

VitaSense

Unattended Child Detection

Seminar "Forgotten Child in the Car"
MIROS, 13th July 2018

More than 25 years of innovation-
and we are just getting started!



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About IEE

- Founded in 1989 and headquartered in Luxembourg
- Pioneer and global leader in automotive safety sensing systems for occupant detection and classification
- Proven reliability with installations in over 300 mio vehicles
- First to market with capacitive Hands-Off Detection sensor for ADAS
- Global player with local presence and ~3600 employees

Contents



- In-vehicle Heat Stroke
 - Statistics and Root Causes

- VitaSense
 - Background Information
 - Functional Principles

- NCAP Incentives and Rule-making Trends



In-vehicle Heat Stroke

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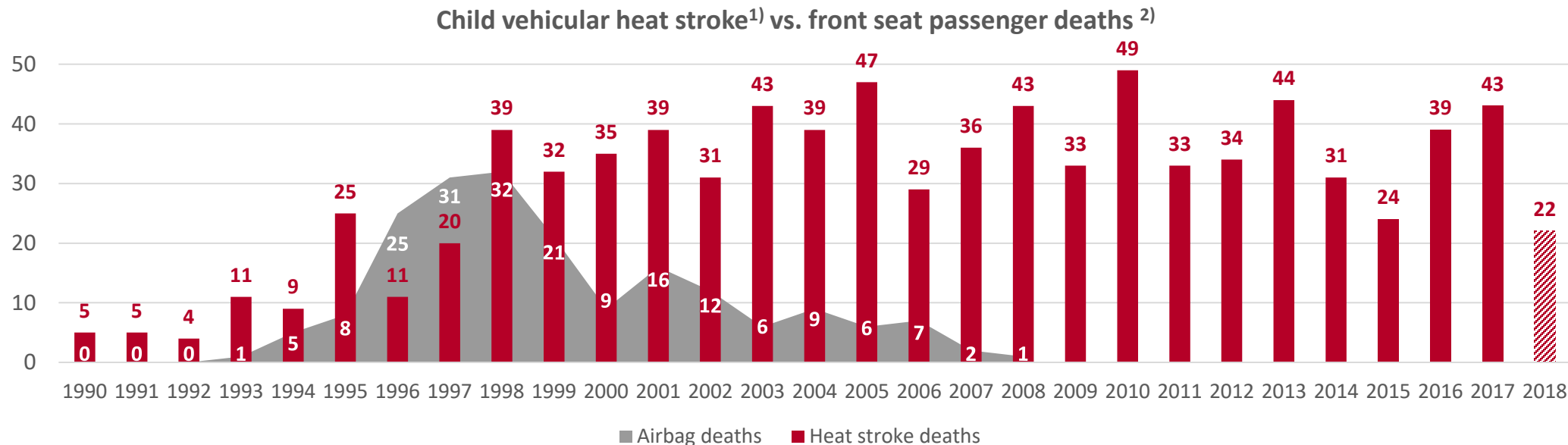




Heat Stroke Deaths of Children in Cars



Heat stroke vs. airbag related fatalities in U.S.



USA:

- In the 1990's about 120 children died due to airbags, and advanced airbags were mandated.
- Since 1998 about 750 children have died from heat stroke in the U.S. alone, on average 37 per year

Rest of the world:

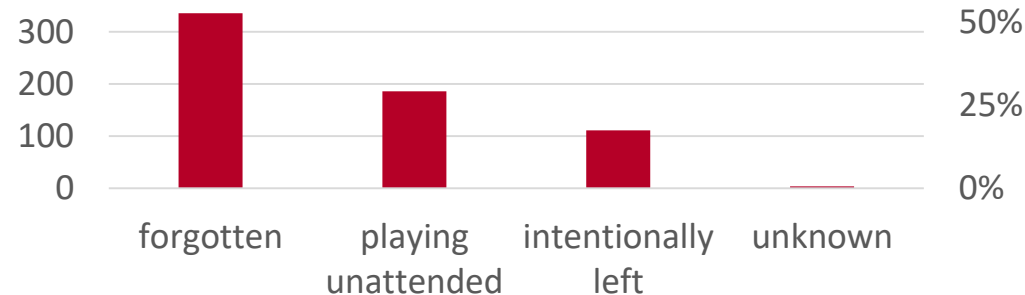
- Many known incidents, but there is no systematic monitoring.

