Correlation Analysis of Vehicle Frontal Impact Parameters

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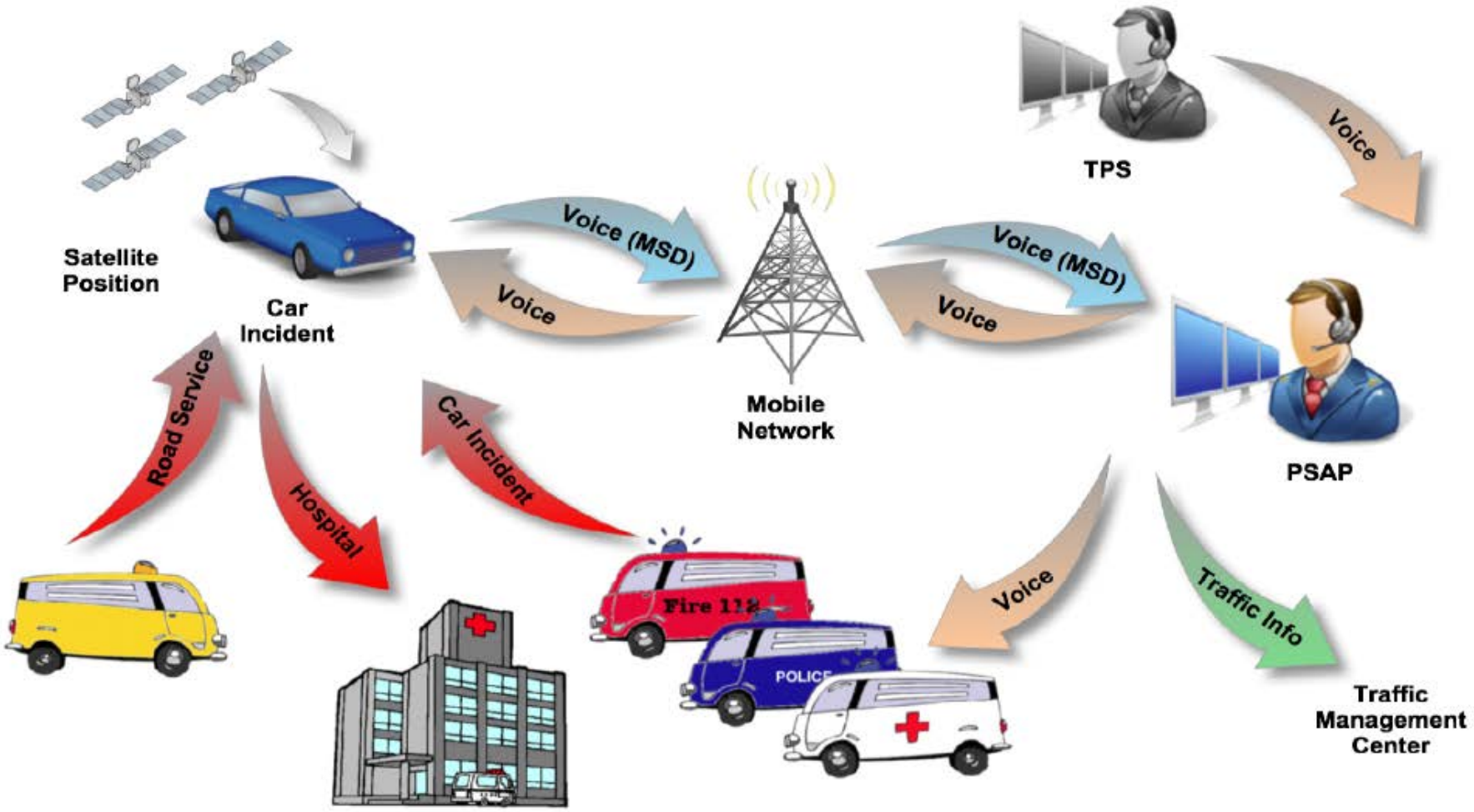
eCall

- Pan-European project
- Seamlessly functioning through Europe by April 2018.
- Automatically calls the nearest emergency center.
- Minimize time between an accident and Rescue Service arrival.
- More time saved equal more lives saved.
- Minimize accident cost.

