CR 11

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CHILD AND INFANT RESTRAINTS

DOT HS-804 729

SB-34
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AVAILABILITY OF DOCUMENTS

Documents listed in this bibliography are **not** available from the National Highway Traffic Safety Administration unless so specified. They must be ordered from the sources indicated in the citations, usually at cost. Ordering information for the most common sources is given below.

NTIS: National Technical Information Service, Springfield, Va. 22161. **Order by title and accession number: PB, AD, or HS.** When no PB number is given for NHTSA Technical Reports, order by prefacing the HS number with DOT, i.e. DOT-HS-000 000.

GPO: Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402. **Give corporate author, title, personal author, and catalog or stock number.**

Corporate author: Inquiries should be addressed to the organization listed in the individual citation.

Reference copy only: Documents may be examined at the NHTSA Technical Reference Division or borrowed on inter-library loan through your local library.

See publication: Articles in journals, papers in proceedings, or chapters in books are found in the publication cited. These publications may be in libraries or purchased from publishers or dealers.

SAE: Society of Automotive Engineers, Dept. HSL, 400 Commonwealth Drive, Warrendale, Pa. 15096. Order by title and SAE report number.

TRB: Transportation Research Board, National Academy of Sciences, 2101 Constitution Ave., N.W. Washington, D.C. 20418.

This bibliography has been prepared because of the interest in the subject by the staff in the program areas of NHTSA. The citations and abstracts have appeared in the publication *Highway Safety Literature* and are in the HSL information retrieval system.

Notice: Material published in this special bibliography is intended only for information. References to brand names, equipment models or companies does not imply endorsement by the NHTSA or the U.S. Department of Transportation.

National
Highway Traffic Safety
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SUBJECT BIBLIOGRAPHY SERIES

SB-01	Fuel Tank Systems	HS-801 981
SB-02	Bicycle Safety	HS-801 931
SB-03	Traffic Safety Effects of Fuel Shortage and Speed Limits	HS-801 938
SB-04	Restraint Systems	HS-801 932
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SB-18	Bumpers	HS-802 482
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SB-25	Passive Restraint Systems	HS-803 222
SB-26	Vision and Visibility in Highway Driving	HS-803 221
SB-27	Crashworthiness of Motor Vehicles	HS-803 241
SB-28	Technical Reports of the National Highway Traffic Safety Administration; a Bibliography, 1977	HS-803 336
SB-29	Manpower Development: Education and Training	HS-803 366
SB-30	Emergency Medical Services. Revised Edition	HS-803 552
SB-31	Heavy Duty Vehicles	HS-803 965
SB-32	Technical Reports of the National Highway Traffic Safety Administration; a Bibliography, 1978	HS-804 727
SB-33	Automobile Fuel Tanks	HS-804 728
SB-34	Child and Infant Restraint Systems	HS-804 729
SB-35	Shoulder Harnesses	HS-804 730

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16. Abstract

This bibliography represents literature acquired since the establishment of the National Highway Traffic Safety Administration (NHTSA) as related to restraints in automobiles for children and infants. It is comprised of NHTSA contract reports, reports of other organizations concerned with highway safety, and articles from periodicals in related fields.

Citations follow the format used in the monthly abstract journal Highway Safety Literature and are indexed by a key-word-out-of-context (KWOC) listing, author, corporate author, contract number, and report number.

Documents listed herein may be examined in the Technical Reference Branch, NHTSA, Room 5108, 400 Seventh Street S.W., Washington, D.C. Few of the items are available for distribution by NHTSA. Availability is given in individual citations.

This bibliography was compiled in the Technical Reference Branch, NAD-41, NHTSA.

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FOREWORD

This bibliography is one in a series of subject bibliographies to be published irregularly reflecting expressed interests of readers of Highway Safety Literature. Documents cited in these bibliographies may be examined in the Technical Reference Branch, National Highway Traffic Safety Administration. Few of the documents are available for distribution by NHTSA. Please note availability as given in individual entries.

Suggestions of subjects for future bibliographies should be forwarded to

Mrs. W. Desmond, Chief
Technical Reference Branch
National Highway Traffic Safety Administration
400 Seventh St., S.W.
Washington, D. C. 20590

ABSTRACT CITATIONS

HS-001 160

DYNAMIC TESTS OF RESTRAINTS FOR CHILDREN

Describes tests of childrens restraining devices using simulated head-on and intersection collisions.

by F.A. Appoldt
New York Univ., New York, N.Y. School of Engineering and Science
Publ: Stapp Car Crash and Field Demonstration Conference, Detroit, 1966, p329-45
1964 ; 17p
Availability: see publication

HS-001 715

THE DESIGN AND DEVELOPMENT OF A MORE EFFECTIVE CHILD RESTRAINT CONCEPT

Impact tests indicate that the restraint system will retain a child-like dummy in rollovers, side impacts, and frontal impacts at moderate speeds.

by E.P. Grenier; S.A. Heap
Ford Motor Co., Dearborn, Mich., Safety Research Office
Rept. No. SAE-680002 ; 1968 ; 14p
Availability: SAE

HS-001 735

'FFECTIVE USE OF RESTRAINT SYSTEMS IN ASSENGER CARS

Describes research into the use of various types of restraint systems for adults and children, and studies the level of protection afforded when occupants can anticipate impact.

by W.G. Cichowski; J.N. Silver
General Motors Corp., Detroit, Mich.,Proving Ground Sec.
Rept. No. SAE-680032 ; 1968 ; 13p
Availability: SAE

HS-002 467

RESTRAINING DEVICES FOR CHILDREN

Discusses dynamic tests of seven restraining devices, designed to protect a small child in event of automobile collision.

by F.A. Appoldt
New York Univ.. New York, N.Y., School of Engineering and Sciences
PH86-63-165
Rept. No. 917.01 ; 1964 ; 58p
Availability: Public Health Service, Washington, D.C. Accident Prevention Division

HS-004 435

ELEMENTS OF AN EFFECTIVE CHILD RESTRAINT SYSTEM

Success of an effective system for preventing child injury must be measured in terms of child acceptance as well as impact performance and anatomical considerations. Adult lap belts, child harnesses and vests, rearward facing seats, and child auxiliary seats are compared. Different types of restraint systems are needed as children grow.

by R.A. Rogers; J.N. Silver
General Motors Proving Ground, Milford, Mich.
Rept. No. SAE-680776 ; 1968
In Proceedings of Twelfth Stapp Car Crash Conference, Detroit, 22-23 Oct., 1968, p172-87.
Availability: In HS-004 429

HS-005 129

TWO NEW SPECIFICALLY DESIGNED CHILD RESTRAINT SYSTEMS OFFERED

Describes new systems of Ford and General Motors for child protection, emphasizing that a successful restraint system must allow child to see out of the windows. Also gives rules for determining when and how children should use lap and shoulder belts. Gives crash test results for various child restraint systems.

by Emile P. Grenier; Samuel A. Heap; William G. Cichowski; Jeffrey N. Silver
Publ: SAE Journal v77 n1 p53-5 (Jan 1969)
1969
Availability: see publication

HS-006 599

INFANTS AND CHILDREN IN THE ADULT WORLD OF AUTOMOBILE SAFETY DESIGN: PEDIATRIC AND ANATOMICAL CONSIDERATIONS FOR DESIGN OF CHILD RESTRAINTS

The infant and child differ structurally from the adult in a number of ways which are critical to the design for protection against impact forces and for adequate occupant restraint systems. The purpose of this paper is to bring together a profile of the anatomy, anthropometry, growth, and development of the infant and child. Age differences related to the proper design of child restraint systems are emphasized. Problems discussed include child-adult structural differences, center of gravity of the body, the head mass in relation to the neck and general body proportions, positions of key organs, and biomechanical properties of tissues.

by A.R. Burdi; D.F. Huelke; R.G. Snyder; G.H. Lowrey
Publ: Biomechanics v2 p267-80 (1969)
1969
Availability: see publication

HS-008 471

CHILD RESTRAINT SYSTEMS...LAP BELTED CHILDREN MUST BE ABLE TO SEE OUT OF WINDOW

Describes Ford and GM child restraint systems and gives test results on the Ford unit. Rules for use of adult seat belt for a child also are given.

by E. P. Grenier; S. A. Heap
Publ: SAE Australasia v30 n2 p70-1 (Mar-Apr 1970)
1970
Availability: see publication

HS-008 616

RESTRAINT SYSTEMS: HOW EFFECTIVE ARE THEY?

Many facts, figures, and statistics are presented showing what occurs during an automobile accident, what restraint systems are available to the occupants of motor vehicles, and how effective they are. Each system is discussed and evaluated on its own merits in reducing injury to occupants. Flaws are pointed out when necessary. Percentage of seat belt usage, injury survival, and seat belt availability are given. It is noted that the effectiveness of any safety system component cannot be judged adequately except in the context of the entire system.

by D. J. Van Kirk
Publ: Proceedings of the 13th Annual Conf of the AAAM, 1969, p165-84
1969 ; 61 refs
Presented at the 13th annual conference of the American Assoc. for Automotive Medicine, Minneapolis, Minn., 16-17 Oct 1969.
Availability: In HS-008 596

HS-008 617

RESEARCH IN CHILD RESTRAINT DEVELOPMENT

Describes the process by which Ford developed the Tot-Guard child seat and the various belt and rest combinations designed and studied before arriving at the final result.

by R. H. Fredericks
Publ: Proceedings of the 13th Annual Conf of the AAAM,1969,p207-12
1969
Presented at the 13th annual conference of the American Assoc. for Automotive Medicine, Minneapolis, Minn., 16-17 Oct 1969.
Availability: In HS-008 596

HS-008 618

INFANT SAFETY CARRIER

The Infant Safety Carrier is designed to help safeguard infants from injury in all automotive collisions regardless of direction of impact: frontal, angular, side, rear and roll-over. It is recommended for use by children who weigh up to twenty pounds. Elements of the restraint system are the automotive seat, standard lap belt and the carrier which is of a double-shell molded plastic construction with integral adjustable straps. The infant carrier is positioned in the vehicle with the child facing rearward in a semi-reclining position and fastened in place with the standard lap belt.

by George W. Sierant
General Motors Corp., Warren, Mich. Engineering Staff
Publ: Proceedings of the 13th Annual Conf of the AAAM,1969, p213-20
1969
Presented at the 13th annual conference of the American Assoc. for Automotive Medicine, Minneapolis, Minn., 16-17 Oct 1969.
Availability: In HS-008 596

HS-008 938

AUTOMOBILE COLLISION AND THE EFFECT OF THE NEW U. S. A. STANDARDS

The evolution of collision injury safety in modern American automobiles is traced. The effectiveness of several standards is described and collision examples are given where current performance standards are under study. Conclusions of detailed accident studies by medical-engineering teams are presented. A Trauma Research Group at the University of California, Los Angeles, has been involved in live accident studies for the past several years. Results illustrating reduced injury levels due to improved steering wheel column systems, improved windscreens, and load distributing panels and the need for improved side impact protection are documented. In addition, cases are presented which illustrate other areas of needed design change where current performance standards are being developed: truck-trailer underride protection, seat anchorage failure, fuel tank rupture, hood latch failure and windscreen-pillar failure. The need for adequate child restrain systems is discussed.

by A. M. Nahum; A. W. Siegel
California Univ., Los Angeles
Publ: Conference on Road Safety. Vol. 2, Brussels,1968, pA15-1 - A15-80.
1968
see also HS-010 808.
Availability: Reference copy only

HS-009 924

PORTRAIT OF A YEAR. WHAT HAPPENED ON MICHIGAN'S HIGHWAYS IN 1968

A study of fatal accidents that occurred during six weekends in 1968 found that 72% of the drivers involved in fatality accidents had been drinking, and it is recommended that the implied consent law should be improved; that 67% of injured children were car passengers, showing a need for better child restraint systems; that police traffic law enforcement is inadequate; that accident repeater drivers are not being controlled adequately; that over 70% of fatal accidents occurred on two-lane roads, on which speed limits should be reduced; that drivers under 21 were involved in 25% of the fatal accidents; that vehicle defects as an accident cause are nearly non-existent; that motorcycles and motorbikes were involved in a growing number of fatalities. Traffic safety recommendations based on the study are included. Accident statistics and the records of the 10 worst drivers are given.

Automobile Club of Michigan
1969 ; 46p
Availability: Reference copy only

HS-010 154

MOTOR VEHICLE RESTRAINING DEVICES FOR CHILDREN

Seven restraining devices, designed to protect a small child in the event of an automobile collision, were tested dynamically by New York University. The tests simulated both head-on and intersection collisions. The evaluation of these devices considers the ease with which the device is adjusted to fit the child and the method of attachment to the automobile. The deceleration of the anthropometric dummy exceeds that of the sled by 30 to 230 percent. The major fault of all of the devices is the lack of lateral restraint they provide in an intersection collision. This report also includes recommendations for improvement.

by Francis A. Appoldt
New York Univ.
PH-86-62-165
1965 ; 59p
Reprinted with permission of U.S. Public Health Service.
Availability: Reference copy only

HS-010 361

THE SIGNIFICANCE OF SLACK IN RESTRAINT OF VARIOUS STIFFNESS

The response of a restrained car occupant to deceleration patterns recorded at barrier impacts with some European cars is studied by using a simple model in an analog computer. In order to illustrate the general influence of restraint characteristics and slack the occupant is defined as one solid mass and restraints are characterized by linear load-elongation functions of different stiffness. Peak accelerations and total displacements of the occupant as a function of slack are given.

by B. Aldman; A. Asberg
Statens Trafiksakerhetsrad (Sweden)
Publ: Conference on Road Safety. Vol.1. Biomechanics of Accidents, Brussels, 1968 pA5-(1-19)
1968 ; 18 refs
Summaries in French, Dutch, and German.
Availability: In HS-010 357

HS-010 502

THE CHILD'S PLACE IN THE CAR

Vehicular deaths and injuries have become the major unsolved problem in pediatrics. The major reason is that so few children are correctly restrained in the automobile. The basic premise for providing crash protection is to anchor the child to his seat; however the majority of safety restraints sold today are useless. There are some effective devices available and their uses cover four weight groups: birth to 12 lbs., 12 lbs. to 24 lbs., 25 lbs. to 50 lbs., and over 50 lbs.

by William D. Alsever
Publ: American Family Physician v3 n2 p167-70 (Feb 1971)
1971
Availability: see publication

