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ASSESSMENT PROGRAMME

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Preface

Stakeholders have been working for some years on the concept of a pan-European in-vehicle emergency call ('eCall') which has the potential of saving over 2000 lives annually in the EU on top of the reduction in injury severity. Installation of eCall is mandatory for each new type of passenger car which is approved after March 2018. It is, in short, a system to inform 112-centers (commonly known as PSAPs or public safety answering points) about the whereabouts of an incident. With the call, made over a mobile network, a set of data is transferred which is defined in CEN standard EN 15722. This set of data (known as MSD) can be used in the emergency process, on top of any information retrieved from the occupants of the car.

The forenamed CEN standard makes a provision for additional data that can be embedded in the MSD. This additional data is called ‘optional additional data’ and should be well defined along the guidelines laid out in EN 15722. It shall, amongst other things, have an ASN.1 encoding scheme, be limited in space and provide well defined meaning of the information elements.

The MSD itself contains relevant but limited information and has no provision for information about the triggering incident. Other than the fact that if an eCall is automatically triggered (as opposed to user-initiated) the incident must have been severe enough. Based on its experience Euro NCAP has defined an additional data concept for eCall that gives information about the triggering incident. This information can help the emergency services to better and more efficiently respond to an incident.

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EUROPEAN NEW CAR ASSESSMENT PROGRAMME (Euro NCAP)

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1. Scope

In this document Euro NCAP defines an additional data concept that can be transferred as the ‘optional additional data’ part of an (automatic) eCall MSD, as defined in EN 15722, that may be transferred from a vehicle to a PSAP in the event of a crash or emergency via an eCall communication session.

The purpose of this document is to provide means to notify the PSAP about some details of the triggering incident, in order for the PSAP or another emergency service to be able to better estimate the severity of the incident. This can be beneficial to the efficiency of the emergency response.

This document can be seen as an addendum to CEN standard EN 15722; it contains as little redundancy as possible.

NOTE 1 This document is not a CEN standard, but for readability and better implementation it follows the structure of such document.

NOTE 2 The additional data concept defined herein will be submitted to a relevant data registry if such registry exists.

2. Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

Organisation	Document Reference	Title
CEN	EN15722	eCall minimum set of data (ITS/eSafety)
ISO/IEC	ISO 8825-2	ASN.1 encoding rules/specification of PER
ISO/IEC	ISO 4130	Road vehicles — Three-dimensional reference system and fiducial marks — Definitions
ISO/IEC	ISO 12353	Road vehicles — Traffic accident analysis — Part 1: Vocabulary

3. Terms and Definitions

Where applicable definitions are copied from existing sources (which are then referenced)

Term	Definition
coordinate system	set of reference lines used to identify the location of points in a certain space
delta-v	difference between velocity just at (t_0) and just after (t_1) the beginning of the triggering incident where the difference between t_0 and t_1 is equal to 250ms ($\Delta v = v_{t_1} - v_{t_0}$) *Note 1 to entry: also see ISO 12353*
eCall	emergency call generated either automatically via activation of in-vehicle sensors or manually by the vehicle occupants; when activated it provides notification and relevant location information to the most appropriate 'Public Safety Answering Point', by means of mobile wireless communications networks, carries a defined standardised 'Minimum Set of Data' notifying that there has been an incident that requires response from the emergency services, and establishes an audio channel between the occupants of the vehicle and the most appropriate 'Public Safety Answering Point' (ref: CEN EN15722 et al)
vehicle coordinate system	right-handed coordinate system with a selected origin for defining the location of points on the vehicle *Note 1 to entry: See ISO 4130.*

4. Symbols and abbreviations

For the purposes of this document, the following symbols and abbreviations apply.

ASN.1	abstract syntax notation one
Δv	delta v
M	mandatory
MSD	minimum set of data
O	optional
OID	object identifier
PSAP	public safety answering point
UPER	unaligned packed encoding rules (ASN.1)

5. Conformance

This additional data standard does not change the common conformance requirements that have to be met by eCall devices. Correctness and reliability of the data included in the MSD based on this document shall be proven by written documentation.

6. Requirements

6.1 General

This document describes an extension to the CEN standard EN 15722 for the coding of the MSD message. In addition to the requirements set out in this document, all requirements from EN 15722 shall be met equally (in respect of this additional data concept).

