

	SURFACE VEHICLE INFORMATION REPORT	
	SAE	J2189 FEB2011
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Superseding J2189 DEC2001		
Guidelines for Evaluating Child Restraint System Interactions with Deploying Airbags		

RATIONALE

The members of the SAE Human Biomechanics and Simulations Standards Steering Committee have reviewed J2189 and made a conscientious decision to stabilize this Information Report. J2189, first issued in 1993, documents the tests developed to assess the risk of injury to children restrained in child restraints and exposed to a passenger frontal airbag. It served as a basis for ISO/TR14645, but is more comprehensive than ISO/TR14645. While the types of child restraints illustrated in Section 9 are outdated, the static and dynamic test conditions in J2189 remain relevant. This Information Report has historical value.

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1. **Scope**—This SAE Information Report prescribes dummies, procedures, and configurations that can be used for investigating the interactions that might occur between a deploying airbag and a child restrained by a child restraint system (CRS). During the inflation process, airbags generate a considerable amount of kinetic energy which can result in substantial forces being applied to a child who is restrained in a CRS in the front seat of a vehicle. Field data collected by the special crash investigation team of the National Highway Traffic Safety Administration (NHTSA) indicate that fatal forces can be developed. In response to these field data, NHTSA added a series of airbag/child interaction tests and limits to the Code of Federal Regulations (CFR 571.208) that deal with occupant protection, commonly known as Federal Motor Vehicle Safety Standards (FMVSS 208). The bases for NHTSA tests are the various test procedures that were developed by the International Standards Organization (ISO) and the Society of Automotive Engineers (SAE). This document was one of those reports.

This document describes static and dynamic tests that can be used to assess the injury potential of such interactions. The static tests can be used to sort these interactions on a comparative basis in either an actual or a simulated vehicle environment. Systems that appear to warrant further testing can be subjected to an appropriate dynamic test. Engineering judgment will be needed to identify the test conditions that produce the most severe interactions.

Mild-severity and high-severity crash pulses are described in 8.2. These pulses are not vehicle-specific but represent general acceleration-time histories for two crash conditions. The mild-severity pulse approximates a crash that would just deploy a typical airbag. This pulse would be used to evaluate the effect of the energy of the deploying airbag when the CRS and dummy are exerting the least amount of inertial force in the forward direction, but the dummy and/or CRS is moved forward by that inertial force. The high-severity pulse is similar to that specified in FMVSS 213 to evaluate CRS performance and would be used here to evaluate the airbag as an additional variable in a well-documented crash environment. These generic pulses or other vehicle-specific pulses may be used as appropriate. Differences in shape between the generic and the vehicle-specific pulses are expected to be greater for the high-severity than the mild-severity, with corresponding differences expected in dummy responses.

This document encourages the use of a wide range of test configurations and conditions, while recognizing that the range of possible interactions is essentially limitless and beyond testing capability. Further, measurements of primary importance for the various configurations are given in Section 10, Table 1, but performance limits are not specified. FMVSS 208 does specify performance limits which are based on the injury risk curves given in References SAE 973318 and SAE 2000-01-SC005.

2. References

2.1 Applicable Publications—The following publications form a part of the specification to the extent specified herein. Unless otherwise indicated, the latest revision of the publications shall apply.

2.1.1 SAE PUBLICATIONS—Available from SAE, 400 Commonwealth Drive, Warrendale, PA 15096-0001.

SAE J211-1—Instrumentation for Impact Test—Part 1: Electronic Instrumentation

SAE826040—Description and Basis of a Three-Year-Old Dummy for Evaluating Passenger Inflatable Restraint Concepts, M.J. Wolanin et al.

SAE 973318—Injury Risk Curves for Children and Adults in Frontal and Rear Collisions, H.J. Mertz et al.

SAE2000-01-SC05—Improved Neck Injury Risk Curves for Tension and Extension Moment Measurements of Crash Dummies, H.J. Mertz and P. Prasad

2.1.2 ISO PUBLICATION—Available from ANSI, 11 West 42nd Street, New York, NY 10036-8002.

ISO/TR 12349-2—Road vehicles—Child dummies for restraint system testing

2.1.3 CODE OF FEDERAL REGULATIONS (CFR) PUBLICATIONS—Available from the Superintendent of Documents, U.S. Government Printing Office, Washington, DC 20402.

49 CFR, Part 571.208—Occupant Crash Protection (FMVSS 208)

49 CFR, Part 571.213—Child Restraint Systems (FMVSS 213)

49 CFR, Part 572—Anthropomorphic Test Dummies

2.1.4 CMVSS PUBLICATION—Available from Canadian Government Publishing Center, Ottawa, Canada K1A0S9.

CMVSS 213—Child Restraint Systems

2.1.5 OTHER PUBLICATIONS

Weber, K., "Child Passenger Protection," Accidental Injury: Biomechanics and Prevention, New York, Springer-Verlag, 1993

Special Crash Investigation Reports—Air Bags, National Center for Statistics and Analysis, NHTSA web site: <http://www.nhtsa.doc.gov/people/mcsa/scirepts.htm>

2.2 Related Publications—The following publications are provided for information purposes only and are not a required part of this document.

2.2.1 SAE PUBLICATIONS—Available from SAE, 400 Commonwealth Drive, Warrendale, PA 15096-0001.

SAE J1733—Sign Convention for Vehicle Crash Testing

SAEJ1980—Guidelines for Evaluating Out-of-Position Vehicle Occupant Interactions with Deploying Airbags

SAE 826047—Responses of Animals Exposed to Deployment of Various Passenger Inflatable Restraint System Concepts for a Variety of Collision Severities and Animal Positions, H.J. Mertz et al.

SAE826048—Interpretations of the Impact Responses of a Three-Year-Old Child Dummy Relative to Child Injury Potential, H.J. Mertz and D.A. Weber

SAE841656—A Biomechanical Analysis of Head, Neck, and Torso Injuries to Child Surrogates Due to Sudden Torso Acceleration, P. Prasad and R.P. Daniel

SAEPT-31—Passenger Car Inflatable Restraint Systems: a Compendium of Published Safety Research, D.C. Viano

SAE SP-736—Automatic Occupant Protection Systems