HS-010 535

A UNIVERSITY- AND POLICE-SPONSORED SPRING FIELD TRIAL TO REACH HIGH SCHOOL SENIORS IN MICHIGAN

Review and discussion of anthropometric inputs which will describe children for purposes of crash kinematic modeling and construction of anthropometric dummies for use in crash tests. In addition, techniques for obtaining such data are described. Two lists of measurements needed for dummy and mathematical model construction were developed. One lists 43 body dimensions considered to be a bare minimum of those needed. The other more comprehensive list contains 196 body measurements, few of which are presently available for children. The selection of subjects to be described anthropometrically is also a major problem. In addition to anthropometric data, biomechanical data are also needed for children. acceptance of one of the programs are presented in detail. Results await analysis of ongoing data collection from the young driver files.

by D. C. Pelz; S. H. Schuman; T. L. McDole; J. Amthor
Michigan Univ., Ann Arbor; Michigan State Police, Lansing
FH-11-7333
Publ: Proceedings of the 14th Annual Conference of the American Association for Automotive Medicine, 1970, p215-28
1970 ; 5 refs
Presented at the annual conference, Ann Arbor, 19-20 Nov 1970.
Availability: In HS-010 504

HS-010 810

AUTOMOBILE COLLISION AND THE EFFECT OF THE NEW U. S. A. STANDARDS

The evolution of collision injury safety in modern American automobiles is traced. The effectiveness of several standards is described and collision examples are given where current performance standards are under study. Conclusions of detailed accident studies by medical-engineering teams at UCLA are presented. Reduced injury levels due to improved steering wheel/column systems, windshields, and other protective features are illustrated. The need for improved side impact protection and adequate child restraints is discussed. Cases are presented illustrating other problem areas, such as underride protection, seat anchorage failure, fuel tank rupture, hood latch failure, and windshield pillar failure. The need for further intensive medical-engineering collision research to be used as a basis for future performance standards is stressed.

by A.W. Siegel; A. M. Nahum
California Univ., Los Angeles
Publ: HS-010 808, Conference on Road Safety. Vol. 2 Biomechanics of Accidents, Pt.2, Brussels, 1968 pA15-(1080)
1968
Summaries in French, Dutch and German.
Availability: In HS-010 808

HS-010 861

CAR RESTRAINT DEVICES DESIGNED FOR CHILDREN

A child's size and weight generally determine the most appropriate type of restraint for him. If an infant carrier is not used, babies weighing less than 12 pounds should be placed in

a car bed in the back seat with the axis parallel to that of the car, the infant's feet pointed towards the front of the car. A net covers the bed and the middle front and rear seat belts are wrapped around the legs of the bassinet to secure it. From 12 to 24 pounds an adequately designed safety harness restraining the child across the high-chest and pelvic areas is recommended. From 25 to 50 pounds a shield type seat gives the best protection, but a good safety seat will be adequate. Children who weigh more than 50 pounds and who are less than 55 inches should use an adult safety belt but no shoulder harness. Any child taller than 55 inches may use both the adult seat belt and the shoulder harness.

by John M., Douglass; Frederick D., Burg; Eugene, Diamond; Arnold W. Siegel
Publ: Modern Medicine p112-4 (8 Mar 1971)
1971
Availability: see publication

HS-010 944

WHAT EVERY YOUNG MOTHER SHOULD KNOW ABOUT AUTO SAFETY

One of the first things a driving mother should do is learn the truth about a number of myths: that she can protect her child when she sees an accident coming, that most serious accidents are head-on collisions between two carsthat a car is a protective cage that can be counted on to ward off danger in a minor collision. The only protection for children (and their mothers) is a proper restraint system. Safe and unsafe child restraint systems are considered, and some safe driving tips are proposed. The part played by stress in driving with children is discussed.

by E.D. Jr. Fales
Publ: Redbook v135 n5 p91, 193-7 (Sep 1970)
1970
Availability: see publication

HS-011 620

A SURVEY OF USAGE OF CHILDREN'S CAR SEATS AND RELATED DEVICES

Detailed findings of a telephone survey of mothers (from upper, middle, and lower socio-economic levels in the Boston and Los Angeles areas) regarding the use of children's car seats or other restraint devices are presented. The purpose of making the survey was to describe the ways in which children's car seats are presently used in terms of extent of use, ages at which children use them, ways children ride in cars before and after using car seats, and reasons children are changed from one device to another. It was found that babies generally ride lying down but in devices which are are not adequate for protection; that children from six months to two years ride in child car seats about 50% of the time; and that older, more restless children need devices designed for them.

by Glenn Jones
Bolt, Beranek and Newman, Inc.
Rept. No. BBN-1829 ; 1969 ; 80p
Availability: Corporate author

HS-011 906

SPECIAL PROBLEMS AND CONSIDERATIONS IN THE DEVELOPMENT OF AIR CUSHION RESTRAINT SYSTEMS

The General Motors air cushion restraint system and specific technical problems of systems development and implementing a production build program are discussed. The details of the system include a description of the components of the driver's and front passenger's systems, crash sensing, and variable inflation. The discussion of specific technical problems includes performance considerations, such as occupt rebound, child-size occupants, out-of-position occupants, non-barrier type crashes, and the function of the appearance cover. Also included is a discussion of the toxicity potential, noise risk, sensor development, reliability considerations, and field service requirements.

by E.H. Klove, Jr.; R.N. Oglesby
General Motors Corp.
1972 ; 9p
Presented at 2nd International Conference on Passive Restraints, Detroit, 22-25 May 1972.
Availability: SAE

HS-011 907

NEW DEVICES TO PROTECT THE KIDDIES

The need for adequate child restraint systems is discussed. A checklist of important safety features includes the following: the child seat must be designed so it can be fastened in place with the vehicle seat belts; the seat must give protection from front and rear-end crashes; the seat should withstand front forces up to 1,000 pounds for 10 seconds; forward movement of the seat occupant should be restricted to 12 inches, under 1,000 pound load; the seat must give adequate protection against whiplash injury; the seat's restraint belts must be at least 1 1/2 inches wide; the child's upper body should be restrained by belts or impact pad; special padding should line all areas the child's head might contact; there must be no sharp or pointed hardware.

by E. Janicki
Publ: California Highway Patrolman v36 n4 p14-5, 24-5, 27 (Jun 1972)
1972
Availability: See publication

HS-012 078

CRASH TESTS OF CAR SAFETY RESTRAINTS FOR CHILDREN

Fifteen children's seats, one infant carrier, and one child's harness were tested using a deceleration sled that crashed into a fixed barrier. All 15 seats tested bore a label certifying compliance with Federal Motor Vehicle Safety Standard 213. For each crash test, a child restraint was secured to the auto seat, according to the manufacturer's instructions. A dummy representing a three-year-old child was placed into each child restraint, also according to its manufacturer's instructions. Accelerometers in the dummy's head and chest measured deceleration upon impact. The restraint systems were considered effective if decelerations were sufficiently low and spread over a sufficiently large area of the body, away from the abdomen, and if the dummy's head did not hit the inst

ment panel. Twelve of the restraints tested were rated not acceptable. Only one met all of the safety criteria for front, rear, and side impacts. Descriptions and ratings of the child restraints tested are included.

Publ: Consumer Reports v39 n8 p484-9 (Aug 1972)
1972 ; 2refs
Availability: See publication

HS-012 590

CONCEPTS IN AUTOMOTIVE OCCUPANT CRASH PROTECTION

The contributions of restraint systems and vehicle interior design to crash survivability are discussed. Occupant restraint systems including seat belt systems, head restraints, child restraint systems, and air bag systems, are reviewed, and experimental restraint designs are discussed. The windshield, steering assembly, instrument panel, header, side rail, and A pillar are identified as the major structural features of the vehicle which contribute to occupant injury. Progress in reducing the injury potential of these vehicle features is discussed and suggestions for further improvements are made. Methods of determining vehicle impact protection capability are also briefly discussed.

by R. G. Snyder
Michigan Univ. Hwy. Safety Res. Inst.
Publ: HS-012 588, Highway Safety: Anatomy of a Problem, Chapel Hill, N. C., 1972 p35-98
1972 ; 135refs
Includes discussion by: R. G. Pearson and J. H. Meredith.
Availability: In HS-012 588

HS-013 033

CHILD RESTRAINTS

The effectiveness of harnesses, seat belts, child safety seats, and infant restraint systems in preventing child injuries is discussed. Child restraint equipment should distribute an impact over large areas of the child's body; sustain a static load of 1,000 pounds; attach either to the rigid car structure or to a seat belt that is anchored to the car structure; be constructed of materials free from injury-producing components such as sharp edges or hard corners; and prevent whiplash by bracing the child's head and neck.

Publ: Driver
1973
Availability: Driver v6 n9 p8-11

HS-013 290

AUTOMOBILE INJURIES--THE FORGOTTEN AREA OF PUBLIC HEALTH DENTISTRY

Although vehicle design changes have significantly decreased the severity of body injuries, the orofacial region is traumatized in one fifth to two thirds of those injured. Impacts with the instrument panel, steering wheel, windshield, or other forward structures cause a wide range of orofacial injuries that are routinely treated by the dentist. However, the expertise of the dental profession has not been focused on the preventive aspects of orofacial injuries received in car crashes. These could be implemented, through national dental leadership and encouragement of three point and child restraint system usage by the practicing dentist.

by D. F. Huelke; H. W. Sherman
Publ: Journal of the American Dental Association v86 p384-93 (Feb 1973)
1973 ; 11refs
Availability: See publication

HS-013 605

RESTRAINT OF CHILDREN

The General Motors Infant Love Seat provides improved restraint for infants of up to 20 lbs who cannot sit up alone. The Child Love Seat is designed for use by children who weigh between 20 and 40 lbs, whose height is 40 inches or less, and who can sit upright alone. A vehicle's adult belt system can be used by children who are able to sit up alone. Use of the belt system will restrain the child during an accident. The shoulder belt can be worn to provide added upper torso restraint. Face and neck irritation can be minimized by repositioning the child on the vehicle seat, and/or proper use of the comfort clip. If irritation cannot be relieved, the child can be lap belted in the rear seat. Studies concerning child restraint are limited by the lack of biomechanical and field data about children's impact tolerances.

by W. B. McCormick; S. L. Schmelter; R. B. Heintz
General Motors Corp., Warren, Mich. Environmental
1973 ; 15p
Presented at General Motors Automotive Safety Seminar, Warren, 20-21 Jun 1973.
Availability: Corporate author

HS-013 897

A PROFILE OF OUR YOUTH SAFETY PROBLEM

Problems associated with the full range of youthful traffic safety activities including driving, walking, riding, bicycle and motorcycle riding, and alcohol are reviewed. Statistics show that drivers in the 15 to 25 age range are involved in 35% of all traffic accidents although they are only 21.6% of the motoring population. The majority of these are male. Bicycle accidents show the same trends, but at earlier ages. Motorcycle accident rates are correspondingly high. Neither bicycle nor motorcycle riders are required to have special instruction, and licensing varies from state to state. Alcohol is becoming more of a problem with teenagers. These problems have led to new developments in safety education which, hopefully, will improve the performance of all highway users.

by R. M. Calvin
Publ: Highway User p8-11 (Sep 1973)
1973
Availability: See publication

HS-014 184

AUTOMOTIVE SAFETY ENGINEERING SEMINAR, JUNE 20-21, 1973. PROCEEDINGS

The areas of responsibility of the General Motors Environmental Activities Staff are vehicle emissions, automotive safety, vehicular noise control, plant and environmental engineering, and quality assurance. The purpose of this seminar

was to provide a forum for discussion of this broad area of public opinion with the intention of a free exchange of views, a presentation of varying perspectives of the subjects, and to encourage dialogue on problems and progress. All speakers were authorities in their fields of interest, and topics selected for discussion were highway safety progress, safety priorities, accident avoidance, occupant protection and future safety research needs. Up-to-date, state-of-the-art information exchange in many areas of interest proved very beneficial.

General Motors Corp., Warren, Mich. Environmental Activities Staff
1973 ; 200p refs
Availability: Corporate author

HS-014 381

EVALUATION OF AUSTRALIAN CHILD RESTRAINTS

The dynamic performance of child restraints available in Australia is examined from engineering and medical points of view. Dynamic collision simulations were carried out with restraints having the approval of the Standards Association of Australia. Frontal and side impacts were simulated to allow measurement of space requirements and appraisal of the forces applied to the passenger using each restraint. Strengths and weaknesses of the various types of device are explored and conclusions are reached about the crash protection available to children in Australia. The principal doubt about the crash protection offered by the restraints is in the way they restrain the immature lower torso of the young child.

by B. A. Vazey; D. C. Herbert; J. M. Wyllie; R. G. Vaughan; V. Leitis
New South Wales Dept. of Motor Transport, Sidney (Australia)
Publ: HS-014 371, Proceedings of Stapp Car Crash Conference (17th), New York, 1973 p219-44
Rept. No. SAE-730972 ; 1973 ; 18refs
Paper presented at the Stapp Car Crash Conference (17th), 12-13 Nov 1973, Oklahoma City, Okla.
Availability: In HS-014 371

HS-014 382

THE GM CHILD LOVE SEAT

The design and development of the General Motors Love Seat restraint system, recommended for children from 20 to 40 lb and under 40 in, are detailed. The child is restrained in a seat by a five-belt harness system that utilizes a single quick-release buckle. The seat is restrained by the vehicle lap belts and a top anchor strap. It meets the standards of FMVSS 213 in static testing, and it reduces excursion of the child in front and side impact testing. The seat has padded forward-projecting walls at the side of the head. It retained its integrity during impact testing.

by N. Feles; J. P. Makinen; L. P. Garvey
General Motors Corp., Warren, Mich.
Publ: HS-014 371, Proceedings of Stapp Car Crash Conference (17th), New York, 1973 p245-58
Rept. No. SAE-730973 ; 1973 ; 3refs
Paper presented at the Stapp Car Crash Conference (17th), 12-13 Nov 1973, Oklahoma City, Okla.
Availability: In HS-014 371

HS-014 805

CHILD RESTRAINT SYSTEMS. FRONTAL IMPACT PERFORMACE

State of the art design concepts, medical knowledge, regulations, and impact performance of different child restraint systems in Sweden are defined, and compliance test procedures and performance criteria are recommended. Some 34 frontal impact tests were made with 25 systems. Impact speed was 30 mph and the deceleration level 15-20 g. Fully instrumented Alderson 3 and 6-year-old anthropomorphic dummies were used, and the measurements included dummy and sled accelerations, forces and displacements. It is shown that the rearward facing systems have a considerably better protection performance than forward facing systems, lap belts, shields, cushions, harnesses, and hookover seats, especially concerning head acceleration and displacement. It is proposed that the head accelerations be used as the main performance criteria. General recommendations for protection and handling improvements of rearward facing seats are included.

