



## Phase 2 and 3 of GRSP informal group

**General reflections  
and available results  
« efficiency of ISOFIX connectors (rigid) »**

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## Informal group Phase 2 and 3 - **General reflections**

Lot of technical points already listed or investigated, (accidentology, CASPER and EPOCH outputs, CRS and car compatibility, bench geometry,...)

Necessity to have consumers better informed, on use of CRS, how to chose them, how to use them correctly,

R44/04 should still be in place for a long time if too much delays are introduced into the new regulation

Sales department : asking for categories of product that are may be not always the best solutions to protect children

**It's time to initiate reflections on specific items :**  
**shields, seatbelt routing requirements, ISOFIX connection for boosters, ...**

# Phase 2: Boosters with connection to rigid ISOFIX anchorages

How to get consumer lost?

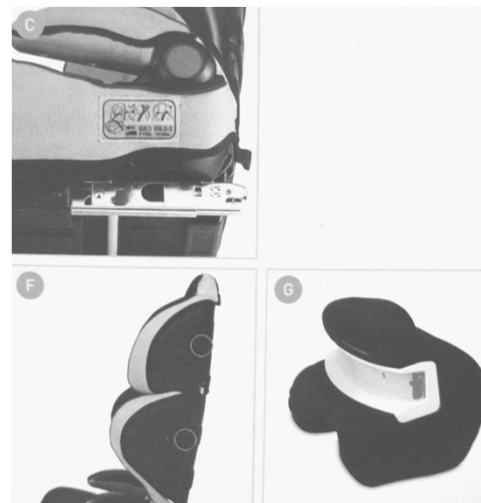
## Need for harmonization of the names

### Today:

- Many CRS with isofix connection possibilities are named with the extension CRS-FIX but not always
- Connections on the CRS side have different names (including ISOFIX, SEATFIX, TWINFIX,...)
- But the use of FIX at the end of CRS name do not necessarily implied that the CRS has ISOFIX connection possibilities.



## RodiFix



Isofix-  
Verankerungs-  
punkte

# Phase 2: Boosters with connection to rigid ISOFIX anchorages

## Define characteristics for ISOFIX connection

**Today:** systems approved R44 / 04

- rigid connectors
- soft connectors



## Define systems on which it is applicable



## Phase 2 and 3: Boosters considered as seatbelt positioners

**We have to be cautious with the definition of limits in which a booster can be used without upper seatbelt guide**

system approved R44 / 04

-How can we say that the upper part of the seatbelt is correctly positioned on the shoulder ?  
(especially for a 15 kg child)



# Phase 2 and 3: Boosters considered as seatbelt positioners

## Same with CRS with backrest

system approved R44 / 04

Do we consider this kind of boosters as sufficiently guiding the seatbelt?

Are such devices used by consumers  
Are they sufficiently efficient?

Very poor seatbelt route indicator

Does not guarantee that seatbelt will be on the thighs



CRS-35-03e

# Phase 2 and 3: Boosters considered as seatbelt positioners

## How to ensure good lap belt routing?

system approved R44 / 04

15 - 25 kg

Sufficient?

Lap part of seatbelt directly guided on the abdomen of the child  
*(15-25 kg = under 6 year old often)*

No comment!

Protect your child

# Phase 2 and 3: Boosters considered as seatbelt positioners

How to ensure good lap belt routing?

systems approved R44 / 04



OK=Pulling the lap belt forward on the thighs

HIGH RISK OF MISUSE



No lap belt guidance



# Phase 2 and 3: Boosters considered as seatbelt positioners

Do we have to define or limit functionalities?

If not, in which configurations products have to be homologated?



## Phase 2 and 3: Boosters considered as seatbelt positioners

**After phase 3, this kind of product should not exist any longer!  
(for 15 kg and neither for 36 kg)**

system approved R44 / 04

**15 - 36 kg**



## New regulation: i-size

Do we intend to enforce the communication around the correct use?



Pictures in catalogs have to show the good example



Parents on forum are exchanging their experiences (CRS choice) and pictures without any external advice possible

*(appropriate use, misuse, etc...)*

# Phase 2: Boosters with connection to rigid ISOFIX anchorages

## Connecting a booster to rigid ISOFIX anchorages:

Is there any safety benefit?

During 34th meeting LAB was given an action on this item.

