota is exiting the right shoulder of the road and want to turn his car in opposite direction.*
- *Motorbike is driving on the road and is confronted with the turning car in front of him.*
- *Driver motorbike is braking full with blocked wheels , falls on to the left side and slides into the left side of the turning car.*
- *Motorbike driver is seriously injured.*
- *Reconstruction Issues: How fast was the motorbike going at the time of the impact?*

Case Study Using Toyota Data

Accident scene



Impact

Damage *Vehicles*

EDR Rapport

BOSCH

CDR CRASH DATA RETRIEVAL

IMPORTANT NOTICE: Robert Bosch LLC and the manufacturers whose vehicles are accessible using the CDR System urge end users to use the latest production release of the Crash Data Retrieval system software when viewing, printing or exporting any retrieved data from within the CDR program. Using the latest version of the CDR software is the best way to ensure that retrieved data has been translated using the most current information provided by the manufacturers of the vehicles supported by this product.

CDR File Information

User Entered VIN	JTEBH3FJ00K117435
User	M. Huijsmans, J. van Essen, H. Bot
Case Number	2014 425988-3
EDR Data Imaging Date	10-21-2014
Crash Date	10-21-2014
Filename	JTEBH3FJ00K117435_ACM.CDRX
Saved on	dinsdag, oktober 21 2014 at 10:33:55
Collected with CDR version	Crash Data Retrieval Tool 14.1
Reported with CDR version	Crash Data Retrieval Tool 14.1
EDR Device Type	Airbag Control Module
Event(s) recovered	Side (1)

Comments

bandenmaat: 265/70r17 bf Goodrich

BOSCH

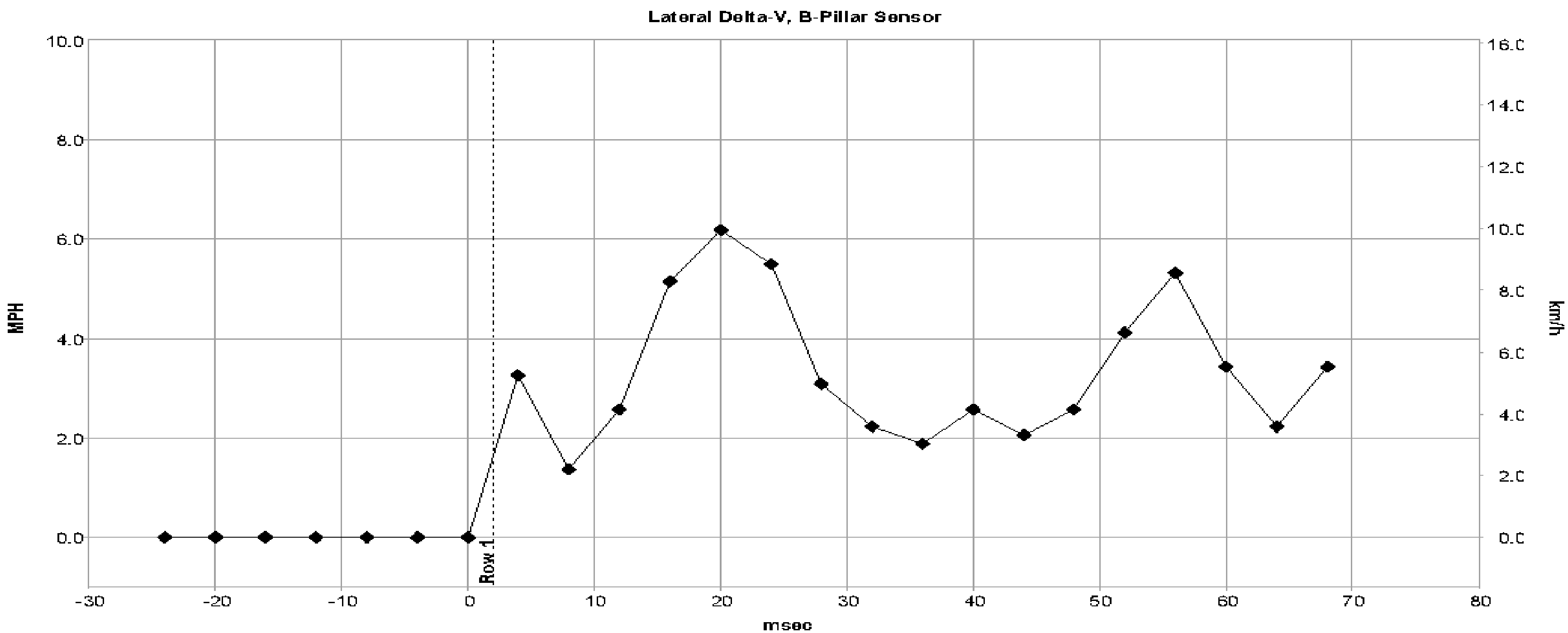
CDR CRASH DATA RETRIEVAL

System Status at Time of Retrieval

ECU Part Number	89170-60451
ECU Generation	06EDR
Recording Status, All Pages	Complete
Freeze Signal	ON
Freeze Signal Factor	None
Diagnostic Trouble Codes Exist	No
Time from Previous Pre Crash TRG (msec)	16381 or greater
Latest Pre-Crash Page	0
Contains Unlinked Pre-Crash Data	No