by T. Turbell
Statens Vag- Och Trafikinstitut, Stockholm
1974 ; 124p
Sponsored by the Transport Res. Delegation. One of a series of investigations to promote safer transportation of children.
See also HS-014 806, HS-014 807.
Availability: Corporate author

HS-014 806

CHILD RESTRAINT SYSTEMS. HANDLING PERFORMANCE OF BUCKLES AND HARNESSES ON CHILD SEATS

Two psychological and technical studies of child car seats are reported, the first dealing with two-to-five year-old children's potentially dangerous capacity for opening different buckles, and the second dealing with adults' difficulties in removing children from different types of child seats under simulated conditions of darkness. In the first experiment all but one of the children over four years of age opened all the buckles; half were opened by one or more of the youngest children. One of the buckles classified as technically difficult and strenuous could not be opened by any child under four. In the experiment with adults, opening times differed greatly, and it took more than two minutes before one or more of the subjects had rescued the child-dummy from five of the 10 seats. It is concluded that proposals altering the design of child seats are needed.

by P. W. Arnberg
Statens Vag- Och Trafikinstitut, Stocklholm
1974 ; 65p
Sponsored by the Transport Res. Delegation. One of a series of investigations to promote safer transportation of children.
See also HS-014 805 and HS-014 807.
Availability: Corporate author

HS-014 807

CHILD RESTRAINT SYSTEMS. PSYCHOLOGICAL PROBLEMS RELATED TO THE USE OF REARWARD FACING CHILD SEATS

Psychological problems related to the use of child car seats are examined in three studies: a general questionnaire survey of

the use of car seats; interviews with 60 parents to assess the differences between rearward-facing seats, forward-facing seats, and having children unrestrained in cars; and a study of the effect of rearward-facing seats on the attitudes of 16 parents who had not used these seats before. Results show that problems (e.g., car sickness) using rearward-facing seats were not greater than those experienced when using forward-facing seats or none at all. This preference and proven safety factors in collision impact tests encourage the use of rearward-facing child seats.

by P. W. Arnberg
Statens Vag- Och Trafikinstitut, Stockholm
1974 ; 30p
Sponsored by the Transport Res. Delegation. One of a series of investigations to promote safer transportation of children.
See also HS-014 805, and HS-014 806.
Availability: Corporate author

HS-014 942

CRASH PROTECTION FOR BABIES

The dynamic performance of devices that are intended to protect baby occupants of crashing automobiles is examined from an engineering point of view. Dynamic collision simulations were carried out with "baby" dummies restrained by each of three "baby" restraints that were readily available in Sydney. Further simulations were carried out on some experimental restraints. Strengths and weaknesses of the various restraints are explored and conclusions reached about the crash protection available to babies in New South Wales indicate that the restraint of the prone baby requires a container stronger, stiffer, and better padded than those available.

by B. A. Vazey; D. C. Herbert; V. Leitis
New South Wales. Dept. of Motor Transport, Sidney
1974 ; 57p
Availability: Traffic Accident Research Unit, Dept. of Motor Transport, New South Wales, Sydney, Australia

HS-015 095

RELATING AIR CUSHION PERFORMANCE TO HUMAN FACTORS AND TOLERANCE LEVELS

Major programs related to the development of the crash-deployed air cushion restraint system for passenger cars are discussed. A series of impact tests were performed on a portion of Air Cushion Restraint System (ACRS) Field Trial Program Fleet. Test conditions, occupant sizes, and other factors that lie outside the bounds of FMVSS 208 were studied in order to evaluate a wider spectrum of the field performance required of a completely new system such as ACRS. In tests conducted at eight different impact severities with forty humans and thirty-two anthropomorphic dummies under similar conditions, no significant injuries were experienced for the volunteers. In comparable tests, the anthropomorphic dummies response to impact was more exaggerated than the humans. Development, manufacture and testing of a new anthropomorphic test dummy was discussed. Improvements in repeatability and reproducibility of the dummy are documented, and the development of repeatability testing procedures and of dummy fractures that enhance the accuracy of the initial test setup are discussed.

by L. C. Lundstrom; R. A. Wilson; G. R. Smith
General Motors Corp., Warren, Mich. Environmental Activities Staff
1974 ; 138p refs
Presented at the Fifth International Technical Conference on Experimental Safety Vehicles (ESV), London, 4-7 Jun 1974.
Includes: Pt. 1--Program Development, Pt. 2--Crash Testing the General Motors Air Cushion, and Pt. 3--Human Volunteer Testing of General Motors Driver Air Cushion System.
Availability: Corporate author

HS-015 570

PANEL DISCUSSION-PHYSICIANS VIEW SAFETY BELT USE

The role of physicians in promoting automotive safety is discussed as a means of preventive medicine. Support for the mandatory use of seat belts is offered. Emphasis is placed on the negligence of crash protection for infants and children and the injury and fatality rates especially in children under 14. The hazards of using standard seat belts on small children are described, as well as the indifference of parents, industry, and government to child safety in vehicles. It is suggested that legislative provisions for child transportation safety should be all-inclusive, and that taxis, limousines, and commercial vehicles should have safety belts in all seated positions and readily available for passenger use. Public education is also advocated.

by S. Charles
Physicians for Automotive Safety, Newark, N. J.
Publ: HS-015 558, National Safety Belt Usage Conference Proceedings, Washington, D. C., 1973 p69-73
1973
Availability: In HS-015 558

HS-015 571

PANEL DISCUSSION--PHYSICIANS VIEW SAFETY BELT USE

Injuries resulting from non-use of seat belts are described from the viewpoint of a hospital emergency room physician, and mandatory usage laws are advocated. Questions and answers are given relating to child safety restraint systems, the Australian seat belt law, parental responsibilities in child safety, shoulder harness injuries, school bus safety, small child safety using standard seat belts, and legislation needs.

by J. D. Mills
American Coll. of Emergency Physicians
Publ: HS-015 558, National Safety Belt Usage Conference, Proceedings, Washington, D. C., 1973 p74-9
1973 ; 2refs
Availability: In HS-015 558

HS-015 607

SYMPOSIUM ON CAR CRASH INVESTIGATIONS AND THEIR USEFULNESS. GENERAL DISCUSSION

The need for advertising traffic safety is stressed, particularly for seat belt usage by pregnant women and children. Questions

and answers follow on deactivation of seat belt buzzers and the need for usage laws.

by D. F. Huelke; J. L. Weygandt; R. C. Haeusler; J. Moon
Publ: Conference on Medical, Human and Related Factors Causing Traffic Accidents, Including Alcohol and Other Drugs, Proceedings, 1973 p223-5
1973
Conference held in Montreal, 30-31 May 1972.
Availability: See publication

HS-015 647

CRASH PROTECTION FOR THE SUB-TEEN CHILD

A program of simulated car crashes and examinations designed to evaluate the child restraints currently available in Australia is described. Each restraint was subjected to crash simulations producing deceleration forces equal to 17 times the weight of the occupant. During each crash, data such as harness forces, deceleration and velocity were recorded and high speed movies were provided. It was concluded that, in general, SAA-approved devices afforded a degree of protection adequate to ensure survival of the occupant in most real life frontal collisions, but there were some aspects of approved devices which could be improved. In general, non-approved devices were considered inadequate in at least some respects, while some could easily be modified to satisfy safety requirements. The report concludes with detailed appraisals of the following commercial products manufactured in Australia, Canada, Britain, or the U.S.: Micklem 694, 725, 710, and 715; Steelcraft C54, C57, C45, and C52; Britax B335, B336, and B338; Safe-N-Sound Premier X4, KL, and SS150; Volvo; General Motors "Love" seat; Guardwell CS200; adult's lap/sash and lap belts; and Clippa Safe "Trainer" and "Pilot".

by D. C. Herbert; B. A. Vazey; J. M. Wyllie; V. Leitis; J. D. Stott; R. G. Vaughan
New South Wales Dept. of Motor Transport, Sydney
1974 ; 154p
Availability: Traffic Accident Res. Unit, Dept. of Motor Transport, New South Wales, Australia

HS-015 670

INTERNATIONAL CONFERENCE ON OCCUPANT PROTECTION (3RD) PROCEEDINGS, TROY, MICHIGAN, JULY 10-12, 1974

Various aspects of occupant protection were examined by conference participants. Topics included: energy basis for collision severity; automotive recorder research; exact accident data acquisition on scene; statistical analysis; energy absorbing automotive structures using scale model test techniques; front end structures crash response; crash energy management in compact automobiles; a new radar concept (BARBI) for precollision sensing; fluid crash sensor; air bag development; human volunteer and anthropomorphic dummy tests of driver air cushions and passive belt restraint systems; NHTSA efforts in advanced passive protection and child restraint system developments; safety belt webbing; three-point belt system; Army aircrew personnel restraints; scale model testing; test sled simulation; human chest impact protection criteria; and dummy development.

Society of Automotive Engineers, Inc.
Rept. No. SAE-P-53 ; 1974 ; 425p refs
Sponsored by the Passenger Protection Com., SAE Automobile Body Activity Safety Com., and SAE Passenger Car Activity. Includes HS-015 671--HS-015 697.
Availability: SAE

HS-015 682

THE DEVELOPMENT OF AN AIR BAG ON COLLAPSIBLE DASHPANEL RESTRAINT SYSTEM FOR RIGHT FRONT SEAT OCCUPANTS

An air bag on collapsible dashpanel (ABCD) is described which is positioned within steering wheel distance or greater of the occupant to absorb the primary portion of the kinetic energy of the occupant-vehicle interaction, and which uses two small air bags to deploy at speeds above 20 mph to distribute chest contact forces and control head motions. A crushable kneebar is used for lower torso restraint. The Calspan 3-D Crash Victim Simulation was used as a preliminary design tool in developing the concept. Component tests of the collapsible dashpanel were conducted on the Calspan linear accelerator impactor. Sled tests were conducted to refine the restraint system design and to evaluate the performance of the restraint system with respect to accepted injury criteria. Satisfactory restraint system performance was demonstrated for the 50-lb child at 40 mph and the 50th percentile male at 50 mph. Performance for the 95th percentile male at 45 mph was was marginal. The ABCD concept was demonstrated to be a feasible passive restraint system which shows promise for improving occupant protection.

by D. J. Biss; N. E. Shoemaker
Calspan Corp.
Publ: HS-015 670 (SAE-P-53), International Conference on Occupant Protection (3rd) Proceedings, New York, 1974 p168-888
Rept. No. SAE-740576 ; 1974 ; 12refs
Conference held in Troy, Mich., 10-12 Jul 1974.
Availability: In HS-015 670

HS-015 686

THE EFFORTS OF THE NATIONAL HIGHWAY TRAFFIC SAFETY ADMINISTRATION IN THE DEVELOPMENT OF ADVANCED PASSIVE PROTECTION SYSTEMS AND CHILD RESTRAINT SYSTEMS

An overview is presented of the Occupant Packaging research program of NHTSA with focus on the program's efforts to establish the feasibilities of practical methods for providing the highest levels of occupant protection. In the area of frontal impact protection, work is progressing on advanced driver air bag systems, on a bag and bolster approach to passenger protection, on the development of improved inflation techniques for inflatables, and on the passive application of the air belt concept. Efforts in other areas of side, rear, and rollover pro-

tection are discussed as are NHTSA's efforts in child restraint research.

by R. M. Morgan; C. E. Strother
National Hwy. Traffic Safety Administration, Washington, D. C.
Publ: HS-015 670 (SAE-P-53), International Conference on Occupant Protection (3rd) Proceedings, New York, 1974 p246-677
Rept. No. SAE-740580 ; 1974 ; 15refs
Conference held in Troy, Mich., 10-12 Jul 1974.
Availability: In HS-015 670

HS-015 951

SAFETY BELTS AND CHILD RESTRAINTS--THE PROPORTION OF CARS FITTED AND OF OCCUPANTS USING THEM

Surveys of safety belt usage in London and the Thames Valley over the period 1964-1973 are summarized, together with results of an intensive survey in Hounslow in 1970, a survey of the fitting and use of child restraints in six towns in 1974, and a Junior Accident Prevention Council of ROSPA study covering eight regions of Great Britain during 1969 and 1970. The proportion of cars fitted with safety belts to the front seats rose from about 28% in 1967 to 95% in 1973. The percentage of cars observed on motorways with drivers wearing safety belts rose from about 9% in 1964 to 31% in 1970, remained fairly constant up to 1972 and then rose sharply to 49% in 1973. The pattern on "A" class roads was similar. On town roads the percentage rose from 5% in 1964, to 9% in 1968, to 20% in 1973. In Central London the percentage rose om 2% in 1964 to 17% in 1973. The increase in safety belt /earing in the last year coincided with a large national advertising campaign to encourage the use of safety belts sponsored by the Department of the Environment and followed the legal requirement to fit improved seat belts to new vehicles.

by B. N. Farr
Transport and Road Res. Lab., Crowthorne, Berks., England
Rept. No. TRRL-LR-644 ; 1974 ; 19p
Availability: Vehicles Div., Safety Dept., Transport and Road Res. Lab., Crowthorne, Berks., England

HS-016 091

TESTS OF CURRENT AND EXPERIMENTAL CHILD RESTRAINT SYSTEMS

The protection potential offered by various production and prototype child restraint systems is investigated. Parameters of child seat performance are determined which are relevant to injury prevention. A detailed discussion of these parameters is given. The dynamic performance of 10 child auto-car seats, two harnesses, and three infant restraint systems are discussed. The head excursion, head and chest accelerations, and overall system performance are presented. It was found that head excursion in the rear impacts, and to a lesser extent in the front impacts, was due in part to deflection of the adult car seat back, which allowed the child restraint systems to travel further than they would have, had the seat backs been more rigid.

by R. L. Stalnaker
University of Michigan, Hwy. Safety Res. Inst., Ann Arbor, Mich. 48105
Rept. No. SAE-740045 ; 1974 ; 27p 13refs
Presented at the Automotive Engineering Congress, Detroit, 25 Feb-1 Mar 1974.
Availability: SAE

HS-016 368

FRONTAL CRASH EVALUATION TESTS OF THE GM CHILD SEAT HARNESS

The mechanism and efficacy of the General Motors Child Seat harness configuration have been tested using animal models in crash sled experiments. The purpose of the tests was to answer additional questions about child restraint which have arisen since the introduction of the seat. Results of the 32.2, 40.2, and 48.3 km/h (20, 25, and 30 mph) frontal barrier crashes have confirmed the safety of the seat harness on the closest animal surrogate to the human child. There were no significant injuries to the test animals. Special techniques were devised and used in examining the subjects for trauma in order to dispense with the usual procedure of post-test sacrifice and autopsy. As a result, the healthy animals were donated to the primate colony of the Detroit Zoological Society after completion of the experiments.