Circumstances and Age of Victims

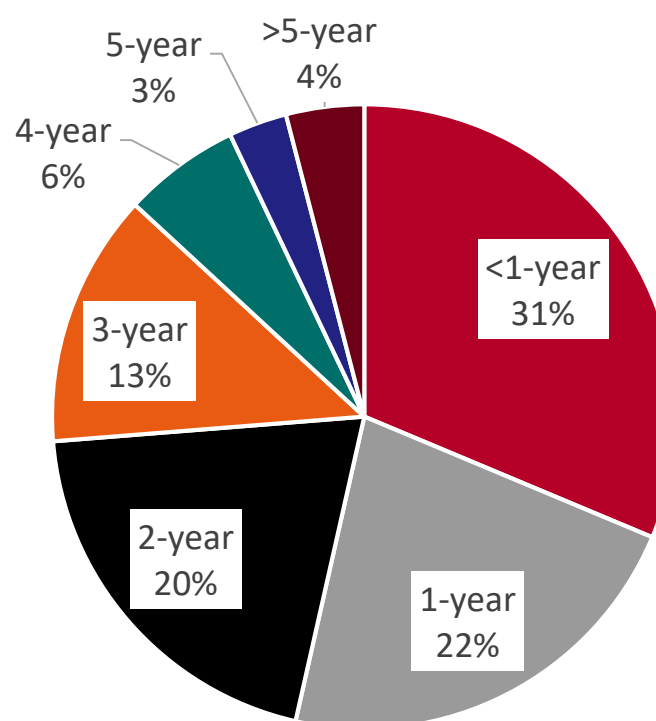
- People can forget their children in cars
 - When daily routine distracts them
 - When misunderstandings occur
 - When the children are out of sight
- Children can climb into unlocked cars (age 3+)
- Some children are intentionally left, as people are unaware of the risk
- The interior temperature of a vehicle can reach a critical level in 15 minutes
- Heat strokes happen to small children much faster than to adults



vehicular heat stroke death by circumstances¹⁾



vehicular heat stroke death by age¹⁾



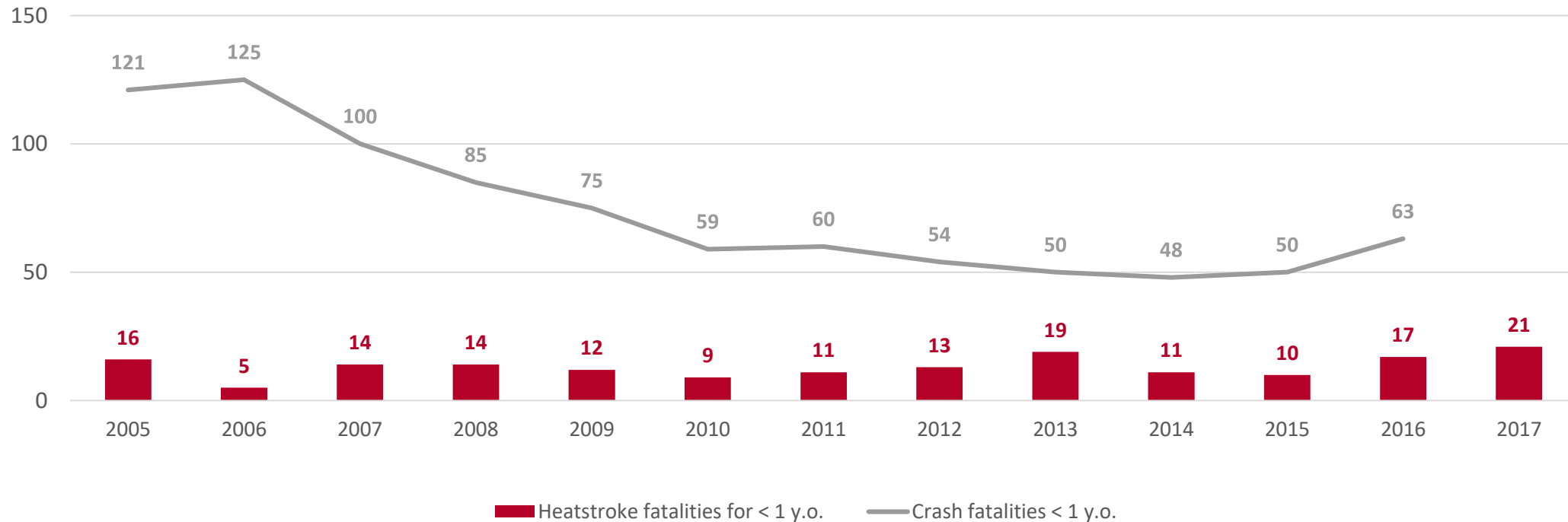
It is important to detect small (and often sleeping) children !