eCall architecture



Source: HeERO

eCall – today

- The impact detection unit based on signals from accelerometers
- Signals from passive safety systems and crash sensors
- MSD (Minimum Set of Data)
  - Activation type
  - VIN code of the vehicle ISO 3779
  - Fuel type
  - Time of an accident
  - Vehicle location
  - Movement direction
  - Previous vehicle location
  - Numbers of fasten seatbelts
- Verbal communication with passengers
- Additional information from third parties

eCall – Detailed description of impact

- Finding parameters suitable for prediction of traffic accident consequences detected by eCall system with a focus on a M1 front collision category.
- Already implemented description of the accident based on:.
  - Type of impact
  - In cabin picture
  - Use of surrounding infrastructure
- Using correlation analysis

Input data – set of performed crash tests

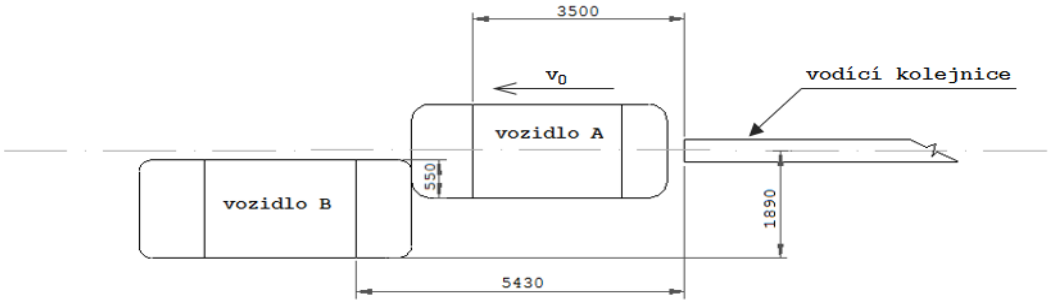
- Set of vehicle frontal collision crash tests
  - Favorit (rigid barier, overlap 100%)
  - Škoda Fabia (rigid barier, overlap 100%)
  - Škoda Rapid (rigid barier, overlap 100%)
  - Škoda Rapid (rigid barier, overlap 100%)
  - Renault 5 GTD (rigid barier, overlap 40%)
  - Škoda Roomster (ECE Regulation No. 94)
  - Škoda Fabia (second car, front inpact)

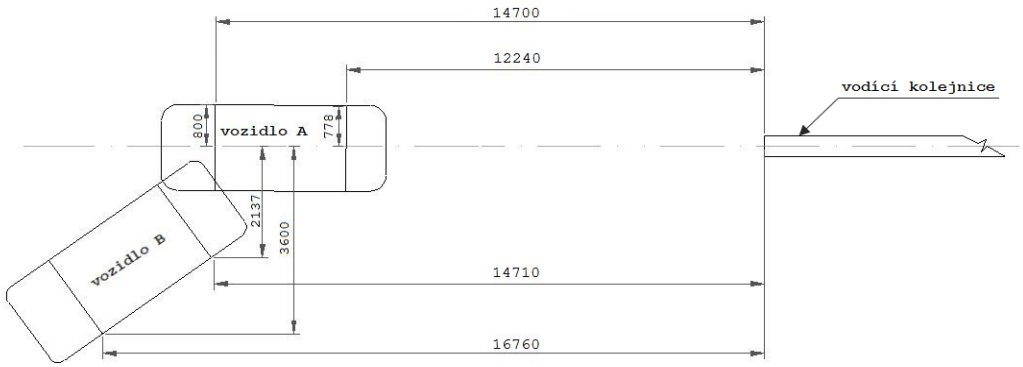
Crash tests - Parameters

- Frontal collision with a rigid barrier
  - Škoda Favorit
  - Škoda Rapid

Crash tests - Parameters

- Compatible impact
  - Škoda Fabia vs. Škoda Octavia
  - Škoda Roomster





- Source: Koyanda, J. First, J. Schejbalová, Z. Šotola, M.: *Kolize automobil – automobil II.* zpráva o testu. FD ČVUT v Praze, 2008. VÝZ616.004/07