by R. M. Schreck; L. M. Patrick
General Motors Res. Labs., Geomedical Science Wayne State Univ., Dept. of Mechan
1975 ; 63p
Availability: General Motors Research Laboratories, Warren, Mich. 48090

HS-016 768

FACTORS ASSOCIATED WITH CHILD USE OF AUTOMOBILE RESTRAINING DEVICES: KNOWLEDGE, ATTITUDES, AND PRACTICE

One hundred ninety-eight child-parent pairs were studied for knowledge, attitude, and practice factors associated with the use of automobile restraining devices in children attending a pediatric clinic. A child use index was cross-tabulated with other variables. Children most likely to be using appropriate restraining devices were over 6 months old and had US-born, white, married parents who had at least completed high school, who themselves used seat belts and who indicated a belief in their ability to control what happens to them in life. No associations were found between use and parents' knowledge about age-appropriate methods of child restraint, or the families' accident history. The parents held many false beliefs about the use of seat belts. Pediatricians might improve parents' behavior in properly restraining their children by in-

corporating automobile safety information and counseling as part of the well child visit.

by A. K. Neumann; C. G. Neumann; M. E. Cockrell; S. Banani
Publ: American Journal of Diseases of Children v128 p469-74 (Oct 1974)
1974 ; 14refs
? Computing assistance was obtained from the Health Sciences Computing Facility, UCLA, sponsored by NIH special research resources Grant RR-3.
Availability: See publication; Dept. of Pediatrics, UCLA School of Medicine, 10833 La Conte Ave., Los Angeles, Calif. 90024

HS-016 770

VEHICLE SAFETY AND OCCUPANT PROTECTION. SUBMISSION TO THE HOUSE OF REPRESENTATIVES SELECT COMMITTEE ON ROAD SAFETY, SEPTEMBER, 1974

Various aspects of occupant restraint systems (along with the effects of compulsory seat belt usage), and vehicle design for accident avoidance and crashworthiness are examined. In addition to adult restraint systems, child protection and child restraint systems, such as the seat-and-harness are discussed. In regard to vehicle design for crash protection, fire-accompanied accidents and causes, vehicle compatibility, windshield characteristics, and car-pedestrian accidents, and injury causes are explored. The importance of recognizing related human and environmental factors also is stressed. Similarly, policy issues in vehicle safety design should be taken into account, as regards competing demands of the total transportation system, including other aspects of accident/injury reduction policy. It is concluded that the extent to which technological advances in safety and restraint system design can be fed into the consumer-oriented automobile industry via legislation depends not only on the degree of involvement shown by governments, but also by social attitudes to accident/injury reduction and the public's willingness to pay for safety improvements.

Traffic Accident Res. Unit, Dept. of Motor
1974 ; 15p
Availability: Corporate author

HS-016 829

WISCONSIN LAUNCHES CHILDSAFE PROGRAM

Project Childsafe is an experiment in promoting child restraint education by going directly into the hospital to reach new mothers. The slide/sound program together with posters and brochures emphasizes the special restraint requirements of automobile passengers under the age of four. Ninety percent of the new mothers followed through by purchasing acceptable restraints. Some hospital gift shops are offering both new and used infant and child restraints for sale.

by J. Fernan
Publ: Traffic Safety v75 n3 p22-4 (Mar 1975)
1975
Availability: See publication

HS-016 830

INFANT CARRIERS AND CHILD RESTRAINTS

Consumers Union made a test of 19 models of child restraints. To simulate actual crash conditions, an acceleration sled was used with a dummy representing a 3 year old child. A smaller doll was used to test the infant carriers. Based on the available data, the safest place for a child is the center of the rear seat, which was the test location used. Tests were made of 30 mph head-on and front corner crashes, as well as 12 mph side impacts.

Publ: Consumer Reports v40 n3 p150-2 (Mar 1975)
1975
Availability: See publication

HS-017 139

PRACTICAL ASPECTS OF CHILD SAFETY RESTRAINT SYSTEM STANDARDS

Factors involved in developing child restraint systems (CRS) for automobiles are discussed. Some CRS which meet the static test requirements of the present child safety seating standard have been shown to structurally collapse under the dynamic loads produced in a 30 mph crash situation. CRS design considerations are evaluated. The CRS must be compatible with the child's size and anatomical features, which have a great range of variation from birth to six years. These factors have led to the development of CRS in different size categories. The following types of CRS are discussed: rear-facing, supporting the entire body surface; a load distributing surface in front of a forward facing passenger; a fixed surface frontal barrier; and a belt harness system. General criteria for CRS design are presented. It is suggested that available accident data be examined to determine dynamic performance criteria and test procedures, and to study existing restraint systems. From previous studies, it appears that evaluation of a CRS should include: testing at several angles in the frontal quadrants; testing under a variety of conditions which might induce ejection from the seat; the development of a standardized platform simulating the response of a given production seat; revision of testing standards to limit the forward excursion to 25 inches, and the vertical excursion to 29 inches above the car seat cushion; ease of installation and daily use of CRS; and assuring that the system can be marketed at a reasonable price.

by John W. Melvin; Richard L. Stalnaker
University of Michigan, Hwy. Safety Res. Inst.
Publ: HS-801 745, Proceedings, International Congress on Automotive Safety (4th), Washington, 1975 p509-17
1975 ; 11refs
Presented at the Fourth International Congress on Automotive Safety, San Francisco, 14-16 Jul 1975.
Availability: Reference copy; also in HS-801 745

HS-017 188

CAR CARE. HOW TO TRAVEL WITH KIDS AND PETS (SAFETY SEATS AND INFANT CARRIERS)

Proper arrangements for children and pets can not only make them safer in an accident, but doing the job right may oftentimes prevent the accident from occurring in the first place. All child restraint systems must now meet federal standards For children up to 20 lbs., a GM Love Seat Infant Carrier

Peterson 75 Safety Shell, belted into the back seat, facing the rear with a lap belt, meets these regulations. Most car companies offer larger seats for children up to 50 lbs. After that, a regular lap belt can be used, often with a hassock on the seat, so that the child can look out the window, and the lap strap can come across the hips at the correct angle. When a child has reached 4 ft. 6 inches, he should also use the shoulder strap. Children should never ride in the lap of an adult. In a crash, weight is multiplied 10 to 20 times, so a 10 lb. infant develops an inertia of 100 to 200 lbs. in an impact. Pets are even more important to restrain from a standpoint of driver distraction. Cats should be placed in a travel case, placed on the back floor, never on the seat. Larger pets should be trained to sit on the floor in back. Tranquilizers should also be considered, since a pet, jumping from seat to seat, or barking out the windows is a great distraction to the driver. Also, in the event of a sudden stop or impact, a large dog in the back seat can exert considerable force flying forward.

by Tom Tappett
Publ: Mechanix Illustrated v71 n567 p68, 70, 80 (Aug 1975)
1975
Availability: See publication

HS-017 322

BASIC DESIGN PRINCIPLES OF CHILD AUTO RESTRAINTS

The anatomical and general principles of occupant restraints in automobile collisions are presented with emphasis on the protection of the child occupant. The particular problems presented by the child's underdeveloped skeletal system, and its wide range in size are discussed. Rear facing restraint systems (the most effective), systems employing a load distributing surface in front of a forward facing occupant, and belt harness systems (five point belt for children) are considered. Child restraint design criteria (structural integrity, dynamic interaction with the adult seat, proper use of adult restraints to secure the child's seat, load distribution, limitation of body motions, comfort, useability, and cost) are discussed. The following typical dynamic performance problems in child restraint systems are considered: structural collapse and rupture (bending loads applied to the tubular metal framework of some systems, excessive tensile loading or stress concentrations on molded plastic structures); concentrated loading of the occupant (caused by structural discontinuities or abrupt changes in the stiffness along supporting surfaces); and high occupant accelerations due to harness looseness and/or padding inadequacies.

by R. L. Stalnaker; J. W. Melvin
University of Michigan, Hwy. Safety Res. Inst.
Publ: Can Hwy Safety Council Proc, 13th Ann Conference 1974 ; 15p
Presented at the Automotive Engineering Meeting, Toronto, Canada, 21-25 Oct 1974.
Availability: SAE

HS-017 398

BIBLIOGRAPHY ON MOTOR VEHICLE AND TRAFFIC SAFETY

This bibliography represents the literature acquired since the establishment of the Office of Vehicle Systems Research in 1967. A large number of reports were contributed by national and international organizations active in motor vehicle safety, research, and standardization. The bibliography includes 81 subject breakdowns within 6 major categories: brakes, including compliance test reports, skid control, and friction and temperature studies; occupant protection, including crash injuries, child restraints, human simulation, restraint systems and their use and effectiveness, and seat belt standards; human factors, including alcohol, anthropometry, biomechanics, driver characteristics, drugs, human engineering, and medical impairmemt; tires and wheels, including compliance, radial tires, retreaded and regrooved tires, tire standards, tire characteristics, and winter tires and chains; traffic and transportation, including accident investigation, laws, crash barriers and break-away structures, emergency services, highway safety, illumination, road construction, traffic control and studies, and transportation systems and economics; and vehicles, including electric cars, exhaust control, glazing materials, vehicle safety (motorcycles, safety cars, and school buses), signaling and lighting, standards, transmissions, and vehicle handling, inspection and diagnosis, and noise.

National Bureau of Standards, Office of Vehicle Systems Res., Washington, D. C. 20234
1971 ; 225p
Availability: GPO

HS-017 493

CHILDREN AS PASSENGERS IN AUTOMOBILES: THE NEGLECTED MINORITY ON THE NATION'S HIGHWAYS

The problem of infants' and children's need for special seat restraints in automobiles is examined. Federal Motor Vehicle Safety Standard 213 (FMVSS 213) for child seating systems and its subsequent revision, the availability of effective devices, the position of car seat manufacturers, and the focus on child protection in scientific literature are discussed. Also considered are: the importance of using safety devices correctly, the performance rating of child restraints, in-hospital education of new parents, and pediatrician involvement. It is concluded that: it is essential for parents to keep abreast of advances in child seat development; in-hospital instruction of expectant and new parents is showing promising results; and there is an urgent need for pediatricians to become involved in this vital area of "preventive medicine."

by Seymour Charles; Annemarie Shelness
Publ: Pediatrics v56 n2 p271-84 (Aug 1975)
1975 ; 97refs
Availability: See publication; Executive Director, Physicians for Automotive Safety, 50 Union Ave., Irvington, N. J. 07111
$1.50

HS-017 605

INJURIES TO CHILDREN INVOLVED IN ROAD ACCIDENTS

Results are presented of two investigations into traffic accidents involving children to determine possible methods of child protection. Data were gathered from: accident casualty/hospital patient interviews; questionnaires submitted to the purchasers of child restraints; and national traffic accident statistics of England. In order to make valid comparisons between children and adults, only passenger casualties were considered in the study. The following factors were in-

vestigated: children in cars (variation of injury incidence with age; and distribution of injuries to child car occupants); restraint systems for children (design requirements and efficacy of current restraint systems); and children as pedestrians (the variation in child pedestrian injury incidence with age, the distribution of injuries to pedestrians, and vehicle modification to reduce injuries to child pedestrians). It was found that: in 1972 in England, about 2400 children under the age of 15 were killed or seriously injured in cars; and in the same period about 11,500 child pedestrians were killed or seriously injured. It is concluded that: children in cars are significantly safer in rear than in front seats; for children, both as car occupants and as pedestrians, the most critical injuries are those to the head; child restraint systems need to be designed to suit the child's body; there is evidence that correctly designed child restraint systems are effective in reducing injuries

by R. W. Lowne
Transport and Road Res. Lab., Crowthorne, Berks., England
1974 ; 11p
Presented at the International Meeting on Biomechanics of Trauma in Children, Lyon, France, Sep 1974.
Availability: Reference copy only

HS-017 607

TRAUMA TO CHILDREN AS CAR OCCUPANTS

A review is made of field data available on injuries sustained by child car occupants in accident situations. A sample of 103 accident-involved vehicles containing 402 occupants of whom 178 were children under 15 was selected for study from at-the-scene and retrospective in-depth accident investigations conducted by the Accident Research Unit at Birmingham University, England. Vehicle occupancy is analyzed according to numbers and age and seating position, and injuries to unrestrained children are discussed. It was found that: 50% of all injured children less than one year old were seated on the lap of a front seat occupant; a high proportion of children aged 1-5 years occupied rear seats (70%); and there is a great occurrence of head injury in children due to their big head to body weight ratio. A series of tests, evaluating the performance of child seats and harnesses for 9-18 kilogram children (1-5 year olds) in frontal impacts at 20 mph, are reviewed. Five accident case studies are presented to illustrate the performance of child restraints (2 side impacts, one out-of-control complex collision, one collision with a tree, and a severe frontal impact with a heavy goods vehicle). It is concluded that: younger children are less likely to be injured than older children; the head is most frequently injured regardless of age; as age increases head injuries decrease and face injuries increase; upper and lower limb injuries increase with age; children wearing the correct

by S. J. Ashton; G. M. Mackay; P. F. Gloyns
University of Birmingham, Dept. of Transportation England
Min. of Aviation/Tech.
Publ: WSW Technische Berichte
1974 ; 18p
Presented at the International Meeting on Biomechanics of Trauma in Children, Lyon, France, Sep 1974.
Availability: Reference copy only

HS-017 612

CHILD RESTRAINT SYSTEMS. RESULTS FROM FRONTAL IMPACT TESTS AND PROPOSALS FOR COMPLIANCE TEST PROCEDURES

Frontal impact simulations with 25 different types of child restraint systems were made with Alderson 3 and 6 year old anthropometric dummies. Impact speed was 50 kilometers per hour and deceleration levels were 15-20 g. Electrical measurements were made of dummy head and chest accelerations, sled acceleration, and forces acting on the restraint systems. High-speed photography was also used. The most significant difference among various types of systems was found to be that the resultant head acceleration and hyperflexion of the neck are considerably lower with rearward facing seats than with forward facing seats, cushions, shells, and harnesses. It is proposed that, when using the described test methods, the following main performance criteria should be met: a maximum resultant head acceleration of 50g and a maximum vertical head acceleration of 20g. This implies that, among the systems existing today, only rearward facing seats can be approved. Behavioral studies and experience from the 100,000 rearward facing seats used in Sweden confirm that this is a practical and usable design concept for a child restraint system.

