Low-technology child restraint car seat

Country of origin | United States of America

Health problem addressed

Children travelling in a vehicle are at an increased risk for injury or death if they are unrestrained, especially in low- and middle-income countries which account for 93% of child deaths. Therefore, child restraint systems (CRS) are an effective way to mitigate the risk of injuries in a crash.

Product description

The device is a low-tech child restraint made from materials readily available in developing settings (steel, plywood and cotton). The design was evaluated against the U.S. Federal standards crash safety for child restraints. The primary innovations are the use of low-cost materials and low-tech manufacturing processes, and the novel open-source design promotion.

Product functionality

The device distributes restraint forces over the torso of the child and reduces the likelihood of contact with the interior. The system is designed to be used with either two- or three-point vehicle safety belts to secure the device to the vehicle. The device can be used rearward facing for infants or forward-facing for appropriate age ranges.

Developer’s claims of product benefits

The restraint is intended to be a sustainable technology to improve road safety for child vehicle occupants in developing settings. It is designed using widely available materials so that the fabrication can occur within the country for which it is intended. It is a low-tech device that requires minimal capital investment – the manufacturing process does not depend on expensive techniques. This would allow for the child restraint to be sold at low cost. The integrity of the design is validated using the dynamic testing methods described by the Federal Motor Vehicle Safety Standard of the U.S. The child restraints will be readily available since they will be manufactured in country.

Operating steps

The restraint is placed in a rear seat of the vehicle and is put in the rear or forward facing configuration based on the size and weight of the child. Then, it is secured to the seat of the car using the seatbelt through the belt routings on the device. The harness is adjusted and locked in place at the buckle.

Development stage

We have fabricated and dynamically tested an initial prototype. It was tested in the forward and rear facing configurations in a 49 km/hour test in accordance with Federal Motor Vehicle Safety Standard 213 (FMVSS 213). The prototype passed all of the major FMVSS injury criteria with the exception of the head excursion limit. We are currently developing a second prototype to address this issue, to be tested in February 2011.

Future work and challenges

We need to develop a prototype that successfully passes all U.S. FMVSS 213 and ECE R44 criteria. Subsequently multiple prototypes need to be tested to ensure they pass consistently. Business contacts in the region of interest fit for implementation need to be established and a business and cultural implementation plan developed. Another challenge will be raising awareness of the importance of using child restraints.

Use and maintenance

User: Self-user
Maintenance: User

Environment of use

Requirements: The child restraint can be used in any vehicle in which a safety belt is available to secure the restraint to the vehicle seat. The child restraint should not be used in a front seating position that is equipped with an airbag.

Product specifications

Dimensions (mm): 730 x 430 x 630
Weight (kg): 7.36
Life time: 5 years
Retail Price (USD): Expected max. 20 (mass manufactured)

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