



# **CAD – Investigation on R2- ISOFIX Envelope for GRSP Informal Group**

18.11.2009

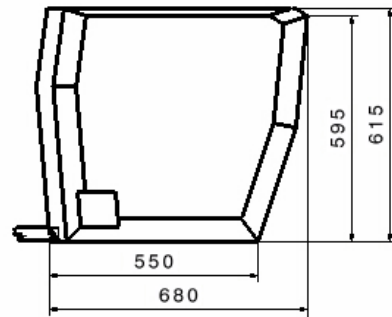
## Objectives

- Evaluation of the available space, defined by R1 and R2 ISOFIX envelopes using CANDAT occupant dimensions.
- Proposal of balance between occupant maximum size/CRS size and R2 ISOFIX envelope capacity.

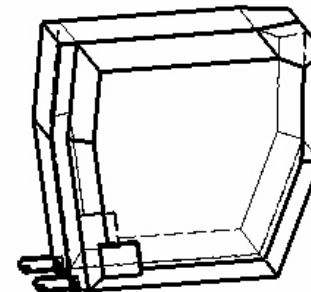
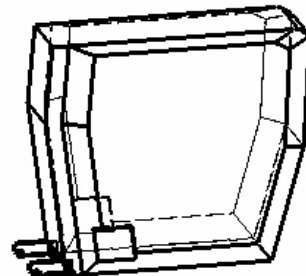
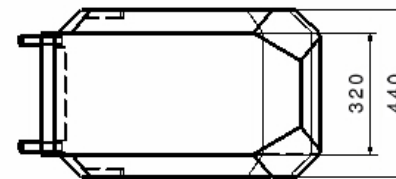
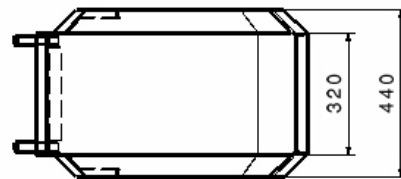
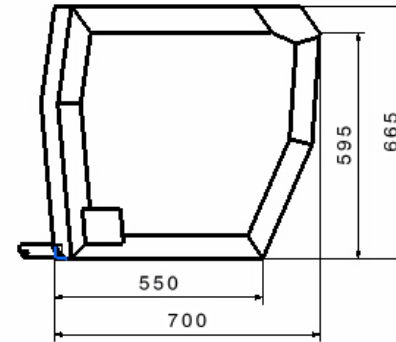
## Methodology

- R1 and R2 envelope applied to the CAD system
- Current ISOFIX RF seat group 0+
- Dummy definition by CANDAT data
- Adjustment of CRS size and position to determine maximum occupant size, while **staying within R2**.