Event Record Summary at Retrieval

Events Recorded	TRG Count	Crash Type	Time (msec)	Pre-Crash & DTC Data Recording Status	Event & Crash Pulse Data Recording Status
Most Recent Event	1	Side Crash	0	Complete (Page 0)	Complete (Side Page 0)



Lateral Crash Pulse (Most Recent Event, TRG 1 - table 1 of 2)

Recording Status, Time Series Data	Complete
Time from TRG to Next Sample (msec)	0
Max Lateral Delta-V, B-Pillar Sensor (MPH [km/h])	6.2 [9.9]
Max Lateral Delta-V, C-Pillar Sensor (MPH [km/h])	5.0 [8.0]

EDR Rapport

Lateral Crash Pulse (Most Recent Event, TRG 1 - table 2 of 2)

Time (msec)	Lateral Delta-V, Airbag ECU Sensor (MPH [km/h])	Lateral Delta-V, B-Pillar Sensor (MPH [km/h])	Lateral Delta-V, C-Pillar Sensor (MPH [km/h])
-24	0.0 [0.0]	0.0 [0.0]	0.0 [0.0]
-20	0.0 [0.0]	0.0 [0.0]	0.0 [0.0]
-16	0.0 [0.0]	0.0 [0.0]	0.0 [0.0]
-12	0.0 [0.0]	0.0 [0.0]	0.0 [0.0]
-8	0.0 [0.1]	0.0 [0.0]	0.0 [0.0]
-4	0.1 [0.1]	0.0 [0.0]	-0.1 [-0.1]
0	0.2 [0.4]	0.0 [0.0]	-0.1 [-0.1]
4	0.6 [1.0]	3.3 [5.2]	0.0 [0.0]
8	0.7 [1.1]	1.4 [2.2]	0.3 [0.6]
12	1.5 [2.5]	2.6 [4.1]	0.9 [1.5]
16	2.2 [3.5]	5.1 [8.3]	1.3 [2.1]
20	2.7 [4.4]	6.2 [9.9]	1.7 [2.8]
24	3.5 [5.6]	5.5 [8.8]	2.7 [4.4]
28	3.5 [5.7]	3.1 [5.0]	3.0 [4.8]
32	3.2 [5.1]	2.2 [3.6]	3.8 [6.1]
36	2.6 [4.1]	1.9 [3.0]	3.3 [5.2]
40	2.6 [4.1]	2.6 [4.1]	3.8 [6.1]
44	2.7 [4.4]	2.1 [3.3]	4.1 [6.6]
48	3.2 [5.1]	2.6 [4.1]	4.8 [7.7]
52	3.2 [5.1]	4.1 [6.6]	4.9 [7.9]
56	3.6 [5.8]	5.3 [8.6]	5.0 [8.0]
60	4.0 [6.5]	3.4 [5.5]	5.0 [8.0]
64	3.9 [6.2]	2.2 [3.6]	4.8 [7.7]
68	3.9 [6.2]	3.4 [5.5]	4.7 [7.6]

How Much Data?

- *The EDR had 6 data points of speed, brake, accel pedal and RPM – 5@1 sec intervals and the 6th data point at first event AE.*
- *Lateral Delta V Airbag ECU sensor 3,9 mph (6,2 kph) for side impact and graph and data table for 110ms at 10ms intervals.*
- *Lateral Delta V B and C pillar. We will not use these. No DTC's present at time of event.*
- *Driver safety belt was buckled.*

Was the Recording from My Crash?

- *The motorbike a Yamaha XJ 900 did not have any accessible data recorder.*
- *The Toyota Landcruiser has EDR and is supported by the Bosch Crash Data Retrieval System.*
- *Vehicle electrical appeared intact post crash.*
- *One (side)crash driver side was recorded and freeze signal is on.*
- *Conclude data **is** from the event of interest based on Delta V matching up with facts.*

Needed data for this Case

- *On the scene we found brake marks from the motorbike with a length of approximately 9 meters and slide marks of 4 meter.*
- *Weight of the Toyota is 2.340 kg and the Yamaha 270 kg*
- *EDR data Toyota*
- *Deceleration data motorbike 6m/s2 for braking and 2,5 m/s2 for sliding (wet road)*
- *For an side crash, Lateral Delta V and vehicle weights can give you closing speed.*

Solution?