by Thomas Turbell
National Swedish Road and Traffic Res. Inst., Drottning Kristinas Vag 25, S-114 28 Stockholm, Sweden
1974 ; 10p 12refs
Presented at the International Meeting on Biomechanics of Trauma in Children, Lyon, France, Sep 1974.
Availability: Reference copy only

HS-017 613

EVALUATION OF CURRENT PRODUCTION AND PROTOTYPE CHILD RESTRAINT SYSTEMS IN THE USA

The protection potential offered by various production and prototype child restraint systems is investigated. A three-year-old size anthropometric dummy (37.5 inches high, and 32 pounds in weight) was used in tests conducted on an unsupported bench seat mounted on a test rig duplicating the occupant compartment in a full size 4 door sedan. The dummy was instrumented with triaxial accelerometer packs in the head and chest and high-speed films were taken of each test. The test configuration employed in the side impacts for this study represents the most severe conditions which may result from a real automobile side collision. The restraint system was installed on a bench seat nearest the impact point. If the system had been installed in the middle of the seat or on the side opposite the impact site, the test results would have indicated much less severe consequences. The performance of the vehicle seat is also very important; head excursion in rear impacts, and to a lesser extent in the front impacts was due in part to deflection of the adult car seat back wich allowed the child restraint system to travel further than it would have, had the seat back been more rigid.

by R. L. Stalnaker; J. W. Melvin
University of Michigan, Ann Arbor Oregon Dept. of Transp.
1974 ; 13p
Presented at the International Meeting on Biomechanics of Trauma in Children, Lyon, France, Sep 1974.
Availability: Reference copy only

HS-017 838

MEASURING THE PHYSICAL DIMENSIONS OF U.S. INFANTS AND CHILDREN

In March 1975, a multidisciplinary research team at The University of Michigan completed a three year study designed to obtain 41 different anthropometric measurements on 4,000 infants and children representative of the U.S. population. The children ranged in age from 2 weeks to 13 years. The principal purpose of the study was to obtain data essential for the development of improved standards for the safe design of toys, furniture, bicycles, automotive child restraint seats, and other products used for or by infants and children. Two field teams using specially modified measuring devices linked to a portable NOVA 1220 minicomputer measured subjects at 76 locations in eight states in accordance with a sampling plan based upon U.S. Census and Department of Health, Education, and Welfare population data. The 41 dimensions measured consisted of: five general body measures; five body segment lengths; 11 hand, foot, and finger measurements; five body segment breadths; four body segment depths; nine segment circumferences; and standing and sitting center of gravity. The study results for each measurement present the sample size, the mean, the standard deviation, and the 5th, 50th, and 95th percentile numbers for 22 age intervals.

by Richard G. Snyder; Martha L. Spencer; Clyde L. Owings; Lawrence W. Schneider
Publ: HIT Lab Reports v6 n1 p1-23 (Oct 1975)
1975 ; 24p refs
Availability: See publication

HS-018 022

RESEARCH ON THE DESIGN OF CHILD RESTRAINT SYSTEMS WITH AN ANIMAL MODEL 0RECHERCHE SUR LA CONCEPTION DE SYSTEMES DE RETENTION D'ENFANTS AL'AIDE D'UN MODELE ANIMAL

Dynamic tests of child restraints were carried out using a baboon as test subject so that major biomechanical criteria for assessing present restraint systems might be studied and elements that might improve the systems be pinpointed. Crashes were simulated in the frontal mode at 30 and 50 kilometers per hour on a sled carrying the occupant department of a medium-sizedvehicle. Mean decelerations were 17 and 24 g. Five child seats were chosenfor testing according to type of restraint (helmet with harness, support surface) and type of anchoring (number of anchor points, shock absorption). It was found that: the movement of the chest does not seem to involve a dangerous phase; the impact shield system seems to be of doubtful value because of the thoracic or abdominal impact it produces; submarining is best avoided withthe five-point harness seats; it appears that it is possible to obtain correct shock absorption with a few types of harness seats, but to the detriment of displacement; and the notion of available space must be reconciled with that of shock absorption. Drawings of each seat tested and force graphs of the tests are provided.

by M. Dejeammes; R. Quincy
National Hwy. Safety Organization, Bron-France Crash Lab.
1976 ; 18p
Unofficial translation from Proceedings of the International Meeting on Biomechanics of Trauma in Children, Lyons, France, 17-19 Sep 1974, n.p., n.d., p260-77. Text also in French.
Availability: Reference copy only

HS-018 024

CHILD RESTRAINT DEVICES IN VEHICLES: ANALYSIS AND EVALUATION OF VARIOUS SYSTEMS 0DISPOSITIFS DE RETENUE DES ENFANTS A BORD DES VEHICULES--ANALYSE ET EVALUATION DES DIFFERENTS SYSTEMES

The effectiveness of various restraint devices in the automobile is compared and evaluated without determining whether the thresholds of children's tolerance were reached or exceeded. A three-year-old child test dummy was sled tested to determine head and chest decelerations along three axes, trajectories and maximum displacements of the child (using high speed films), and head severityindices and modules of maximum chest acceleration at three millisecond intervals. Harnesses, bucket seats, and impact shield devices were evaluated. None of the devices tested offers adequate protection to children during violent crashes, some may even be dangerous. Minor modifications would improve some devices; some are simply inadequately designed. It is natural to have bad results: few child restraint devices have been subjected to serious dynamic tests in vehicles and the limits of children's biomechanical tolerance are poorly understood at present. More specific testing is being undertaken.

by G. Oberle; G. Mauron; C. Tarriere
Peugeot, Paris Res. Center; Peugeot-Renault, Physiology and Biomechanics Lab.
1976 ; 13p 9refs
Unofficial translation from Proceedings of the International Meeting on Biomechanics of Trauma in Children, Lyons, France, 17-19 Sep 1974, n.p., n.d., p301-13. Text also in French.
Availability: Reference copy only

HS-018 114

FRONTAL CRASH EVALUATION TESTS OF A FIVE-POINT HARNESS CHILD RESTRAINT

Tests were conducted to provide information on the mechanics of child restraint with a five-point harness system. For anatomical reasons, juvenile chimpanzees were chosen as the best approximation of the human child. Sedated juvenile male chimpanzees withstood frontal deceleration tests in a five-point harness at crash speeds of 20, 25, and 30 mph without skeletal bone fractures or evidence of soft tissue injury. Injury assessment was by X-ray and blood serum enzyme analysis as well as electrocardiogram readings and post-test observations of the animal's behavior. While the animal model used does not fully guarantee the identical performance ofthe harness system with humans, these results add additional weight to the opinion that the protection offered the child seat occupant is comparable to that available to adult passengers by the conventional three-point restraint system.

by Richard M. Schreck; Lawrence M. Patrick
Wayne State Univ., Biomechanics Res. Center
Publ: HS-018 102 (SAE-P-62), Stapp Car Crash Conference (19th) Proceedings, Warrendale, Pa., 1975, p317-43
Rept. No. SAE-751152 ; 1975 ; 18refs
Conference held in San Diego, 17-19 Nov 1975.
Availability: In HS-018 102

HS-018 115

PERFORMANCE EVALUATION OF CHILD DUMMIES AND BABOONS IN CHILD RESTRAINT SYSTEMS IN A SYSTEMATIZED CRASH ENVIRONMENT

A three-part program, undertaken to establish an appropriate means of evaluating child restraints in car crashes, is described. A standard seat was designed to provide a reproducible test base on which to evaluate child restraint systems in dynamic testing. Developmental and evaluation data are presented, including child restraint performance tests. Results showed the standard seat to be a durable, repeatable, and economical test platform which provides a realistic base for evaluation ofchild restraint systems. Commercially available three and six year old child dummies were evaluated for their anthropometric measurements and dynamic response characteristics in pendulum impact tests and simulated crashes in representative automobile-child seat restraint environments. Simulated crashes included 20 and 30 mph frontal and 20 mph side impacts on automobile and specially designed bench seats. Two types of child seats, the General Motors "Love Seat" and Chrysler "Mopar," were selected for testing as representative of belt and padding restraint types currently in use. The three year old child dummies were found capable of providing repeatable measurements of the head and chest accelerations and head deflections in sled tests. Acceleration measurements on both six year old child dummies were found to contain certain resonances. It was also found that the dummy consisting of clearly defined adjustable body segments is a better simulator than the lumped mass unadjustable type. Test results also indicate that current instrumentation technology forapplication to living subjects is not adequately developed to permit consistent measurements in terms of g levels and injury criteria. The tested shield-type child restraint (Ford Tot-Guard) exposed the occupant to potential riskof ejection during the rebound mode of the forward-collision phase and to substantial excursion in lateral collisions if the seat does not have provisions for limiting the lateral motion of the test subject.

by Stanley H. Backaitis; Jr. Medli, Jere W.; Vladislav G. Radovich; Richard L. Stalnaker; Mahesh P. Shah; John T. Shaffer; Robert M. Letscher
National Hwy. Traffic Safety Administration; Transportation Res. Center; 6570th Aerospace Med. Res. Lab.
Publ: HS-018 102 (SAE-P-62), Stapp Car Crash Conference (19th) Proceedings, Warrendale, Pa., 1975, p345-403
Rept. No. SAE-751153 ; 1975 ; 4refs
Part titles: pt. 1, Development of a Standard Bench Vehicle Seat; pt. 2, Performance Evaluation of Child Dummies; and pt. 3, Comparison of Kinematic Response Baboons and Child Dummies. Conference held in San Diego, 17-19 Nov 1975.
Availability: In HS-018 102

HS-018 854

CHILD RESTRAINTS--AVAILABILITY AND USE

The availability and use of restraining devices for young vehicle occupants, who are not directly affected by legislation requiring the wearing of seat belts, were measured in a survey undertaken in Melbourne and Canberra, Australia, in December 1975. Only one in four children had available a "child restraint", but the wearing rate among these children was extremely high. When "adult restraints" are considered also, a little more than half the children had available some form of restraint and, overall, one in three of the children observed was wearing some form of restraint. Of the "child restraints" observed, approximately one quarter were "unapproved" devices. The current major problem is one of increasing the availability of restraints for young children; even well publicized legislation will not be effective until availability improves. Tables which illustrate survey results include information concerning the number of vehicles, the total number of passengers and the number of occupants less than eight years of age observed in Melbourne and Canberra; restraint availability for seating positions occupied by children less than eight years of age; child restraints by type and whether SAA approved; and restraint usage by children under the age of eight years in Melbourne and also in Canberra. A copy of the bill proposed by the Victoria Legislature concerning 1975 laws for child seat restraints is appended.

by I. R. Johnston
Commonwealth Dept. of Transport, Australia
Rept. No. Paper-17 ; 1976 ; 20p 7refs
Presented at Seat Belt Seminar, Melbourne, Australia, 9-11 Mar 1976, sponsored by Commonwealth Dept. of Transport.
Availability: In HS-018 935

HS-018 855

CHILD RESTRAINT REQUIREMENTS FROM THE VIEWPOINT OF A MOTHER AND A PSYCHOLOGIST

Some problems of current child restraints and various ways of training children to accept restraint in automobiles are reviewed. Problems with current restraints are identified as escapability, discomfort, and child-proof operating mechanisms. Three major points are stressed with regard to training children to accept restraints: training for restraint wearing should begin at birth; parents must be trained to enforce restraint wearing; and no child should be in any part of a moving vehicle without being restrained from possible injury. Educative principles for both children and parents are discussed, with suggestions for implementing the practices of child restraint with success and confidence in results. The key to the problem rests with the parents.

by M. Prior-Hausen
Monash Univ., Australia
Rept. No. Paper-18 ; 1976 ; 8p 3refs
Presented at Seat Belt Seminar, Melbourne, Australia, 9-11 Mar 1976, sponsored by Commonwealth Department of Transport.
Availability: In HS-018 935

HS-018 856

CHILD RESTRAINT REQUIREMENTS--A MEDICAL VIEWPOINT

The injury experience of children as car occupants is reviewed. They are injured less often and less severely than adults, but have similar injury distribution. There is evidence that restraint systems are effective and are being used more frequently. Restraint designs must take into account the fact that children have large heads, soft bones and unprotected ab-

dominal organs. Restraints approved to Australian Standard E46 appear satisfactory in laboratory tests.

by G. A. Ryan
Monash Univ., Australia
Rept. No. Paper-19 ; 1976 ; 9p 13refs
Presented at Seat Belt Seminar, Melbourne, Australia, 9-11 Mar 1976, sponsored by Commonwealth Department of Transport.
Availability: In HS-018 935

HS-018 857

REVIEW OF CHILD RESTRAINT STANDARDS

The development of the first Australian standard for child restraining devices in passenger cars, AS.E46-1970 is reviewed, and the success of the standard in ensuring that satisfactory restraints were available on the market for children of different age groups is noted. A major revision of AS.E46 was completed in 1975 and a new standard AS.1754 "Child Restraints for Passenger Cars and Derivatives" published. The revision broadened the range of devices available for approval and introduced dynamic tests for forward, sideways and rearward impacts. Criteria for infant restraints were revised to overcome difficulties experienced by manufacturers in meeting the more exacting requirements included in AS.E46. The development of criteria for the current standard was based throughout on extensive research work carried out mainly at the N.S.W. Traffic Accident Research Unit. The standard is more comprehensive than those adopted in U.K., U.S.A, and New Zealand and that recommended by the International Organization for Standardization.

by E. A. Huxtable
N.R.M.A., Australia
Rept. No. Paper-20 ; 1976 ; 20p
Presented at Seat Belt Seminar, Melbourne, Australia, 9-11 Mar 1976, sponsored by Commonwealth Department of Transport.
Availability: In HS-018 935

HS-018 858

A COMMONSENSE APPROACH TO CHILD RESTRAINTS

The development of effective, practical, and economical child restraints is considered. Criteria of effectiveness include avoidance of body contact with vehicle interior, avoidance of excessively high head and chest loading during the deceleration phase, and avoidance of stresses imposed by the restraining device in contact with the child. Criteria for practicality include ease of installation of the device, ease of putting the child into it, design and location of buckles and adjusters, child's comfort, and driver's comfort. Factors to consider in testing child restraints are barrier crash, impact sled, vehicle seat vs test seat, use of dummies, and the test set up. Types of currently used child restraints include the following: enclosing restraint up to 9 kg; forward-facing harness with chair from 9 to 19 kg; forward-facing harness without chair from 9 to 38 kg; forward-facing enclosing restraint from 9 to 19 kg; rearward-facing enclosing restraint from 9 to 19 kg; and rearward-facing chair with harness from 9 to 19 kg. New Australian standards are described; most significant is Design Rule No. 34, specifying upper anchorages in the rear seats of passenger cars and derivatives.