Heat Stroke Deaths of Infants < 1 y.o. in Cars



Comparing infant heat strokes to crash fatalities

Infant vehicular heat stroke¹⁾ vs. fatalities in car crashes²⁾



- Infant heat stroke fatalities are significant compared to car crash fatalities



Functional Principles

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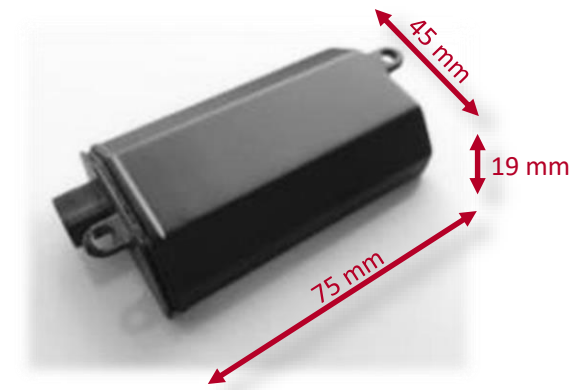
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VitaSense

System background

- VitaSense detects occupants based on their movements or breathing, even when they are sleeping
- VitaSense uses well-known 24 GHz low-power radio technology similar to burglar alarms and automatic doors
- Sleeping children are characterized by a low level of periodic motion, with a certain repetition rate
- VitaSense is mounted invisibly behind the head liner

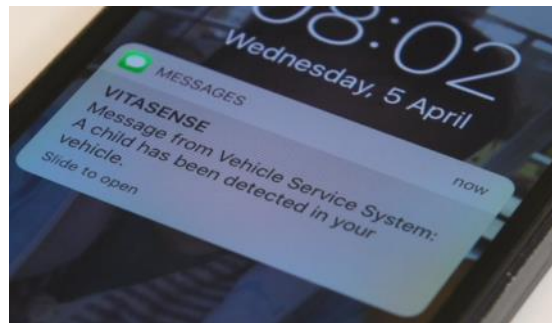
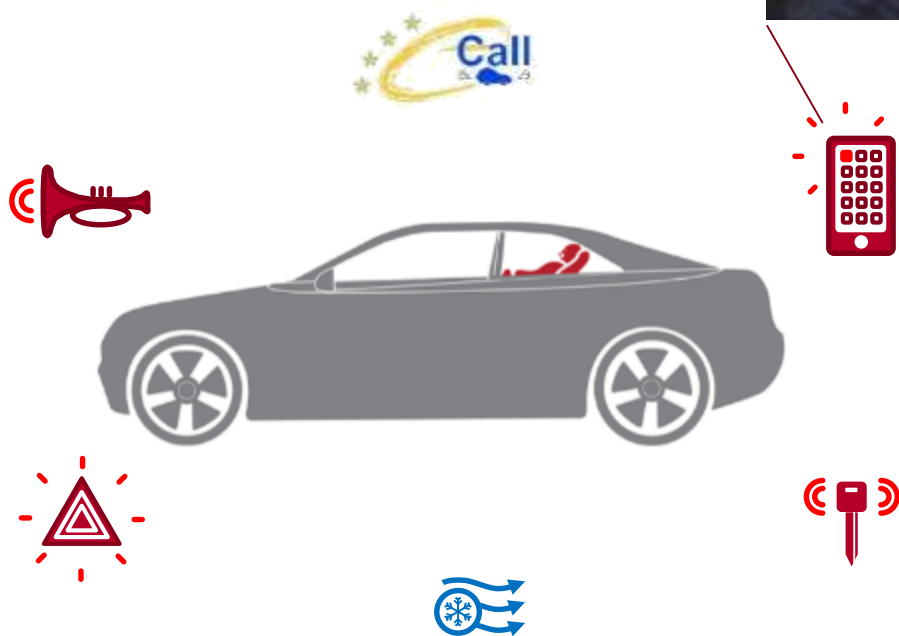