- *Toyota is hit perpendicularly by the Yamaha.*
- *Point of impact laterally of centre of mass.*
- *Toyota lateral speed before impact is assumed 0.*
- *Thus: lateral speed directly after impact = ΔV.*
- *Yamaha + driver keep pushing against the Toyota.*
- *Problem:*
  – *How much Yamaha-speed is needed for Toyota-ΔV?*
- *Answer:*
  – *Depends on weight ratio. How? -> see formula next page.*

Formula

$$V_{Yamaha} = \left(1 + \frac{Mass_{Toyota}}{Mass_{Yamaha} + Mass_{MC\ driver}}\right) \Delta V_{Toyota}$$

So Yamaha speed is 5 to 6 times Toyota-delta-V

What Can I do *with it*?

- *What we can do now is to use the speed calculation from the Delta V (closing speed) and the speed calculated from the brake and slide marks to get the actual driven speed of the motorbike.*
- *Closing speed was around 52 km/h*
- *Driven speed around 66 km/h*

What about all other not EDR supported OEM's

- *For the other OEM's we still need the help of the maker and the TIER1 supplier.*
- *For government investigations there are several ways to get information. Sometimes directly from the OEM or they give you permission to contact the TIER1 supplier like Continental, Bosch or Autoliv. We can advise you in this.*
- *Next slides you will see some examples from French cars.*

Dacia (Renault)

3.2 Results derived from Crash Telegram

3.2.1 General information at time of 1st crash

System Time:	109:26:20 [h:min:sec]
Number of faults stored in airbag ECU:	0
Driver side	Left hand driver

3.2.2 Information about 1st crash

Vehicle speed information[5]:	86km/h: 120ms before crash (filtered)
	84km/h: 80ms before crash
	86km/h: 40ms before crash (filtered)
	84km/h: 0ms before crash
Firing lines deployed:	FP-BPS[1]

3.2.3 General information at time of 2nd crash

System Time:	109:26:20 [h:min:sec]
Number of faults stored in airbag ECU:	0
Driver side	Left hand driver
Driver Belted:	no information (no buckle switch equipped)
Power supply voltage:	2.2V (autarchy[4])
	Autarchy[4] detected by Power ASIC

3.2.4 Information about 2nd crash

Vehicle speed information[5]:	86km/h: 120ms before crash (filtered)
	84km/h: 80ms before crash (filtered)
	83km/h: 40ms before crash (filtered)
	81km/h: 0ms before crash (filtered)
Firing lines deployed:	FP-THAB[3]

Renault Clio

-Capteur safing fermé au moment de l'entrée en algorithme de crash.

-Mise à feu airbag thorax conducteur mémorisée.

-Mise à feu airbag rideau conducteur mémorisée.

-Signal crash output envoyé.

-Temps de mise à feu airbags thorax + rideau conducteur mémorisé : 3 ms.

-Vitesse véhicule mémorisée au moment de l'entrée en algorithme de crash : 67,16 km/h.

-Vitesse véhicule mémorisée 300 ms avant entrée en algorithme de crash : 74,36 km/h.

-Vitesse véhicule mémorisée 600 ms avant entrée en algorithme de crash : 85,16 km/h.

-Vitesse véhicule mémorisée 900 ms avant entrée en algorithme de crash : 95,96 km/h.

-Pas d'action frein mémorisé au moment de l'entrée en algorithme de crash.

-Pas d'action frein mémorisé 300 ms avant entrée en algorithme de crash.

-Pas d'action frein mémorisé 600 ms avant entrée en algorithme de crash.

-Pas d'action frein mémorisé 900 ms avant entrée en algorithme de crash.

-Kilométrage véhicule mémorisé au moment du crash: 68 834 kms.

Renault Clio Sport

Report

Topic Investigation Report : CC0026-NL

Vehicle speed at crash detection

Brake information

CAN Information

	t	t -1	t -2
Vehicle Speed:	120.1 km/h	121.7 km/h	132.6 km/h
Break:	brake activated	brake activated	brake activated

Mileage: 35962 km Vehicle Speed unfiltered: 106.3 km/h

Speed Class Driver: 4

Speed Class Passenger: 4

AB General Status:

	before	after
Crash detected:	0	1
Crash detection out of order:	0	1
Reset info:	0	0
Lamps information:	Valid	Valid
Passenger Airbag lamp:	Off	Off
Airbag malfunction lamp:	Off	On

Driver Safety Belt fastened: switch open

Passenger Safety Belt fastened: reserved

Passenger on seat: reserved

Cluster General Status:

Warning lamp:	Off
Pass. Airbag off lamp:	Off
Warning lamp:	Valid
Pass. Airbag off lamp:	Valid

"Warning lamp" and "Passenger Airbag off lamp" were off before crash CAN messages of "Warning lamp" and "Passenger Airbag off lamp" were valid

BACK

EUDARTS EDR VIDEO EP