Selecting of impact input parameters

- Test Vehicle

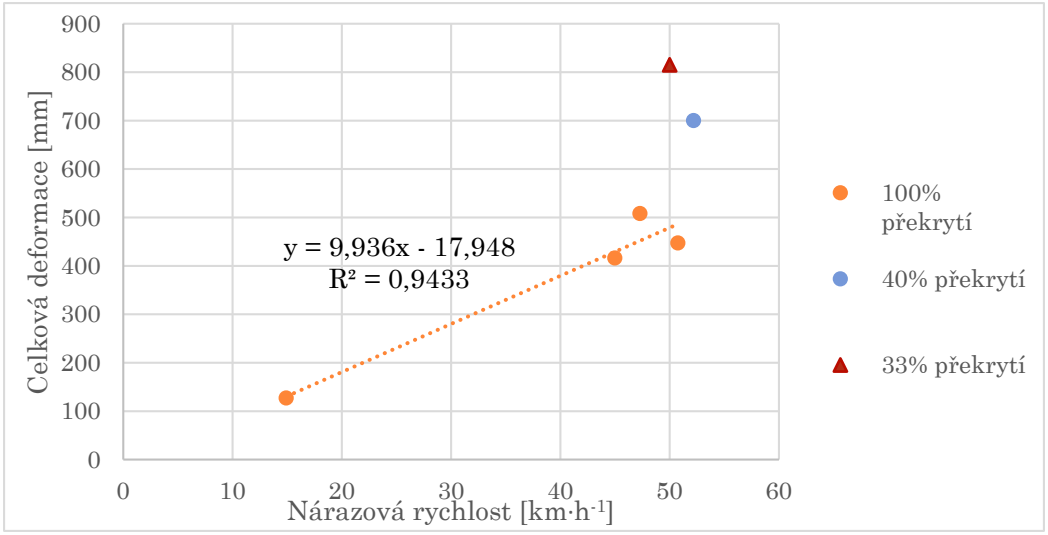
Testované vozidlo	Kolizní patrner	Údaje o vozidle						
		Překrytí [%]	Čelní airbag	V0 [km/h]	m [kg]	Ek [kJ]	amax [m/s2]	Deformace [mm]
Škoda Fabia	Pevná bariéra	100	Ano	50,8	1208	120	620	447
Škoda Favorit	Pevná bariéra	100	Ne	47,3	875	76	460	508
Škoda Rapid	Pevná bariéra	100	Ano	45,0	1235	96	378	416
Škoda Rapid	Pevná bariéra	100	Ne	14,9	1122	10	116	127
Renault 5 GTD	Pevná bariéra	40	Ne	52,2	939	99	345	700
Škoda Roomster	Deform. bariéra	40	Ano	56,2	1542	188	Ne	Ne
Škoda Fabia	Škoda Octavia	33	Ano	50,0	1157	112	176	815

- Test Dummies

Testované vozidlo	Kolizní patrner	Figuría řidiče		Ostatní figuríny		
		amax [m/s2]	HIC [-]	Umístění ve vozidle	amax [m/s2]	HIC [-]
Škoda Fabia	Pevná bariéra	510	302,9	Spolujezdec	2277	4139,0
Škoda Favorit	Pevná bariéra	2490	2205,6	Dítě	709	706,0
Škoda Rapid	Pevná bariéra	460	180,4	Ne	Ne	Ne
Škoda Rapid	Pevná bariéra	Ne	Ne	Ne	Ne	Ne
Renault 5 GTD	Pevná bariéra	Ne	Ne	Dítě	857	612,0
Škoda Roomster	Deform. bariéra	Ne	359,3	Spolujezdec	Ne	385,6
Škoda Fabia	Škoda Octavia	Ne	Ne	Ne	Ne	Ne