VitaSense

Enabling cars to save the children

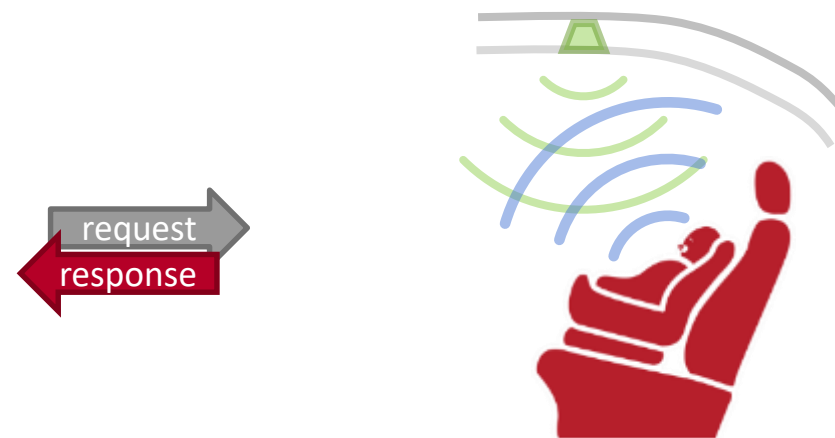
OEM - Vehicle

Warning and preventive actions

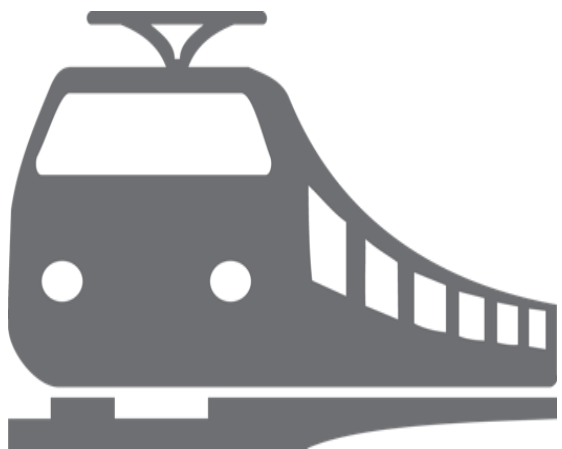


IEE - VitaSense

Detection of unattended child



- It does not take long for parents to be far away from a vehicle



Robust decision making

- Detection of all occupants
 - **Sleeping newborns**
 - Other children, adults, pets
 - Independent from CRS
- Robust decision making
 - Independent of air currents
 - Compatible with CRS sun shades and winter clothing
 - Distinguish breathing motions from background noise
 - Robust against false positives
- Vehicle based integration - direct communication to vehicle (e.g. LIN)



Advantages of low-power radio technology

- 2D Camera
 - Needs direct field of view
 - Does not work with sun shades in direct line of sight
- Infrared imaging
 - Can not differentiate between warm objects and living occupants
- Ultrasonic motion detection
 - Can not detect sleeping newborn
 - Can react on moving of air currents
 - Risk of false positives

⇒ Low-power radio technology can overcome all these disadvantages

- Algorithm functionality
 - Selection is dependent on the level of motion observed:
 - Low level of motion \Rightarrow no action taken
 - Medium level of motion \Rightarrow Data analyzed for presence of a periodic motion \Rightarrow qualification of presence
 - High level of motion \Rightarrow qualification of presence after a few seconds



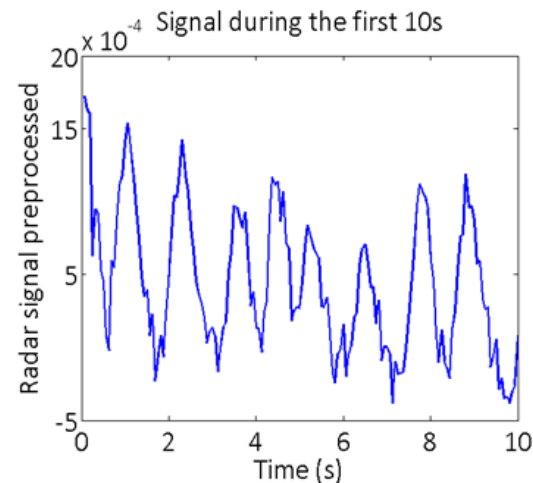
Simulating “worst case” occupants: The IEE live dummy