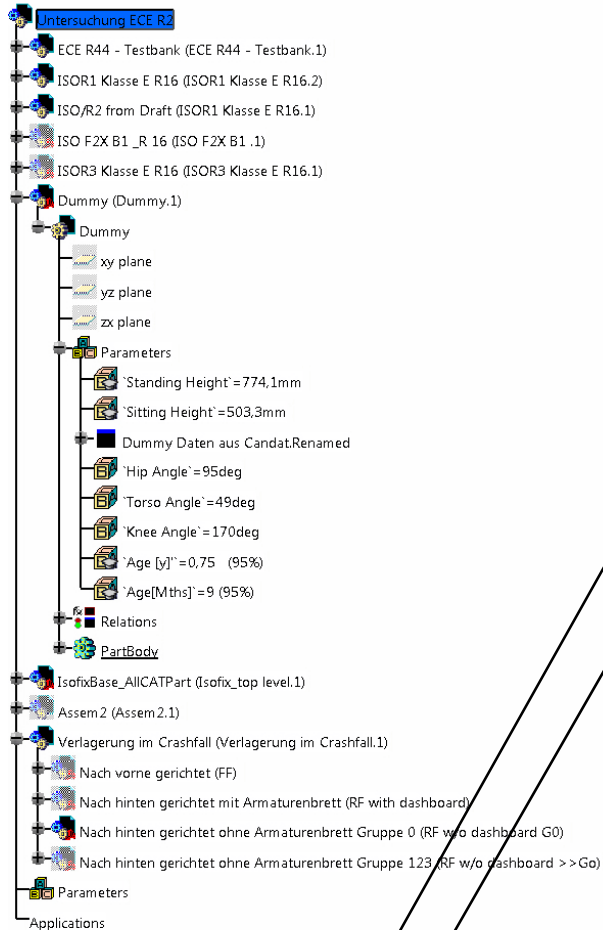
## ISO/R1 Envelope



## ISO/R2 Envelope



# 9 months, 95percentile – Initial Position



R1 Envelope  
R2 Envelope

95-percentile  
9months  
Sitting height: 503  
Standing height: 774

Changes to original  
BabySafe-Position:

X-travel: -  
Torso-A: -  
Hip-A: -  
Knee-A: +10°

Q dummy data

| Dummy  | Mass [kg] | Stature [cm] | Sitting height [cm] |
|--------|-----------|--------------|---------------------|
| Q0     | 3,4       |              | 35,4                |
| Q1     | 9,6       | 74           | 47,9                |
| Q1 1/2 | 11        | 80           | 49,9                |
| Q3     | 14,5      | 98,5         | 54,4                |
| Q6     | 23        | 114,5        | 60,1                |