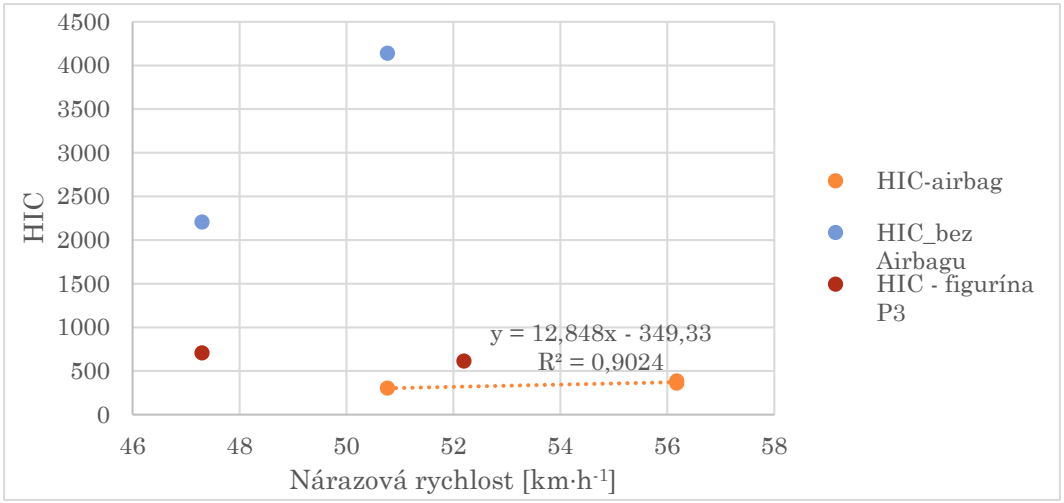
REGRESSION FUNCTION DETERMINATION

- Deformation of the body vs Impact Velocity



- R = 0,97144
- n = 4

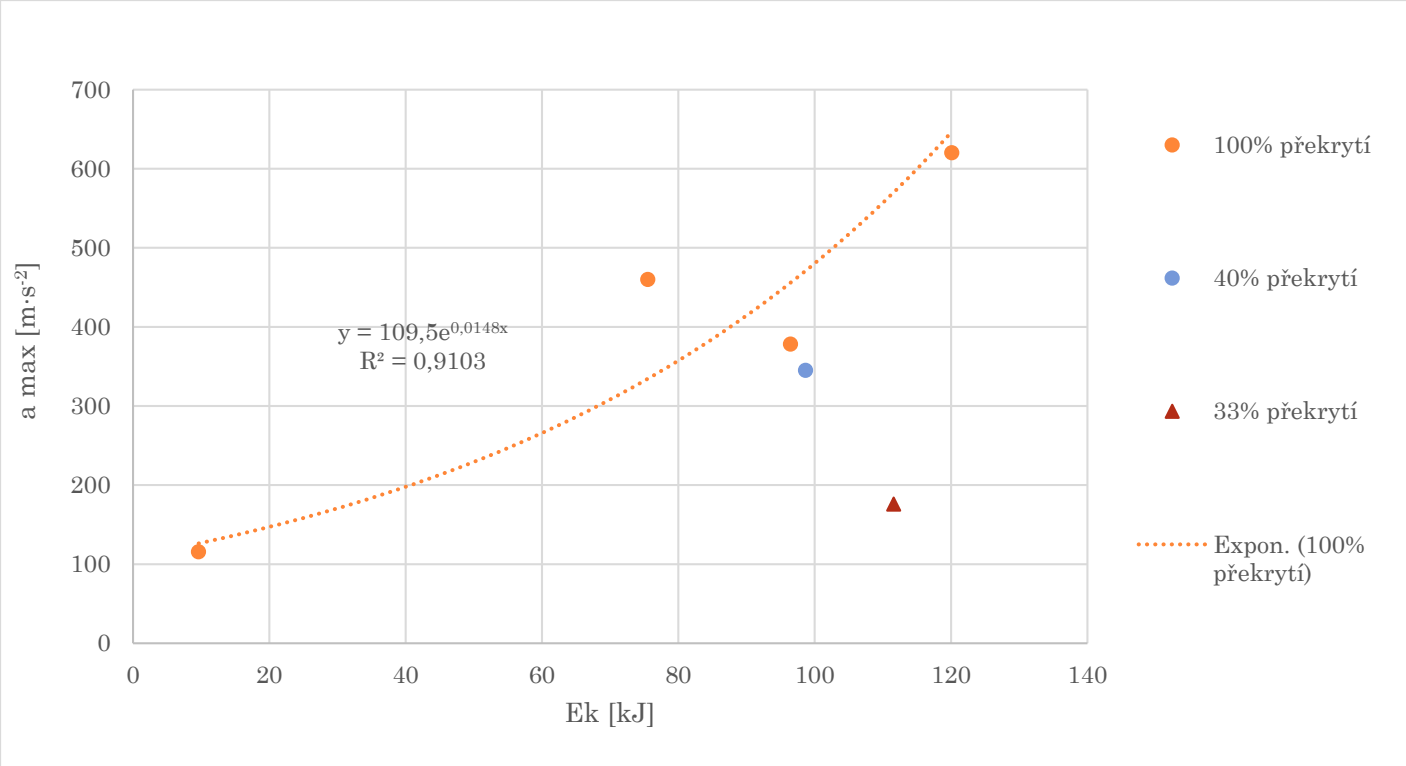
- HIC vs Impact Velocity



- R = 0,9499
- n = 3

REGRESSION FUNCTION DETERMINATION

- Maximal deceleration of the vehicle body vs vehicle kinetic energy.



- R = 0,954
- n = 4

Conclusions

- Parameters for more accurate description of the traffic accidents consequences were derived.
- Solution with respect to eCall system.
- Usage of information from eCall measuring unit.
- Dependency between selected parameters are described through regression functions.
- Small amount of input values.

Thank you for your attention