- Important to have a test tool as newborns are not easily available for frequent testing
- Build-up of “live dummy”:
 - Newborn-sized baby doll
 - Integrated bladder in the abdomen to simulate breathing

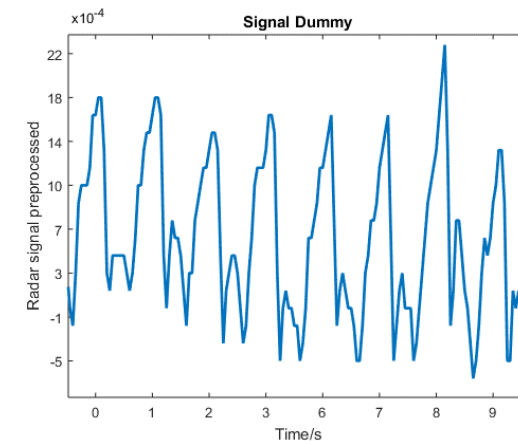
Complete test setup



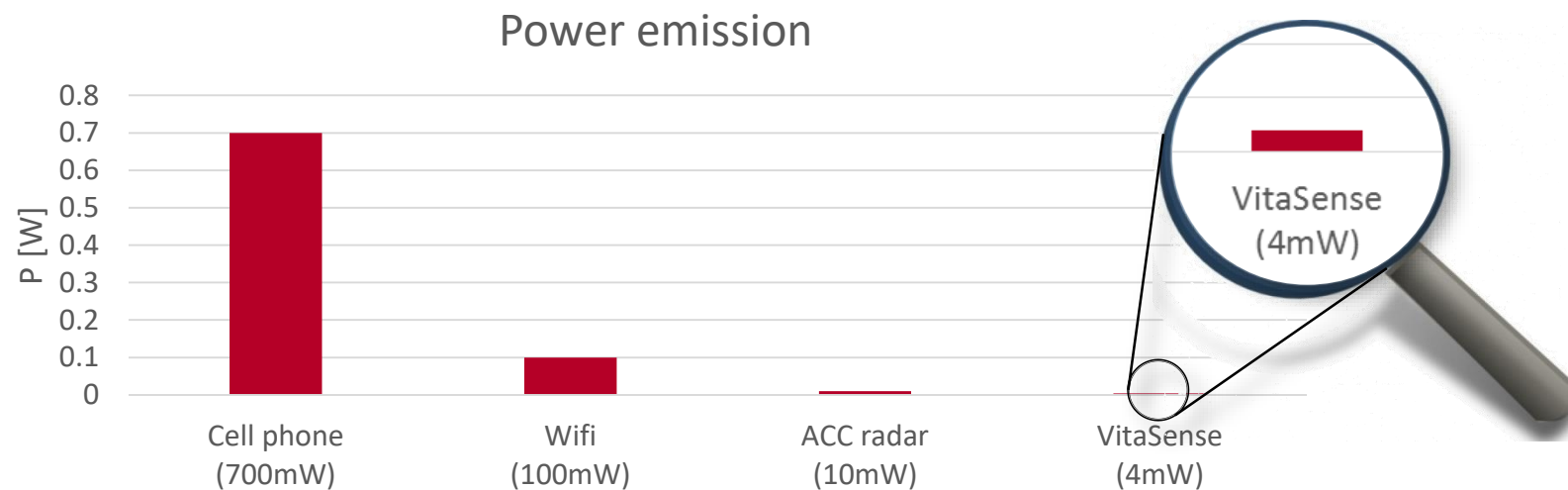
Reference baby signal



IEE “live dummy”



Non-harmful low-power emission



- VitaSense has a significantly lower level of transmitted power than other devices
 - A typical cell phone transmits power between 500 and 1000 mW
 - VitaSense transmits only 4 mW – and only for a short period of time
- The level of absorbed power per human body mass is significantly lower for VitaSense than e.g. for mobile phones
 - Limit according WHO: $SAR_{max}^1 = 2.0W/kg$
 - Mobile phone: $SAR \approx 0.1W/kg \dots 1.6W/kg$
 - VitaSense: $SAR \approx 0.005W/kg$