# 1 year, 95percentile Limits of R1 envelope

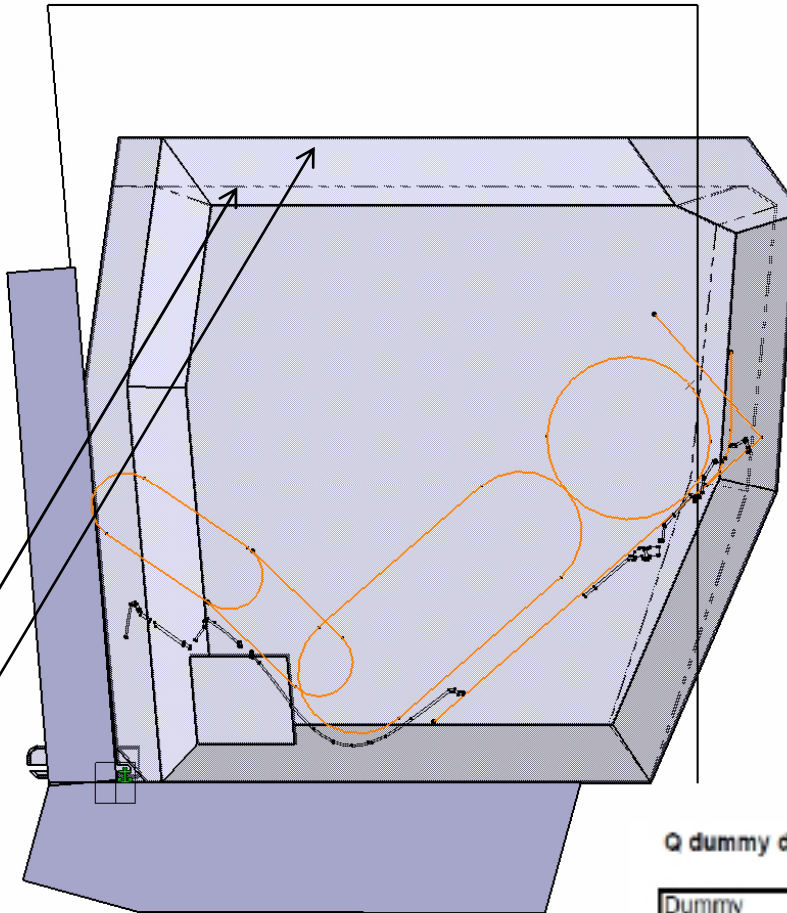


Untersuchung ECE R2

- ECE R44 - Testbank (ECE R44 - Testbank.1)
- ISOR1 Klasse E R16 (ISOR1 Klasse E R16.2)
- ISO/R2 from Draft (ISOR1 Klasse E R16.1)
- ISO F2X B1\_R 16 (ISO F2X B1 .1)
- ISOR3 Klasse E R16 (ISOR3 Klasse E R16.1)
- Dummy (Dummy.1)
  - Dummy
    - xy plane
    - yz plane
    - zx plane
  - Parameters
    - 'Standing Height'=801,2mm
    - 'Sitting Height'=515,3mm
    - Dummy Daten aus Candat.Renamed
    - 'Hip Angle'=95deg
    - 'Torso Angle'=49deg
    - 'Knee Angle'=170deg
    - 'Age [y] '=1 (95%)
    - 'Age[Mths] '=12 (95%)
  - Relations
  - PartBody
- IsifixBase\_AllCATPart (Isifix\_top level.1)
- Assem2 (Assem.2.1)
  - Verlagerung im Crashfall (Verlagerung im Crashfall.1)
    - Nach vorne gerichtet (FF)
    - Nach hinten gerichtet mit Armaturenbrett (RF with dashboard)
    - Nach hinten gerichtet ohne Armaturenbrett Gruppe 0 (RF w/o dashboard G0)
    - Nach hinten gerichtet ohne Armaturenbrett Gruppe 123 (RF w/o dashboard >>Go)
  - Parameters
- Applications

R1 Envelope  
R2 Envelope

Maximum Baby-size for BabySafe shell!  
Baby-Safe reaches R1 borderline!



95-percentile  
12months  
Sitting height: 515  
Standing height: 801

Changes to original  
BabySafe-Position:

X-travel: +10mm  
Torso-A: -  
Hip-A: -  
Knee-A: +10°

Q dummy data

| Dummy  | Mass [kg] | Stature [cm] | Sitting height [cm] |
|--------|-----------|--------------|---------------------|
| Q0     | 3,4       |              | 35,4                |
| Q1     | 9,6       | 74           | 47,9                |
| Q1 1/2 | 11        | 80           | 49,9                |
| Q3     | 14,5      | 98,5         | 54,4                |
| Q6     | 23        | 114,5        | 60,1                |

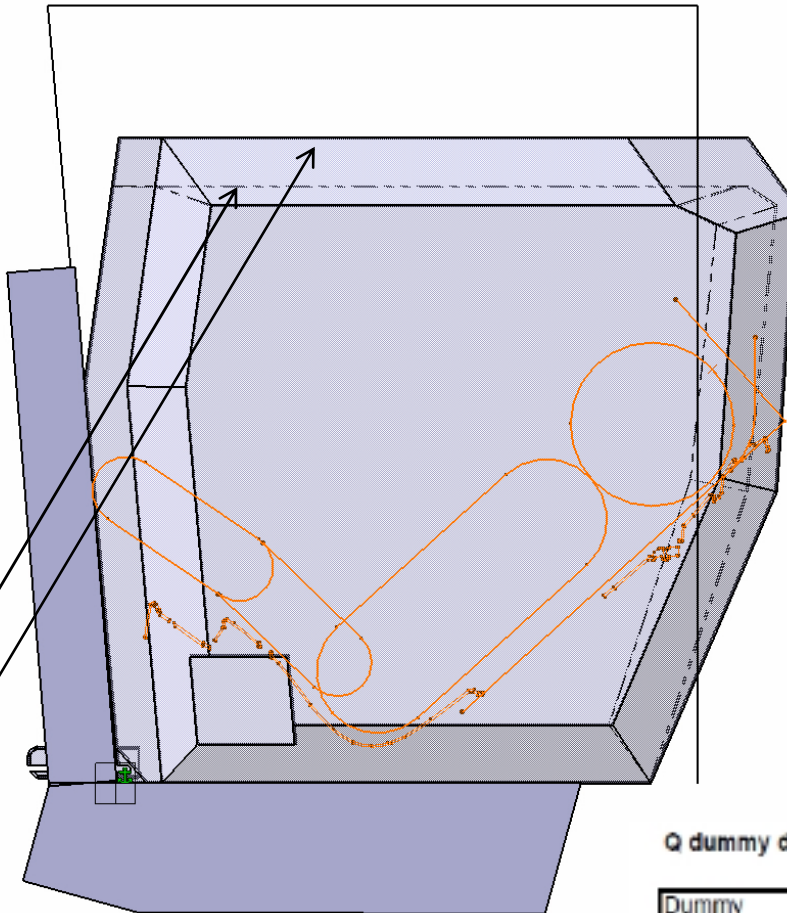
# 15 months, 95percentile Limits of R2 envelope