- Mechanical approach
- Experience with Q6 dummy in CASPER
- Work plan



# Phase 2: Boosters with connection to rigid ISOFIX anchorages

## Is there any safety benefit?

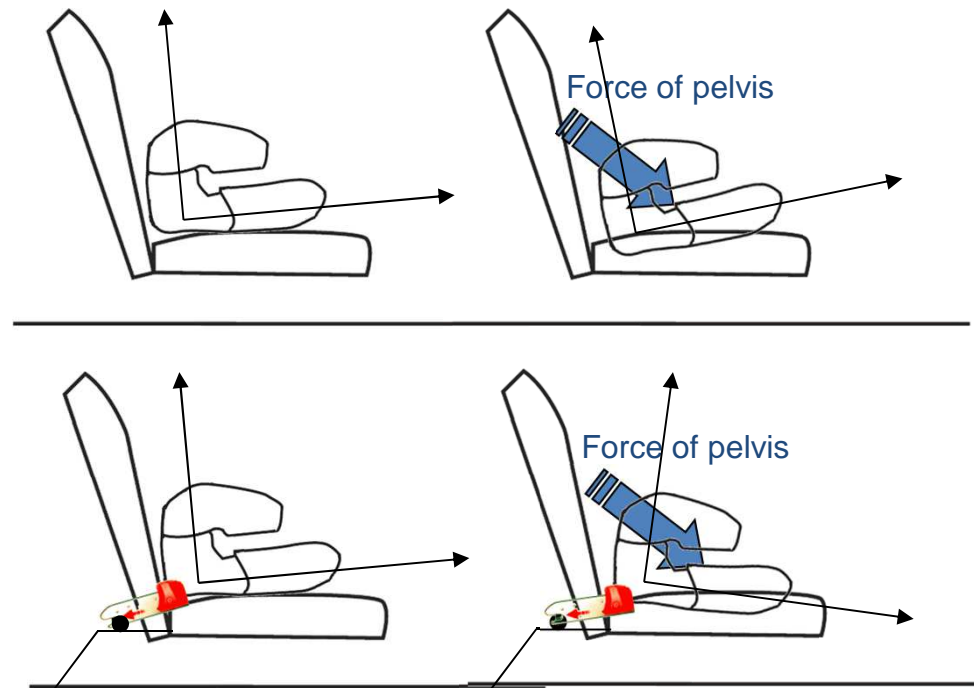
### Mechanical approach (1/2)

-Frontal impact

-When restraint at the rear, the behavior of the booster should be different: diving effect, no anti-submarining effect of the booster: higher chance that the child slides under the seatbelt.

-Same with dummy (if able to reproduce submarining)

- Without ISOFIX restraint, the seatbelt goes onto the pelvis and the seatbelt guides of the booster create a tension on the seatbelt that works like a slipknot around the pelvis.



## Phase 2: Boosters with connection to rigid ISOFIX anchorages

Is there any safety benefit?

### Mechanical approach (2/2)

#### -Side impact

- on the struck side: if intrusion is not finished when the vehicle starts moving, then it is beneficial to have rigid ISOFIX connectors pulling away the restraint system.
- On the non struck side ISOFIX connection (rigid) should limit the head excursion.

# Phase 2: Boosters with connection to rigid ISOFIX anchorages

Is there any safety benefit?

## Experience with Q6 dummy in CASPER

### – Test conditions

- **Purpose** : To Study the behavior in frontal impact
- of a child dummy with and without misuse
- Collaboration LAB / UTAC - 17 tests performed in November 2011
- Test set up:
  - UTAC reverse Catapult, R44 Pulse
  - Peugeot 807 Car body
  - 2 CRS : Britax Kid Fix (*Q6 with abdominal sensors*),



# Phase 2: Boosters with connection to rigid ISOFIX anchorages

## Is there any safety benefit?

### Experience with Q6 dummy in CASPER

#### – ISOFIX /seatbelt

- Frontal Impact – Experience with booster seat

- Q6: Three configurations tested :
1. No CRS
  2. Kidfix with ISOFIX
  3. Kidfix without using ISOFIX



Test	Head Resultant Accel 3ms	Thorax Resultant Accel 3ms	Pelvis Resultant Accel 3ms	Abdomen Pressure (bar)
Without CRS	76,8	65,6	58,1	1,11
CRS + ISOFIX	64,1	59,4	54,2	0,31
CRS without ISOFIX	68,8	59,2	55,2	0,28

- Similar behaviour of the CRS with or without ISOFIX

*Note: this CRS is equipped with an integrated load limitation in the ISOFIX connectors*



# Phase 2: Boosters with connection to rigid ISOFIX anchorages

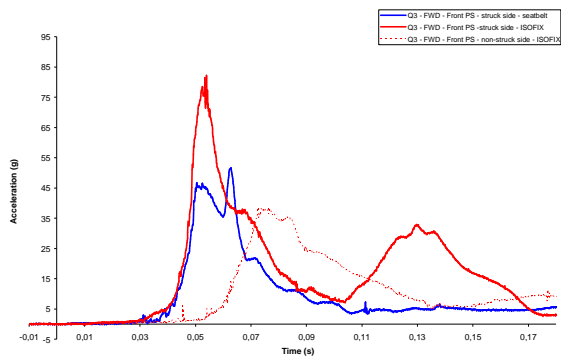
Is there any safety benefit?