by Thomas G. Molnar
Cooldrive Consolidated Industries Pty. Ltd., Australia
Rept. No. Paper-21 ; 1976 ; 13p
Presented at Seat Belt Seminar, Melbourne, Australia, 9-11 Mar 1976, sponsored by Commonwealth Department of Transport.
Availability: In HS-018 935

HS-018 859

PERFORMANCE OF CHILD RESTRAINTS IN CRASHES AND IN LABORATORY TESTS

All child restraints available in Australia have been subjected to a program of dynamic crash simulation studies. Devices approved by the Standards Association of Australia have been shown to have a generally good performance, and those not so approved a generally poor one. 139 crashes involving restrained children have been studied in the field. An analysis of 57 of the more serious ones is given, involving 65 children, in which the restraint system was subjected to significant crash loads or failed in some way. Bucket-type child restraints approved by the Standards Association of Australia have been shown to have a good performance, with the main reason for injury to the child being intrusion of the child's survival space. Unapproved frame-type seats performed very poorly and exposed children to the risk of severe injury. The use of adult seat belts, if firmly adjusted, offered good protection to even small children. Photographs and diagrams of crash damage and restraints are included.

by J. Michael Henderson; D. C. Herbert; B. A. Vazey; J. D. Stott
Department of Motor Transport, N.S.W., Australia
Rept. No. Paper-22 ; 1976 ; 49p 23refs
Presented at Seat Belt Seminar, Melbourne, Australia, 9-11 Mar 1976, sponsored by Commonwealth Department of Transport.
Availability: In HS-018 935

HS-018 903

THE ROAD ACCIDENT SITUATION IN AUSTRALIA IN 1975. ANNUAL REPORT NO. 2

Progress made in improving road safety in Australia from 1972 to 1975 is reviewed and areas in which further action and research are recommended are identified. Since 1970 there has been a decrease in the number of traffic fatalities in Australia in spite of an increase in the number of registered vehicles and a rise in population. Seat belt usage has contributed to this decrease. However, there has not been a decrease in the number of fatalities among pedestrians, cyclists, and motor cyclists. Since 1972, the Australian government has accepted a greater role in road safety by creating the Road Safety and Standards Authority, sponsoring research, creating a central information service and providing financial assistance to the states for improving traffic control. In the future two important new initiatives are recommended: a special program of financial assistance for the implementation and controlled evaluation of comprehensive and coordinated alcohol counter measures; and financial and technical assistance to the states for the establishment of integrated statistical systems. These should incorporate, at a minimum, information on accidents, license holders and motor vehicle registrations. Efforts to en-

courage seat belt usage and proper child restraint systems, improved road design including an increased use of signs and signals for intersection control and efforts to give pedestrians and cyclists safer areas in which to move, research to develop new approaches to motorcycle safety, improved first-aid for crash victims, studies for improved vehicle design, and a system of no-fault personal injury compensation are also recommended.

by C. L. D. Meares
Expert Group on Rd. Safety, G.P.O. Box 2111S, Melbourne, Vic. 3001, Australia
Rept. No. AR-2 ; 1975 ; 180p 299refs
A report to the Australian Minister for Transportation.
Availability: Corporate author

HS-018 935

SEAT BELT SEMINAR. MELBOURNE, (AUSTRALIA) 9-11 MARCH 1976

Papers are presented on the use of seat belts for vehicular occupant protection. The papers concern the following subjects: an American viewpoint of seat belts in the occupant protection system; the European position on seat belts; seat belt wearing and fitting in Australia; seat belt wearer problems; an evaluation of wearing comfort of seat belt installations complying with Australian design rules 4B, 4C, and 5B; the state of the art of seat belts and future trends on the Australian scene; recent developments and findings on safety belts in the United States; restraint systems for occupant protection; a review of seat belt crash performance in modern Volvo vehicles; the selection of materials for seat belts; the design of seat belts for reliability; quality control in respect of safety related automotive components; a review of seat belt crash performance in the United Kingdom and Australia; some dynamic tests with energy absorbing seat belt restraints; the effect of usage on seat belt strength; child restraints, availability and use; child restraint requirements from the viewpoint of a mother and a psychologist; child restraint requirements from a medical viewpoint; a review of child restraint standards; the performance of child restraints in crashes and in laboratory tests.

Australian Dept. of Transport
1976 ; 502p 237refs
Includes HS-018 837--018 859.
Availability: Corporate author

HS-019 152

ARE 1974-1975 AUTOMOBILE BELT SYSTEMS HAZARDOUS TO CHILDREN?

The hazard of 1974-1975 automotive belt systems as required by Federal safety regulations has been investigated with respect to their use for restraining children. The 1974 and early-1975 model automobiles are equipped with belt interlock systems requiring front outboard seat occupants who weigh more than 21.5 kg (47.3 lb) to wear three-point lap and diagonal upper-torso belts (or wear the lap belt and position upper-torso belt behind them), assuming that the automatic interlock system has not been circumvented. Although recent legislation has eliminated the interlock requirement, new models are still likely to be fitted with three-point restraints designed and tested for adult use rather than for children. The effect of the upper-torso belt of the system on restrained children is suggested to be injurious based on structural and biological differences between adults and children, such as in bone structure, center of gravity, head mass relative to neck and body proportions, positions and relative lack of inherent body protection of critical body organs, and biomechanical properties of tissues. Information available on the topic is considered inconclusive because of a lack of research data and data gathered by questionable means and measures, involving use of inadequate child surrogates in dynamic studies; and lack of correlation of experimental and experiential data on child injuries in car crashes. Some data available in a computerized file of collision performance and injury statistics were investigated for child involvement, showing inconclusive evidence for restraint system injuries to children. It was concluded that any restraint used seemed to reduce injury in children. First choice of protection recommended for children is a specially designed child or infant restraint configuration; second choice is the conventional lap belt restraint; third choice is the three point restraint system. Child seats that hook over regular automobile seats should not be used, but under no circumstances should children be unrestrained in a moving motor vehicle.

by Richard G. Snyder; Brian O'Neill
Publ: American Journal of Diseases of Children v129 p946-9 (Aug 1975)
1975 ; 37refs
Availability: See publication

HS-019 285

CHILDREN IN CARS

The methods and medical aspects of protecting children in automobiles are discussed, with distinction made between methods of protecting infants and children of different ages, and stressing the need for passenger protection at any age. Infant protective devices must allow for a reclining position which is protected from disengagement from support and from too much displacement movement in normal traffic. As the child grows, biomechanical properties, anatomical development, and body size dictate the use of child restraint systems progressing from infant seats to the use of adult restraint systems and devices. Age ranges for the childhood groups are given as infant, up to nine months; child seats, nine months to four years; rear seat and seat belt, four years to 15 years. At 12 to 15 years use of adult restraint systems may begin. Child seat designs which are in current use are described and evaluated, including harness systems, rearward facing baskets, forward facing shells, horseshoe-shaped front cushion, hook-over seats, protective net, and protective helmets. The individual child size is a major factor in selecting protective equipment, but some equipment is seen as dangerous in use, such as the hook-over seat and improperly designed or used harness sets. Data on child accident frequency and effects from statistics of Great Britain, Denmark, Finland, Norway, and Sweden are given, showing that front seat placement of the child is more dangerous than rear seat placement and that the age group three to six is most often affected by crashes incident at several angles. Head injuries were most common, indicating secondary collisions as a contributing factor and illustrating the need for effective restraint within the car. Medical aspects are reviewed in order to point out some general methods for protecting small passengers in motor cars. Anthropometric data on overall body development, height, torso, arms and legs, weight, tissues, organs, head, chest, abdomen, pelvis, spinal column, and proportions are reviewed, stressing the need to design child restraint systems which account for

forces acting on the body at places relatively strong enough to be effective without being injurious. The basic problem in designing child restraint systems is the variable size and need of individuals, causing design features which are expensive, complex, and ineffective in use. Viewing child restraint systems from a practical viewpoint encourages the use of individual solutions to individual problems in an attempt to make such equipment as is available and usable as effective and safe as possible. Such practical measures may include location of the child in the car, disallowing equipment which is difficult to install and move about in the car or in which it is difficult to place or remove the child. Accustoming the child to sitting in a restraint system is also recommended. Public information campaigns on child protection systems for use in cars are recommended as a means of affecting their purchase and use. Recommendations are also made for supporting development and standardization efforts and for encouraging legislation on child protection in automobiles.

Nordisk Trafiksikkerheds Rad, Stockholm, Sweden
Rept. No. 11A ; 1975 ; 102p 23refs
Translation from the original publication "Barn i bil," Rept. No. 11, by the Nordic Road Safety Council.
Availability: Reference copy only

HS-019 303

CAR CRASH PROTECTION OF CHILDREN - PRINCIPLES AND PRACTICE

Principles and practice governing the specification of car crash protective devices for children are outlined and reviewed in the light of four programs of crash simulations performed to represent severe side, oblique, and frontal impacts. Crash tests were performed using Standards Association of Australia (SAA) nonapproved and approved child restraints, adult seat belts, and infant restraints. At the level of crash severity selected for testing, dynamic simulations of crashes showed dangerous stomach binding and vehicle ejections for unapproved child restraints; and a sliding loop which severed webbing, weak seat shells, an inadequate fastener, opening of a seat-belt buckle used to restrain a child seat, submarining, and inadequate space requirements in SAA-approved child restraints. Adult seat belts were too long for satisfactory adjustment to a child-size body and cross the child's body in areas vulnerable to belt injury (face, stomach). Unapproved infant restraint systems tested showed collapse of restraint by belt or straps used to secure it during a crash, escape of bassinets from harness by tipping or sliding, and ejection of infant. The effectiveness of current design and static performance requirements specified by the SAA for child restraints is discussed with a view to revision of standards now in progress. It is shown that while there are deficiencies in the manner in which some requirements are specified (ease of installation and adjustment, design of pelvic restraint), the chief factors limiting the effectiveness of Australian approved child restraints are their spatial requirements which often exceed the space available (especially in a vehicle where more than one child restraint needs installation). This limitation has particular consequence in the case of side impacts where severe intrusion is common. It is concluded that present SAA-approved child seats and harnesses can provide good protection for children over one year old when properly used. Discussion and the authors' closure concern other child-restraint configurations and legislation requiring compulsory restraints for children.

by D. C. Herbert; B. A. Vazey; J. D. Stott
Department of Motor Transport, N.S.W., Australia
Publ: HS-019 299, "Road Safety Visibility and Driver/Vehicle Studies. Australian Road Research Board Conference (7th) Proceedings," v7 pt5, Vermont, Vic., 1975 p75-96
Rept. No. Paper-A26 ; 1975 ; 20refs
Presented at the conference held in Adelaide, 1974.
Availability: In HS-019 299

HS-019 451

RESTRAINT SYSTEMS FOR THE PREVENTION OF INJURY TO CHILDREN IN AUTOMOBILE ACCIDENTS

From 1970 through 1974 a series of studies was performed in a large population of infants who attended a well child clinic at a hospital in Tacoma, Washington, to determine the types of vehicular child restraint systems being used and the effect of several different educational approaches to influence parents to use safe restraint systems for transport of their infants and young children in motor vehicles. Emphasis was placed on the use of restraints for children in vehicles because of the high rate of death for children in highway accidents (6,122 such deaths occurring in the U.S. in 1973). Parents of 100 infants ranging in age from nine to twelve months old were surveyed on the type of restraints used. Results showed 62 used either no restraint or restraint systems that were considered unsafe, and 38 used car seats of some type (some of which were ascertained to be more effective than others). These results encouraged the implementation of an educational program on child restraint systems for parents of children coming to the clinic. Parents of 500 infants who came to the clinic with the child at age four weeks were divided randomly into small groups of 12 to 20, stimulated educationally in a variety of ways, and then reassembled into five groups of 100 each to evaluate the effect of the stimulus treatments provided. The five groups were designated as A (received no stimulus), B (exposed to a display in the clinic), C (exposed to the clinic display and handed a pamphlet when they checked into the clinic), D (saw the display and the clinic nurse spent one to two minutes encouraging them to take a pamphlet, read it, and obtain a GM Infant Carrier), and E (saw the display and were encouraged by a physician for from one to five minutes to read the pamphlet and to obtain a GM Infant Carrier). Results showed that personal recommendations by either a nurse or a physician at the four-week visit in the well child clinic increased parent compliance by twice that of other techniques by the eighth week of life. Of the infants who were safely restrained at eight weeks of age, 96% were still in relatively safe restraint systems at 9-12 months of age. It is concluded that compliance with use of restraint systems for children may be improved by parent education in the early postnatal period. Multiapproach educational programs that involve the physician and/or nurse in the early postnatal period are effective in influencing parents to obtain and use safer restraint systems.

by Robert G. Scherz
Publ: American Journal of Public Health v66 n5 p451-6 (May 1976)
1976 ; 21refs
Availability: See publication

HS-019 476

SAVE THE CHILDREN (RESTRAINT SYSTEMS)

Research into child restraints and seats for automobiles conducted by the Highway Safety Research Institute (HSRI) is examined. The biggest problem in testing and evaluating child-restraint devices is that there are no standards. The only present standard is a static one; a dynamic test standard is needed--to be applied to crash situations. Live children cannot be used for crash tests so dummies must be used; here again, there is no standard for dummies. Child-restraint makers are hesitant to improve their products or design new ones in case eventual standards make them obsolete. There are no standards on how children's bodies react to acceleration and deceleration, how they absorb impact, what their tolerances are. There is even confusion as to whether the fact that children's bones are soft is a good thing in an accident situation or a bad thing. In HSRI tests, a $3,000 dummy is used which can show up the systems which don't work at all. Seats should not be purchased unless they are labelled "dynamically tested." Seats come in three major categories: rear-facing, shield type, and harness type. They come in different sizes and should be chosen according to what fits the child. The best seat for infants is the kind in which the infant faces the rear of the car. For older children, the shield type is probably the best providing it fits correctly. Practical considerations when purchasing a seat include making sure it is easy to get the child in and out, easy to clean, and inexpensive (a $20 model can be as good as a $40 model). The Ford Tot-Guard, the Peterson Safety Shell 74 and 75, and the Bobby-Mac Deluxe are especially recommended.

by Fred M. H. Gregory
Publ: Motor Trend v28 n10 p99-102, 104
1976
Availability: See publication