- Untersuchung ECE R2
- ECE R44 - Testbank (ECE R44 - Testbank.1)
- ISOR1 Klasse E R16 (ISOR1 Klasse E R16.2)
- ISO/R2 from Draft (ISOR1 Klasse E R16.1)
- ISO F2X B1\_R 16 (ISO F2X B1 .1)
- ISOR3 Klasse E R16 (ISOR3 Klasse E R16.1)
- Dummy (Dummy.1)
  - Dummy
  - xy plane
  - yz plane
  - zx plane
  - Parameters
    - 'Standing Height'=838,2mm
    - 'Sitting Height'=528,1mm
    - Dummy Daten aus Candat.Renamed
    - 'Hip Angle'=94deg
    - 'Torso Angle'=48deg
    - 'Knee Angle'=170deg
    - 'Age [y] '=1,25 (95%)
    - 'Age[Mths] '=15 (95%)
  - Relations
  - PartBody
- IsifixBase\_AICATPart (Isifix\_top level.1)
- Assem2 (Assem2.1)
  - Verlagerung im Crashfall (Verlagerung im Crashfall.1)
    - Nach vorne gerichtet (FF)
    - Nach hinten gerichtet mit Armaturenbrett (RF with dashboard)
    - Nach hinten gerichtet ohne Armaturenbrett Gruppe 0 (RF w/o dashboard G0)
    - Nach hinten gerichtet ohne Armaturenbrett Gruppe 125 (RF w/o dashboard >>Go)
  - Parameters
- Applications

R1 Envelope  
R2 Envelope

**New shell contour reaches R2 borderline!**



95-percentile  
15months  
Sitting height: 528  
Standing height: 832

Changes to original  
BabySafe-Position:

X-travel: +30mm  
Torso-A: -1°  
Hip-A: -1°  
Knee-A: +10°

Q dummy data

| Q dummy | Mass [kg] | Stature [cm] | Sitting height [cm] |
|---------|-----------|--------------|---------------------|
| Q0      | 3,4       |              | 35,4                |
| Q1      | 9,6       | 74           | 47,9                |
| Q1 1/2  | 11        | 80           | 49,9                |
| Q3      | 14,5      | 98,5         | 54,4                |
| Q6      | 23        | 114,5        | 60,1                |

# GRSP Informal Group – RF Subject

## Illustration of one of the comfort issues



### Installation Check – 18 month Handling Dummy/Infant Carrier RF

- Sitting height: 503 (50%)
- Hits limits of R2 box

• Legs are already in a more upright position and do not have contact to the shell → comfort issues



## Summary

- R1 ISOFIX envelope is going to be exceeded by adjusted CRS size to dimensions of the dummy stature of an age above **12 months/95%**, based on the CANDAT data.
- R2 ISOFIX envelope is going to be exceeded by adjusted CRS size to dimensions of the dummy stature of an age above **15 months/95%**, based on the CANDAT data.
- Above 15 month/95% RF position is obtainable, but will compromise occupant comfort
  - More upright position of the occupant
  - Decreased angle between torso and legs of the occupant
  - Risk for the parents to switch earlier to FF position due to comfort



## Conclusion

- **Recommendation to Informal Group to define switch from RF to FF at an age of 15 months to ensure, we stay within R2 ISOFIX envelope.**
- **Need for confirmation by OEM's if R2 ISOFIX envelope is accepted.**