## Experience in CASPER : ISOFIX vs seatbelt

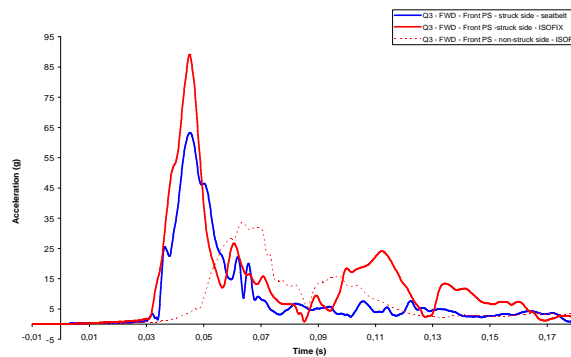
- Side Impact
  - No experience with booster seat,
  - only with G1 and G0+

Q3 in G1 on the struck side:

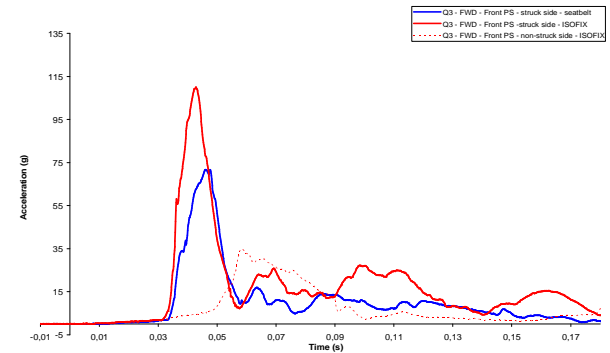
**Higher accelerations observed with ISOFIX**  
**No neck values in reference test**  
**No data on non-struck side G1 FWD FC**



Head acc.



Chest acc.



Pelvis acc.

# Phase 2: Boosters with connection to rigid ISOFIX anchorages

## Is there any safety benefit?

### Experience in CASPER : ISOFIX vs seatbelt

#### – Side Impact

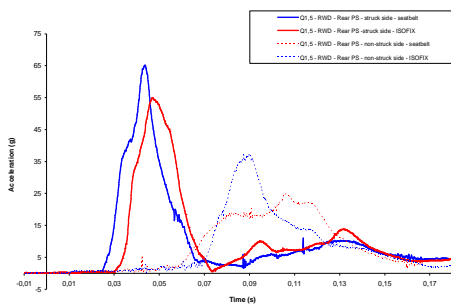
Q1 1/2 in G0+ on the struck side:

Acceleration shows different maximum values and timing

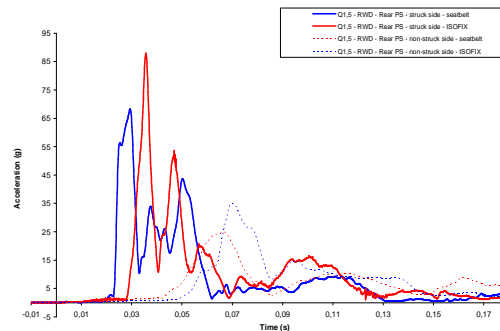
Neck loads relatively similar

Important note: The CRS which is tested with seatbelt is not on the basis

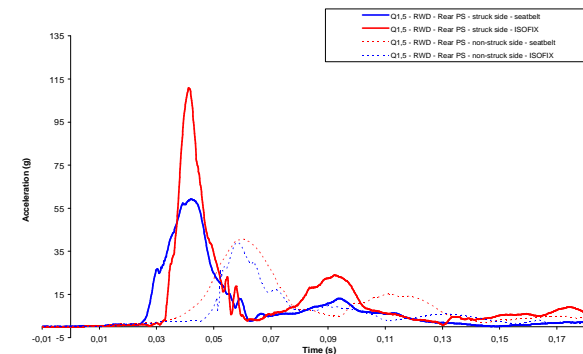
(= lighter and different structure)



Head acc.



Chest acc.



Pelvis acc.

## Phase 2: Boosters with connection to rigid ISOFIX anchorages

Is there any safety benefit?