6.2 Concepts and formats

6.2.1 MSD data concepts

The MSD as defined in CEN standard EN 15722 has an optional additional data block that may be used to add information elements containing information that might be of relevance in an emergency rescue situation. Privacy regulations apply and shall be in accordance with the provisions of EU 2016/679 ‘General Data Protection Requirements’.

6.2.2 Representation of MSD data concepts

The MSD is represented in ‘Abstract Syntax Notation’ (ASN.1) using the ‘Unaligned Packed Encoding Rules’ (UPER) as defined in ISO/IEC 8825 2. CEN standard EN15722 provides the general ASN.1 encoding scheme and sending sequence. The additional data concept in this document is defined following the provisions made in those documents.

6.2.3 The Euro NCAP additional data concept for incident information

The MSD contains two data elements for additional data: the ‘object identifier’ and the ‘object data’. Inclusion of any additional data shall be such that the maximum length of the overall (encoded) MSD does not exceed 140 bytes.

6.2.3.1 The ‘Object Data’

Euro NCAP has found that sharing sensor information about the triggering incident with the PSAP can help to streamline the emergency process further. It may enable the emergency services to estimate the severity of the triggering incident and assess the condition of the occupants. Euro NCAP has created a data concept to embed this information in the data element ‘object data’ of the MSD in the most economical way possible using an ASN.1 encoding recipe which can be found in Annex A. It might be that, over time, additional parameters are found that can help the emergency rescue process. To accommodate such parameters the concept is designed so that an extension most probably can be accommodated using the ASN.1 extension features. If such extension is not possible an updated version of the concept shall be released

6.2.3.2 The ‘Object Identifier’

The ‘object identifier’ (OID) uniquely identifies the format and meaning of the data, the syntax of the data structure and the semantic meaning of the additional data concept in the data element ‘object data’. For further detail regarding the use of OIDs in eCall, see CEN standard EN 15722.

This additional data-concept for triggering incident information has been registered by Euro NCAP and received OID `1.0.14817.106.2.1.2.8`. To accommodate for future, non-backwards compatible, versions, an arc is added to reference the version of the concept. As this document describes the first version of the data concept, the OID to use is `1.0.14817.106.2.1.2.8.1`.

6.3 Contents of the ‘Minimum Set of Data’ (MSD)

The following subclauses provide the definition of the minimum set of data that shall be sent from the vehicle in case of an automatic emergency call with the Euro NCAP additional data embedded.

6.3.1 Basic contents of MSD

Table 1 provides a summary of the semantic contents of the MSD, for a full description please refer to CEN standard EN 15722.

Table 1 — Contents/format of the MSD data concept

M – Mandatory data field
O – Optional data field

MSD				
msdVersion	INTEGER	-	M	
msd				
msdStructure				
...				
optionalAdditionalData			O	
oid	RELATIVE-OID			
data	OCTET STRING			

Source: CEN EN 15722

The next clause describes the contents of the `optionalAdditionalData` block.

6.3.2 Contents of the `optionalAdditionalData`

Table 2 provides a semantic summary of the semantic contents of the `optionalAdditionalData` part of the MSD when filled with this additional data concept for incident information. The sequence of data presentation shall be as specified in this table and represented as described in 6.2.2. For clarity the '`type`' used in Table 2 is a semantic representation of the type used in the ASN.1 definition. The exact representation is found in Annex A.

NOTE: Elements do not necessarily start or end on a byte boundary. The real position of the element in the data-stream is defined by the ASN.1 'unaligned packet encoding rules' (UPER), following the definition in Annex A.

The MSD data element `oid` is defined as RELATIVE-OID which means that the first part of the OID (`1.0.14817.106.2.1.2`), which is fixed for all eCall additional data concepts, is not to be transmitted. Hence the value of this data element shall be **`8.1`**.

See clause 7 for a detailed description of the data elements, the values and their meanings.

Table 2 — Contents/format of Euro NCAP additional data

`optionalAdditionalData`				
`oid`	RELATIVE OID		M	Fixed value: **8.1**
`data`				encoded as OCTET STRING
`locationOfImpact`	ENUM		M	The impact location of the triggering incident, which can be one of these values: `unknown` – unknown if a triggering impact was detected `none` – no triggering impact detected triggering impact detected, … `front` – … at front of the car `rear` – … at rear of the car `driverSide` – … at the driver side of the car `nonDriverSide` – … at the other side of the car `other` – … at an unspecified location
`rolloverDetected`	BOOLEAN		O	Omitted if vehicle is not equipped/able to detect a rollover, else true or false.
`deltaV`			M	difference between velocity just after and just before impact (delta-v)
`rangeLimit`	INTEGER (100…250)		M	Unsigned upper limit of the detection range for delta-v

deltaVX	SIGNED INTEGER (-250...250)		M	delta-v measured over the x-axis of the coordinate system of the vehicle
deltaVY	SIGNED INTEGER (-250...250)		M	delta-v measured over the y-axis of the coordinate system of the vehicle

