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Optimization of mitigation strategy for Under-Body Blast load to minimize injury of spine

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Abstract: In the paper, the mitigation strategy of the seat support system in case of Under–Body Blast (UBB) was investigated. For the UBB, the vehicle body is accelerated vertically, and the main goal was a minimization of the vertical space inside a vehicle required to accelerate the human body without injury of spine. As a biomechanical injury criterion, the Dynamic Response Index (DRIz) was used in connection with other limitations discussed in the paper. In the first stage, simply analytical models were used to evaluate response of the human body and to find optimal loading profile for no-injury conditions. The optimal profile of the acceleration was discussed. In the second stage, the more realistic numerical model based on Hybrid III Anthropomorphic Test Device (ATD) and real structure of the blast attenuating seat was investigated in simplified UBB conditions. The axial force acting on spine and corresponding DRIz profiles were calculated. The limitations of presented mitigation strategy and the DRIz model as a biomechanical criterion for UBB events were discussed.

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