### Experience in CASPER : ISOFIX vs seatbelt

#### – Side Impact

Q1 1/2 in G0+ on the non - struck side:

Acceleration values are higher with the seatbelt

Hard contact with the CRS on the struck side when fixed by seatbelt

Risk of misuse using seatbelt vs ISOFIX basis is huge in the everyday use (*requires to be installed for each travel*)



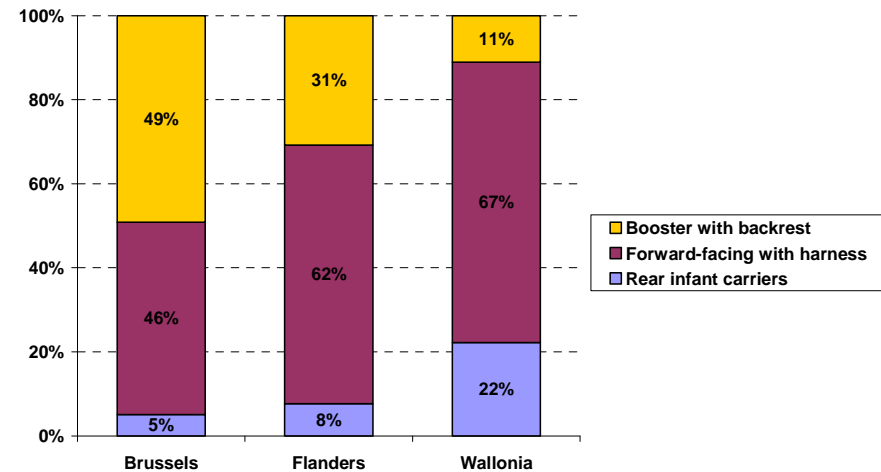
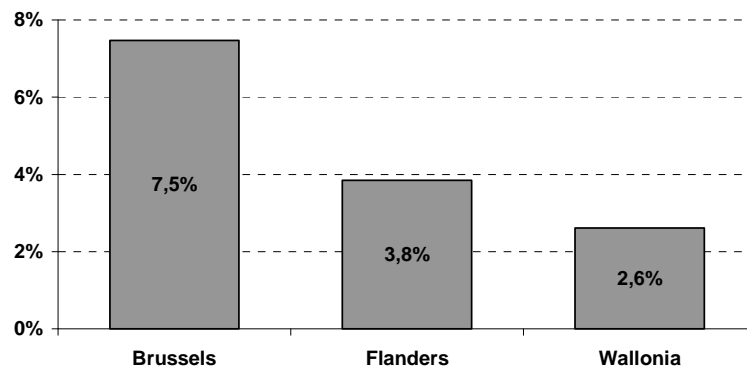
# Phase 2: Boosters with connection to rigid ISOFIX anchorages

## Is there any safety benefit?

### Experience in CASPER : ISOFIX vs seatbelt

#### – Field data on misuse

Extracts from the first roadside survey of child restraint system use and misuse in Belgium (*n= 1,473 children*)  
About 5% using ISOFIX systems



## Phase 2: Boosters with connection to rigid ISOFIX anchorages

Is there any safety benefit?

### Experience in CASPER : ISOFIX vs seatbelt

- Field data on misuse

Decrease of the misuse rate for ISOFIX CRS: 13% versus 30%.

- Isofix FWD harness misuse rate is 8% versus 23%,
- Isofix booster seats misuse rate is 19% vs 32% for booster devices  
*(no significant difference between booster seats and booster cushions in the misuse distribution).*

*No « technical » reason for this difference as the misuse that is mainly reduced is the « seatbelt under the arm » (may be thanks to a better design of a new generation of CRS)*

# Phase 2: Boosters with connection to rigid ISOFIX anchorages

## Is there any safety benefit?

### Summary

- **On going works on geometrical compatibility, shield systems,...**
- **Need to well defined booster characteristics** in the new regulation to avoid bad design solutions, and to make consumer vision clearer
- **Few data available at this day on:**
  - **ISOFIX connection of boosters vs seatbelt** with Q dummies equiped with chest deflection and abdominal sensors
  - **ISOFIX CRS (all types) in lateral impacts** (in vehicle test conditions) – benefits do not seems very clear
  - **Use and misuse of ISOFIX** – only one study leading to the conclusion that the safety benefit is not coming from the technical side only.

# Phase 2: Boosters with connection to rigid ISOFIX anchorages

## Is there any safety benefit?

### Work plan

if necessary LAB is candidate

- to collect and manage available data around the table
  - define test program with test labs if necessary (and potential candidates)
  - to make the follow up and synthesis of analysis of new data
- Need of collaborations of different actors in charge of testing

THANKS

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