6.4 Mode of operation

Any IVS can embed the Euro NCAP additional data concept for information about the triggering incident in the MSD sent. However, the data shall only be embedded in an MSD which is part of an automatically triggered eCall and provided that the information is (a) available and (b) correct at the time when the eCall was triggered (see also clause 7). This data concept shall not be embedded in the MSD of a manually triggered eCall.

The receiving (PSAP) system shall extract the data elements from the MSD as specified in CEN standard EN 15722. This makes the data-elements `oid` and `optionalAdditionalData` available. The value of `oid` can be used to see whether the data concept is supported and if so which ASN.1 definition should be used to retrieve the data elements from `optionalAdditionalData`.

If the value `oid` refers to the additional data concept which is the subject of this document, then the PSAP system can apply the ASN.1 recipe found in Annex A to decode the contents of `optionalAdditionalData`. The decoded values from those contents can then be made available to the operator and/or emergency services. This can lead to a better understanding of the incident and possibly to a more efficient emergency response.

7. Triggering incident information elements

CEN standards only define functional requirements about when to trigger an automatic eCall: when an incident is detected which is deemed severe by on-board logic. The decision logic is left to the manufacturer. Based on their long term experience, Euro NCAP has found that a few data elements are widely used and their values can be relevant to the emergency services.

7.1 Impact

Although not all incidents which are deemed to be severe involve an impact, most incidents do and the fact that there was impact and location of it can play a large role in determining the severity of the incident. Vehicles may be equipped with sensors that detect an impact and probably also detect the location of the impact. The data concept defined in this document has a mandatory element for the (detection and) location of an impact causing or part of the triggering of the automatic eCall.

The information shared in this data concept is related to the initial incident that triggered the automatic eCall. Any impact sustained after that triggering incident will not be part of the data exchanged in the initial MSD nor in case the PSAP requests an updated MSD. This is to avoid false readings due to malfunctioning of sensors after the initial incident and/or readings about events that take place after the occupants have left their vehicles.

EXAMPLE: in a classic head-tail collision the vehicle usually first hits the vehicle in front or is first hit by the vehicle behind, which would result in the values `front` *or* `rear` *respectively. If the frontal and rear impact are at the same time, the value will be* `other`*.*

7.1.1 Location of impact

Any vehicle that embeds the data concept for triggering incident information shall provide the data element `locationOfImpact` to the emergency services via the MSD, even if the vehicle is not equipped with sensors that can detect (the location of the) impact. The emergency services can deduce the situation from the value that is embedded:

value of locationOfImpact	meaning
`unknown`	The vehicle is not equipped with sensors to detect impact or the sensors were not functioning properly or any other reason which prevented the on board system to detect whether or not the vehicle sustained an impact.
`none`	The reading of the (properly functioning) sensors onboard does not suggest the vehicle was impacted in the eCall triggering incident. The automatic triggering of the eCall is hence based on other sensor readings.
`front` or `rear`	The reading of the (properly functioning) sensors onboard show the vehicle sustained impact in the eCall triggering incident on the front or rear of the vehicle.
`driverSide`	The reading of the (properly functioning) sensors onboard show the vehicle sustained impact in the eCall triggering incident on the side of the vehicle where the driver sits. In vehicles with singular seating an impact on any side shall be reported as `driverSide`.
`nonDriverSide`	The reading of the (properly functioning) sensors onboard show the vehicle sustained impact in the eCall triggering incident on the other side of the vehicle than where the driver sits.
`other`	The reading of the (properly functioning) sensors onboard show the vehicle sustained impact in the eCall triggering incident on a location other than front/rear/driver side/non driver side, or on multiple locations.

7.1.2 Rollover

A special case is the detection of rollover. Not all vehicles are equipped with sensors that can determine if a rollover has taken place and even if these sensors are available, then a rollover might take place after the automatic triggering of the incident. However, if and when the vehicle has such sensors and a rollover was detected during/as part of the triggering event, then this information may be of interest to the emergency services.