NCAP incentives, Rule-making trends and public awareness

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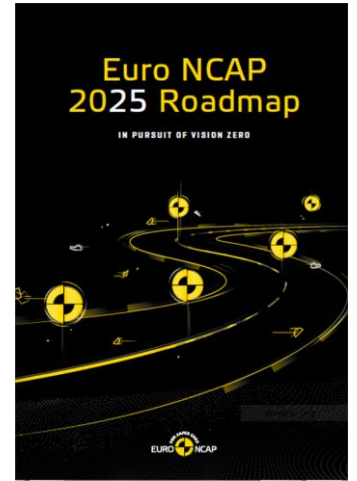
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NCAP Incentives



- "Child Presence Detection" – Function to be awarded in future NCAP roadmaps
- Euro NCAP 2025 Roadmap
 - *"From 2022, a reward is given to Child Presence Detection, which can detect a child left alone in a car and alert the owner and/or the emergency services, to avoid heatstroke fatalities."*
 - 4 points available within "Vehicle based assessment" under "Child safety"
- ASEAN NCAP: listed as Roadmap 2021-2025 topic



U.S. “HOT CARS” Act

- In September 2017, the “HOT CARS” Act was passed in the U.S. House of Representatives
- The “HOT CARS” Act requests the U.S. Department of Transportation (i.e. NHTSA) to issue a final rule within two years, requiring vehicles to be equipped with an alarm system that alerts the driver



KIDS AND CARS.ORG
LOVE THEM, PROTECT THEM

JUST IN...Victory for Parents and Children!

KidsAndCars.org is thrilled to announce that today the House of Representatives passed a bill containing our HOT CARS Act language to require technology that will help prevent children from dying of heatstroke in cars.

Their steadfast commitment for the safety and well-being of America's children is to be commended, recognized and celebrated!! This is a huge step in the right direction towards eliminating preventable hot car deaths of children in our country.

See the news release below issued by Sponsor Representative Tim Ryan (D-OH) and original cosponsors Representatives Jan Schakowsky (D-IL), and Peter King (R-NY).

We also want to thank our 11 cosponsors, Representatives Jose E. Serrano, (D-NY), Kathleen M. Rice (D-NY), Debbie Wasserman Schultz (D-FL), Robert A. Brady (D-PA), Thomas R. Suozzi (D-NY), Debbie Dingell (D-MI), Bruce Westerman (R-AR), Jim Cooper (D-TN), David E. Price (D-NC), Dennis A. Ross (R-FL) and Charlie Crist (D-FL).

Sending our sincere thanks, high-fives, many pats-on-the-back and a big collective hug from America's children.

CONGRESSMAN
Tim Ryan

FOR IMMEDIATE RELEASE
Wednesday Sept. 6 , 2017
Contact: Michael Zetts
[202.225.5261](tel:202.225.5261)

Unattended Child Detection

Public awareness

- IEE presented papers at several conferences, e.g. the **25th ESV conference** in Washington, the **Ircobi Conference** in Belgium, “Kids in Cars” in Munich
- IEE has won awards for VitaSense: **CLEPA Innovation Award** and **FEDIL Innovation Award**

Press coverage

- Press awareness is increasing around the world
- Recent Examples:
 - USA: [NBC Nightly News](#), [New York Times](#)
 - Korea: [MTN news](#)



WHEELS

Forgetting a Child in a Back Seat Can Kill. Cars May Soon Warn You.

Wheels

By PAUL STENQUIST OCT. 26, 2017



A House bill passed last month would require new cars to include a device for detecting children in the back seat. Matt Roth for The New York Times

Summary



- Heat stroke deaths of children in cars are a global issue
 - Detection of sleeping infants is important
- IEE's VitaSense is tailored for the detection of unattended children
 - Detects occupants based on motion, even newborns when they are sleeping
 - Car infrastructure is important to ensure warning and preventive actions
- NCAP and regulatory activities
 - Euro NCAP & ASEAN NCAP Roadmaps include "Child Presence Detection"
 - "HOT CARS" Act was passed in the U.S. House of Representatives

Thank you for your attention

You can see our VitaSense film at:

<https://www.youtube.com/watch?v=1qJRDcaDb-U>



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