HS-020 149

COMPARISON BETWEEN CHILD CADAVERS AND CHILD DUMMY BY USING CHILD RESTRAINT SYSTEMS IN SIMULATED COLLISIONS

A comparison was made between child cadavers and child dummies equipped with child restraint systems in simulated collisions. Until now only impact tests using dummies and animals had been conducted. In this study, frontal impact tests were conducted using a restraint system consisting of a deformable safety impact table combined with a lap belt. Two dummies and four cadavers of children aged two, six (two cadavers), and eleven with body weight of 16 up to 31 kg were used on a decleration sled track with impact velocities of 30 km/h and 40 km/h at a medium deceleration of 20g. None of the test subjects showed injuries to the inner organs; however, numerous muscular hemorrhages as well as hemorrhages of discs and ligaments were noticed. The HIC (Head Injury Criterion) values lay between 100 and 500; acclerations in the x-direction up to 44g and in z-direction up to 85g occurred at the head. Lap-belt forces of 160 up to 400daN were measured. A weak point of the restraint system is shown in the fact that the child's movements are considerably limited, a factor also noticed in other child systems; however, the protective function proved to be an advantage. The movements during the impact, pictured by high-speed cameras, essentially differ from those of adults wearing 3-point belts. The maximum flexion of the vertebral column is, due to the system, located in the transition of the thoracic to the lumbar vertebral column; the flexion angles amounted to about 90°. As expected, the maximum head displacements in relation to a sled-fixed axis were dependent on the impact velocity and the body height, and ranged between 50 cm (crash velocity 30 km/h, body height 97 cm) and 90 cm (crash velocity 40 km/h, body height 139 cm). Results show that the child cadaver and child dummy kinematics are similar during the frontal impact. Also, the belt load history as well as the course of the resultant head decelerations correspond to a great extent. Despite a lower dummy weight, higher force maxima were measured than in the cadaver. Significant differences were observed in the flexion behavior of the vertebral column. It is concluded that the dummy is suited for preliminary examinations of child safety devices; however, child cadaver tests are indispensable for the investigation of the tolerance limit. It is emphasized that the semi-cylindrical shaped safety table causes a lower compressive load on the abdominal region and thus protects the inner organs.

by D. Kalleris; J. Barz; G. Schmidt; G. Heess; R. Mattern
University of Heidelberg, West Germany
Publ: HS-020 133 (SAE-P-66), "Stapp Car Crash Conference (20th) Proceedings," Warrendale, Pa., 1976 p511-422
Rept. No. SAE-760815 ; 1976 ; 18refs
Availability: In HS-020 133

HS-020 167

INDUCEMENTS TO INCREASED SAFETY BELT USAGE

Before intelligent decisions can be made concerning ways to increase seat belt usage, or about substituting an alternative restraint system, it is important to update the seat belt usage data base to reflect information such as the ways in which comfort and convenience affect usage rates, the effectiveness of three-point belts and inertia reels, and information on usage rates by age of car or by specific seat belt system characteristics. Past studies were designed to obtain gross usage rates which did not yield information which would help answer questions about seat belt users. This sort of information is necessary to design new systems to ensure maximum usage, and to understand demographic and regional differences in order that educational and legislative campaigns can be focused and conducted more effectively. A systematic analysis of the differences in pre-law usage rates, educational campaigns, methods of enforcement, responses of insurance companies, and attitudes of courts which are to be found in the 18 jurisdictions which have implemented mandatory seat belt usage laws could be useful to the Department of Transportation (DOT) and the industry in increasing usage. Another opportunity for the generation of experimental data is the use of fleet vehicles with modified equipment and carefully monitored usage rates. DOT could expand its current program along these lines, using its authority to authorize exemptions to permit testing of experimental belt systems. The implementation of an intensive multi-media public education campaign in one or two target cities is another opportunity for experimentation. Television and motion pictures could provide their viewers with a constant reminder to use belts, if actors were consistent in their use. DOT has an opportunity to take the lead in recommending guidelines to the National Assoc. of Broadcasters and the Motion Picture Assoc. of America. The obvious objective of restraint system standards is to save lives and to reduce injuries, therefore, a seat belt which will be worn more often because it is more convenient and comfortable should be given serious consideration even though it may

fail some of the standard's design specifications. Most existing and proposed seat belt legislation concentrates on adults; in fact, children are specifically excluded in many cases. It is suggested that mandatory usage for children only would be a good place to start since it would be far easier for the public to accept. Such legislation would probably have to specify a minimum age in order to avoid legislating infant restraint systems and would probably need to designate an adult (presumably the driver) as the one legally responsible for belt usage by children in his vehicle. A report is appended on the Ford Motor Company's demonstration to NHTSA of a continuous-loop belt system incorporating a "window shade" tension reliever which was denied approval.

by Richard H. Shackson
Ford Motor Co.
1976 ; 6p
Presented at Motor Vehicle Safety Seminar, Washington, D.C., Jul 12-14, 1976.
Availability: Reference copy only

HS-020 696

SURVEY OF THE PERFORMANCE OF INFANT AUTO RESTRAINT SYSTEMS SOLD IN THE UNITED STATES AND CANADA. FINAL REPORT

Dynamic test data are presented on infant devices specified for use in automobiles. The tests were performed on an impact sled capable of simulating a crash. The sled operated on the rebound principle, achieving a desired velocity change by reversing its direction of motion during the impact event. The infant restraint system was mounted in the center position on a 1974 GM bench-type automobile seat. Sears Type I seat belts were used. A 15 lb plus or minus 3 lb belt preload was used where possible. The test subject was the six-month-old Department of Transporation infant crash simulator (CAMI). The data were recorded simultaneously on a Honeywell 7600 GM tape system and on a Honeywell 1612 Light-beam oscillograph. Photoinstrumentation consisted of high speed (100 fps) 16 mm motion picture camera to the side, front and overhead, and a sequence Polaroid camera. The transducer data and the motion picture data were marked simultaneously by a timing pulse generator at 10 msec intervals. Sled velocity was monitored just prior to impact. Of 21 dynamic impact tests, three were 30 mph, 23 G front impacts, seven were 20 mph, 17 G 60° oblique impacts, three were 20 mph, 17 G lateral impacts, and eight were 20 mph, 17 G rear impacts. Seven frontal tests and three lateral tests were reported on which were run at an earlier time for various companies. The results give head and seat excursions, belt loads as well as sled parameters. Detail test results are given as well as a summary data sheet on all tests.

by R. L. Stalnaker
University of Michigan, Hwy. Safety Res. Inst.
Rept. No. UM-HSRI-77-21 ; 1977 ; 163p
Rept. for 15 Mar 1977-Apr 1977.
Availability: Canadian Standards Association, 178 Rexdale Blvd., Rexdale, Ontario, Canada M9WIR3

HS-020 715

CHILD RESTRAINT SIZE

A literature survey is made of Australian, British, and American sources of information for use in the development and evaluation of child safety restraints. A suitable characteristic which may be used to define accurately a restraint size is the child's mass. Dimensions are provided for relevant body lengths, such that 98% of children of given mass will be comfortably restrained. A table of normal body block dimensions is followed by a series of graphs providing data on the relationhip between age, mass, size, and degree of activity of the child. In order to have the means of testing the size of a restraint, designs are proposed for four body blocks of mass 9, 14, 19, and 38 kg respectively.

by David C. Herbert; Andrei Lozzi
Traffic Accident Res. Unit, Dept. of Motor Transport, P.O. Box 28, Sydney, N.S.W
Rept. No. TARU-6/76 ; 1976 ; 25p 11refs
Availability: Corporate author

HS-020 910

UNRESTRAINED CHILDREN AND TEEN-AGERS: TWO PROBLEMS, ONE SOLUTION

The occupant component of the total crash system is addressed using 1974 and 1975 data concerning vehicle restraint usage and injury patterns for children between the ages of 0-5, and 16-17 year old teen-age drivers. Accidents involving child occupants involve more daylight crashes, more female drivers, fewer drinking drivers, and are less serious accidents than all other crashes. Driver restraint usage patterns are similar to those for drivers in crash related vehicles not carrying a child occupant. A child injury decrease of up to 40% is observed with restraint system use, and rear seat positions are safer than front seat positions. Child restraint systems are often not used even when the driver is using a restraint. Failure to use child restraint systems can be considered child abuse given a redefinition of the laws. Or, the problem could be approached via parent education by the pediatrician. For the 16-17 year old driving population, there is a highly elevated risk of accidents compared to the general driving population. This population uses restraints in only one out of ten cases when they are available; their passengers use belts only 7% of the time. Therefore a mandatory restraint usage law is recommended for provisional licensees and their passengers. In addition to reducing fatalities and serious injuries, the law might instill the habit of belt wear in young drivers which would carry over into later driving years. A mandatory belt law for the provisional driver population could be passed, and enacted at a relatively low cost.

by Forrest M. Council
University of North Carolina, Hwy. Safety Res. Center, Chapel Hill, N.C.
1976 ; 24p 8refs
Presented at 3rd Annual North Carolina Conference on Hwy. Safety, Raleigh, N.C., 3 Nov 1976.
Availability: Corporate author

HS-020 926

SLED TESTS OF CHILD RESTRAINTS. FINAL REPORT

A 28-run sled test program evaluated child restraints for protection during car impacts and comparatively evaluated nine different manufacturer's child car restraints, under identical crash simulations. Restraints tested were those manufactured by Strolee, Dorel, Dynamic Hedstrom, Bobby Mac, Swingomatic, Bunny Bear, Kantwet, Peterson, and Dynamic. Twelve

tests were conducted on nine restraints at 30 mph in a frontal crash simulation mode. Eight of these were tested at 30 mph in a 45° left front crash simulation mode and at 12 mph in a 90° left side crash simulation mode. All tests were conducted using a standard, 1973 Chevrolet front bench seat with standard lap belts plus any rear tether straps supplied with the product by the manufacturer and a Sierra Engineering type 492-03 anthropomorphic dummy that weighs 33.8 pounds. Data from the tests are presented with head accelerations as peak values for anterior-posterior, superior-inferior, and left-right directions and resultants. Chest data are presented with a three millisecond exclusion. The Head Severity Index and the Chest Severity Index are presented for each run.

by Michael J. Walsh
Calspan Corp., Buffalo, N.Y. 14221
Rept. No. CR-ZM-6013-V-1 ; 1977 ; 242p
Availability: Corporate author

HS-020 944

PASSENGER MOTOR VEHICLE SAFETY

Chapters of the report include a discussion of the vehicle aspect of road safety, and of the Federal government's role in passenger motor vehicle safety, including the constitutional position and the establishment of the Bureau of Road Safety. The Australian Transport Advisory Council is discussed, including its advisory committees on safety in vehicle design, vehicle performance, and the Australian Motor Vehicle Certification Board. Chapters are devoted to a discussion of the manufacturers' approach to vehicle safety and to the cost of vehicle safety, including the relationship between cost and benefits and effectiveness, government assistance to manufacturers, and advertising. The chapter on recalls and defective vehicles covers definition and prevalence of defects in new vehicles, recall codes, the U.S. recall system, the Australian Code for Safety Related Defects, attitudes to recall code, alternatives, and the question of an independent arbitrator. Other chapters concern quality control, inspection, and testing; accident avoidance (steering and handling, high-performance vehicles, brakes, tires and wheels, interior design, color, and field of view); and pedestrian safety. The chapter on occupant protection covers human tolerances, restraint systems, crash structure, cost benefit, crashworthiness in various situations, occupant restraints (seat belts and child restraints), and interior design factors. The chapter on roadworthiness includes discussion of vehicle inspection, modifications, repairs and maintenance, and licensing of mechanics and/or repair premises. Other chapters deal with consumer protection including the Trade Practices Act and warranties; vehicle accident data including methods of collection and vehicle identification numbers; research needs, research programs in Australia, the Experimental Safety Vehicle Program, and the Research Safety Vehicle Project; and vehicle insurance. Appendixes provide a variety of legislative, statistical, and miscellaneous background material. The 52 recommendations made by the subcommittee are based on the recommendation to establish and support a Bureau of Road Safety which would have control over design standards, following in general overseas standards.

Parliament of the Commonwealth of Australia, House of Representatives Standing C
1976 ; 363p 52refs
Availability: Reference copy only

HS-021 418

CAR SAFETY RESTRAINTS FOR CHILDREN

The results of testing various car safety restraint devices for children are presented, and suggestions to aid in the safe use of such devices are offered. The test group consisted of the following models: Ford Tot Guard, Sears Child Safety Harness 6401, Peterson Reclina Model 67B, Bobby Mac 3-in-1 Baby Chair 4810, General Motors Love Seat, Chrysler Child Safety Seat, and Irvin Child Car Seat and Safety Cushion Model 1165. To simulate actual crash conditions, an acceleration sled was employed that was equipped with a front bench seat, a floor pan, and a simulated instrument panel. Front, side, and rear impacts were investigated in the course of testing. Three of the seven devices provided at least adequate protection (General Motors Love Seat, Ford Tot Guard, and Bobby Mac 4810). The remaining four devices were rated as not acceptable. It is recommended that child restraints not be mounted on a folding car seat without positive latches and that they generally be used in the back seat of most two-door cars built before 1968. In four-door and late model two-door cars, child restraints should be mounted in the center of the rear seat, away from sides and doors. Photographs of the seven devices tested are included, and a rating for each device in terms of its lifesaving performance and quality and cost data are provided.