If a vehicle has no sensors or is otherwise unable to detect if a rollover took place, then the data element shall be omitted from the data embedded in the MSD. If the vehicle has sensors, then the value of the data element shall reflect the detection:

value of rolloverDetected	meaning
`false`	The reading of the (properly functioning) sensors onboard does not suggest the vehicle experienced a rollover in the triggering incident. The automatic triggering of the eCall is hence based on other sensor readings.
`true`	The reading of the (properly functioning) sensors onboard show the vehicle experienced any form of rollover in the eCall triggering incident.

7.2 De- or increase of vehicle speed

An important marker used in the detection of an incident is the difference between velocity just before (t_0) and just after (t_1) the (start of the) triggering incident. Euro NCAP has defined the difference between t_0 and t_1 to be 250ms. This difference in velocity is named delta-v and is measured over both the x- and y-axis of the vehicle coordinate system:

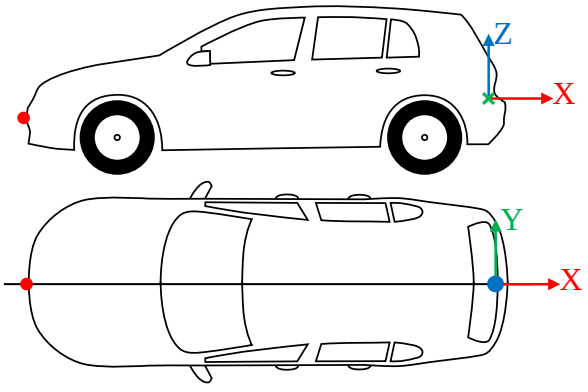

Figure 1 – Euro NCAP Vehicle Coordinate System

The value for delta-v ($v_{t_1} - v_{t_0}$) is signed a negative delta-v_x means that the velocity decreased, assuming the vehicle was driving in the forward direction at the time of the incident.

Under normal circumstances the vehicle is not moving sideways, so the value of delta-v_y usually reveals information about the severity and the direction of the sideway movement at the time of the incident. As can be seen from the figure a positive value for delta-v_y means that the vehicle sped up to the right, a negative value relates to speeding up to the left.

In most vehicles the range of detection for delta-v is limited, which means that reporting the upper limit *dV* should be interpreted as ‘delta-v being dV or above’ and reporting the lower limit *-dV* should be interpreted as ‘delta-v being dV or below’. Since there is no set value for *dV* the data element `rangeLimit` shall be filled with the vehicle/system specific value.

ASN.1 definition of additional data block

A.1 General

As soon as the OID has revealed the nature of the data as being ‘Euro NCAP Triggering Incident Information’ (using the standard eCall MSD message definition, see EN 15722) the data from the optionalAdditionalData block can be decoded. Either by applying the definition of the data block to that data (this annex), or by applying a constituted complete eCall MSD message definition to the MSD received.

A.2 Definition of contents of optionalAdditionalData

A.2.1 Context

This section contains the ASN.1 definition of the extra data.

A.2.2 ASN.1 definition

```
MSD_ADDITIIONAL_EURONCAP_1

DEFINITIONS
AUTOMATIC TAGS ::=
BEGIN

-- Definition can be used to decode data in the data part
-- of optionalAdditionalData in the MSD message.
--
-- AdditionalData::= SEQUENCE {
--   oid  RELATIVE-OID,
--   data OCTET STRING (CONTAINING INCINFO)
-- }

INCINFO ::= SEQUENCE {
  locationOfImpact            IILocations,
  rolloverDetected            BOOLEAN           OPTIONAL,
  deltaV                      IIDeltaV,
  ...
}

IIDeltaV ::= SEQUENCE {
  rangeLimit                  INTEGER(100..255),
  deltaVX                     INTEGER(-255..255),
  deltaVY               INTEGER(-255..255),
  ...
}

IILocations ::= ENUMERATED {
  unknown(0),
  none(1),
  front(2),
  rear(3),
  driverSide(4),
  nonDriverSide(5),
  other(6),
```

```
  ...
}

END
```

A.2.3 Syntax check of ASN.1 definition

The syntax is checked (and found correct) with the online OSS Nokalva ASN.1 Playground, found at https://asn1.io/asn1playground/.

A.2.4 Example

The example below is shown in ASN.1 value encoding (plain text):

```
value1 INCINFO ::= {
  locationOfImpact front,
  deltaV {
    rangeLimit 125,
    deltaVX -45,
    deltaVY 10
  }
}
```

The same example encoded in UPER (hexadecimal representation, 19 bytes):

```
08 32 D2 84 80
```