Publ: Consumer Reports v39 n2 p108-12 (Feb 1974)
1974
Availability: See publication

HS-021 667

TRAUMATIC AND COST MAINPOINTS OF INJURY MODEL AND CAUSE OF INJURY CONCERNING UNRESTRAINT AND RESTRAINT CHILD CAR OCCUPANTS AND AGGRESSIVITY AND COST OF INJURIES BY VEHICLE FRONT SHAPES AND ELEMENTS IN REAL PEDESTRIAN ACCIDENTS

Compared with other groups of traffic participants, the relative danger for child passenger car-occupants, as well as for pedestrians, is increasing. Based on 130 medically and technically studied single-case analyses of real accidents involving child car-occupants, the importance of major influences on trauma, such as impact direction, seating position, and age, has been investigated. The most dangerous occupant position is the front passenger, and the least dangerous is the middle back seat. Improvements in side impacts are as desirable as those in frontal impacts. For unrestrained children, points of contact include the windscreen, side window, and roof frame; for restrained children, points of contact are the windscreen, side furniture, and the restraint system itself. The dysfunction of the restraint system which causes the most injury is incorrect position of anchor points. As to pedestrian accidents, an optimization of the vehicle exterior is only reasonable. In 310 single-case analyses of real pedestrian accidents involving 170 children, the aggressivity of the vehicle, measured by the costs arising from injuries received, is analyzed for vehicle frontal

impacts with regard to different front shapes and their elements.

by G. Sturtz
Technical Univ., Inst. of Automotive Engineering, Berlin, Germany
Publ: HS-021 782, Stapp Car Crash Conference (21st) Proceedings, Warrendale, Pa., 1977 p1093-122
Rept. No. SAE-770941 ; 1977 ; 31p
Presented at 21st Stapp Car Crash Conference, New Orleans, 19-21 Oct 1977.
Availability: SAE

HS-022 356

DIMENSIONS OF CHILDREN AS RELATED TO THE CONSTRUCTION OF CHILD RESTRAINT SYSTEMS

INFORMATION ABOUT ANTHROPOMETRIC DIMENSIONS OF CHILDREN IS REPORTED IN GRAPHIC FORM FOR USE IN DESIGN OF CHILD RESTRAINT SYSTEMS IN MOTOR VEHICLES. DIAGRAMS OF 21 DIMENSIONS VERSUS MASS ARE DERIVED FROM SEVEN LITERATURE SOURCES AND ESTIMATES, AS AN ACTUAL SURVEY OF CHILD MEASUREMENTS WAS NOT POSSIBLE. EACH OF THE 21 DIMENSIONS IS REPORTED FOR THE FIFTH, FIFTIETH, AND NINETY-FIFTH PERCENTILE, WITH ALL DIAGRAMS REFERRING TO THE MEAN OF BOYS AND GIRLS WITHOUT CLOTHING. SURVEY RESULTS ON CHILDREN IN THE U.S. ARE SIMILAR TO SWEDISH AND DUTCH CHILDREN, WITH MASS VERSUS AGE DIFFERING LESS THAN 2 KG AND FOR STATURE LESS THAN 4 CM.

by H. S. T. BROCKHOFF; C. OUDESLUYS; J. C. BASTIAANSE
AB VOLVO, S-405 08 GOTEBORG, SWEDEN; INSTITUUT VOOR WEGTRANSPORTMIDDELEN, TNO-COMPLEX ZUIDPOLDER, POSTBUS 237, DELFT,
Rept. No. TNO-713003-B ; 1976 ; 65P 10REFS
Availability: INSTITUUT VOOR WEGTRANSPORTMIDDELEN, TNO-COMPLEX ZUIDPOLDER, POSTBUS 237, DELFT, NETHERLANDS

HS-022 357

STANDARDS FOR CHILD RESTRAINT DEVICES IN CARS

TABULATED INFORMATION ON EXISTING AND PROPOSED LAWS, REGULATIONS, AND STANDARDS FOR CHILD RESTRAINT DEVICES SUCH AS CHILD SEATS AND HARNESSES IS PRESENTED FROM THE FOLLOWING NATIONS: AUSTRALIA, CANADA, FRANCE, GERMANY, JAPAN, THE NETHERLANDS, NEW ZEALAND, SWEDEN, SWITZERLAND, UNITED KINGDOM, AND THE U.S. ONLY THOSE PARTS OF THE STANDARDS ARE DEALT WITH WHICH RELATE TO CHILDREN HEAVIER THAN ABOUT 9 KG WHO CAN SIT UPRIGHT WITHOUT SUPPORT. GENERALLY THESE ARE RESTRAINT DEVICES WITH A CHILD'S SEAT, OR HARNESSES WITHOUT A CHILD'S SEAT. WIDE VARIATIONS EXIST IN LAWS CONCERNING CHILD RESTRAINTS FOR ELEVEN COUNTRIES DISCUSSED. INTERNATIONALLY THERE IS NO AGREEMENT ABOUT THE AGE AT WHICH CHILDREN CAN SAFELY MAKE USE OF ADULT SEAT BELTS. DIFFERENCES IN GENERAL SPECIFICATIONS INVOLVE COVERED TYPES, ATTACHMENT AND REMOVAL OF THE DEVICE, AND RELEASE OF THE CHILD. FRONTAL, SIDE, AND REAR IMPACT PERFORMANCE ARE EVALUATED BY STATIC AND DYNAMIC TESTING. STANDARDS FOR CHILD RESTRAINTS COVER SUCH ASPECTS AS ROLLOVER PERFORMANCE; WEBBING, STRAPS, AND LOAD-CARRYING COMPONENTS; AND BUCKLES. OTHER RESTRAINT SYSTEMS INCLUDED IN CURRENT REGULATIONS ARE ADJUSTERS; CLIP-ON DEVICES AND OTHER HARDWARE; CAR SEAT BACK RESTRAINTS; AND CHILD SEAT BACK AND HEAD REST. ALSO DISCUSSED AND COMPARED ARE IMPACT SHIELD AND SIDE WINGS; SHOCK ABSORBING MATERIALS; AND PROTRUDING PARTS AND SHARP EDGES. A LARGE NUMBER OF EXISTING AND PROPOSED STANDARDS ARE FOUND TO BE FOCUSED ON CONVENIENCE ASPECTS, WHICH HAVE SAFETY VALUE BECAUSE THEY ENCOURAGE USAGE.

by H. S. T. BROCKHOFF
AB VOLVO, S-405 08 GOTEBORG, SWEDEN; INSTITUUT VOOR WEGTRANSPORTMIDDELEN, TNO-COMPLEX ZUIDPOLDER, POSTBUS 237, DELFT,
Rept. No. TNO-713003-E ; 1977 ; 75P 22REFS
Availability: INSTITUUT VOOR WEGTRANSPORTMIDDELEN, TNO-COMPLEX ZUIDPOLDER, POSTBUS 237, DELFT, NETHERLANDS

HS-022 358

DESCRIPTION OF CHILD RESTRAINT DEVICES

INFORMATION GIVEN FOR 43 CHILD RESTRAINT SYSTEMS ON THE U.S., CANADIAN, AND EUROPEAN MARKETS INCLUDES THE FOLLOWING: PHOTOGRAPH(S); MANUFACTURER; STANDARD WITH WHICH IT COMPLIES; MASS AND AGE RANGES; DESCRIPTIONS OF SHELL, ANCHORAGES, HARNESS, BUCKLE, AND PADDING; DESCRIPTION OF HARNESS AND SEAT-ATTACHMENT ADJUSTMENTS; AND EVALUATION. THE BASIC TYPES OF RESTRAINT DEVICES MOST COMMONLY USED ARE THE FORWARD/REARWARD FACING SEAT WITH HARNESS, HARNESS WITHOUT SEAT, IMPACT SHIELD WITH OR WITHOUT SEAT, AND CARRY-COT RESTRAINT. THE TEN CHILD RESTRAINT DEVICES OF PARTICULAR INTEREST ARE THE FOLLOWING: BABY RELAX, BECAUSE OF ITS SHAPE AND SHELL MATERIAL; BRITAX SR50, BECAUSE OF ITS TWO-WAY BUCKLE; BUNNY BEAR, BECAUSE OF ITS LATERAL INFANT MODE; HEDSTROM, BECAUSE OF ITS SHELL DESIGN AND PADDING; KANTWET, BECAUSE OF ITS SHELL DESIGN; KLIPPAN SEAT, BECAUSE OF ITS PADDING AND SHOCK ABSORBER; PETERSON 74/75, BECAUSE OF ITS THREE MODES; STORCHENMUHLE JET 6086/7, BECAUSE OF ITS INERTIA REEL BELT; STROLEE WEE CARE, BECAUSE OF ITS AWKWARD BUCKLE; AND SWINGOMATIC, BECAUSE OF THE IMPACT PART OF ITS HARNESS.

by C. OUDESLUYS; H. S. T. BROCKHOFF; J. C. BASTIAANSE
AB VOLVO, S-405 08 GOTEBORG, SWEDEN; INSTITUUT VOOR WEGTRANSPORTMIDDELEN, TNO-COMPLEX ZUIDPOLDER, POSTBUS 237, DELFT,
Rept. No. TNO-713003-C ; 1976 ; 95P
Availability: INSTITUUT VOOR WEGTRANSPORTMIDDELEN, TNO-COMPLEX ZUIDPOLDER, POSTBUS 237, DELFT, NETHERLANDS

HS-022 709

OCCUPANT RESTRAINTS IN MOTOR VEHICLES--THE PRESENT SITUATION

THE SIGNIFICANT BENEFITS IN TERMS OF REDUCTIONS OF CASUALTIES FOLLOWING INTRODUCTION IN AUSTRALIA OF LEGISLATION ENFORCING THE WEARING OF SEAT BELTS, HIGHLIGHT THE NEED FOR COMPULSORY RESTRAINTS FOR CHILDREN. SURVEYS IN 1975 AND 1976 PROVIDE INFORMATION ON THE AVAILABILITY OF RESTRAINTS TO ALL CHILDREN, THE WEARING OF RESTRAINTS AND THE ATTITUDE OF CHILDREN (SEATED, STANDING, LYING ON SEAT, NURSED, ETC.). RESULTS, SUPPORTED WHEN POSSIBLE BY A NATIONAL ROADS AND MOTORISTS' ASSOC. SURVEY, ARE USED TO DESCRIBE THE RESTRAINT OF CHILDREN IN CARS. OVERALL, IN MELBOURNE AND CANBERRA (AUSTRALIA) APPROXIMATELY EVERY THREE OUT OF FOUR CAR OCCUPANTS AT LEAST EIGHT YEARS OLD WITH A SEAT BELT AVAILABLE USE IT. FITTING OF SEAT BELTS IS MANDATORY UPON MANUFACTURE, BUT PROVISION OF A SUITABLE RESTRAINT FOR A CHILD IS LEFT TO THE PARENT OR VEHICLE OWNER. MANUFACTURERS MUST NOW PROVIDE UPPER ANCHORAGE POINTS IN EACH REAR SEATING POSITION OF CARS TO FACILITATE FITTING OF CHILD RESTRAINTS. LOCATION WITHIN THE CAR IS IMPORTANT; SAFEST CHILDREN ARE THOSE IN REAR SEATING POSITIONS AND RESTRAINED, WITH LITTLE DIFFERENCE BETWEEN RESTRAINED CHILDREN IN FRONT SEAT AND UNRESTRAINED IN REAR SEAT. THE FORM OF LEGISLATION MOST SUCCESSFUL IN REDUCING CASUALTIES HAS BEEN THAT IN WHICH, IF A SUITABLE RESTRAINT IS AVAILABLE IN THE CAR IT MUST BE WORN, AND NO CHILD IS ALLOWED TO TRAVEL UNRESTRAINED IN THE FRONT SEAT IF A REAR SEAT POSITION IS AVAILABLE. FURTHER IMPROVEMENT COULD BE ACHIEVED BY LEGISLATION TO PROHIBIT BOTH THE SALE AND PLACEMENT IN CARS OF UNAPPROVED CHILD RESTRAINTS, AND PROHIBITING BOTH THE NURSING OF CHILDREN AND STANDING OF CHILDREN IN FRONT SEATS, BY ENCOURAGING PURCHASE AND USE OF APPROVED CHILD RESTRAINTS AND OF SEAT BELTS BY THOSE AT LEAST FIVE YEARS OLD WHEN NO MORE SUITABLE RESTRAINT IS AVAILABLE.

by C. J. BOUGHTON
COMMONWEALTH DEPT. OF TRANSPORT, ROAD SAFETY INFORMATION SERVICE, AUSTRALIA
1978 ; 21P 15REFS
Availability: REFERENCE COPY ONLY

HS-023 015

CHILDSAFE: WHEN CHILDREN TRAVEL BY CAR

AUTO ACCIDENTS ARE THE LEADING CAUSE OF DEATH AMONG CHILDREN. CRASH-TESTED SAFETY RESTRAINTS COULD PREVENT MOST OF THESE DEATHS AND INJURIES. PROJECT CHILDSAFE, A SAFETY/HEALTH EDUCATION PROGRAM SPONSORED BY THE WISCONSIN HOSPITAL ASSOC. AND THE WISCONSIN DEPT. OF PUBLIC INSTRUCTION, ALERTS NEW PARENTS TO THE HAZARDS TO CHILDREN RIDING UNRESTRAINED IN A MOTOR VEHICLE, AND PROVIDES INFORMATION ON PROPER SAFETY DEVICES AND OTHER TRAVELLING AIDS. AMONG THE HAZARDS ARE DISTRACTION OR DIVERSION OF THE DRIVER, THE MISSILE EFFECT OF THE CHILD'S BODY IN A CRASH OR SUDDEN STOP, AND IMPROPER "SAFETY" EQUIPMENT DUE TO POOR DESIGN OR CONSTRUCTION. ADULT SEAT BELTS ARE NOT SUITABLE FOR CHILDREN. SEVENTEEN CRASH-TESTED CHILD RESTRAINTS ARE CURRENTLY AVAILABLE. STATISTICS COLLECTED IN 1975 BY THE INSURANCE INST. FOR HWY. SAFETY INDICATE THAT ONLY 7% OF CHILDREN UNDER AGE 10 WERE PROPERLY RESTRAINED AGAINST POSSIBLE CRASH INJURY. UNRESTRAINED CHILDREN IN THE FRONT SEAT HAVE THE HIGHEST INJURY RATE. THE CHILDSAFE PROJECT INCLUDES A TEN-MINUTE SLIDE PROGRAM, A BROCHURE, A POSTER, AND A BUMPER STICKER. PUBLIC SERVICE RADIO SPOTS WERE DISTRIBUTED TO ALL MAJOR RADIO STATIONS IN WISCONSIN. GRANTS WERE PROVIDED FOR DEVELOPMENT OF THESE MATERIALS AND FOR A TRAVELLING DISPLAY. THE MATERIALS WERE DEVELOPED FROM INFORMATION PROVIDED BY PHYSICIANS FOR AUTO SAFETY AND ACTION FOR CHILD TRANSPORTATION SAFETY, BOTH OF NEW JERSEY. OTHER ACTIVITIES IN CONNECTION WITH THE PROJECT INCLUDE ORGANIZING SPEAKERS' BUREAUS, SETTING UP EXHIBITS, ARRANGING FOR FEATURE ARTICLES IN NEWSPAPERS, ENCOURAGING THE ADDITION OF CHILD RESTRAINT INFORMATION TO HIGH SCHOOL DRIVER EDUCATION, PROMOTING AVAILABILITY OF CRASH-TESTED RESTRAINTS IN LOCAL STORES, ESTABLISHING A BANK OF USED RESTRAINTS FOR NEEDY PARENTS AND SELLING APPROVED RESTRAINTS IN HOSPITAL GIFT SHOPS. VARIOUS TYPES OF CHILD RESTRAINTS ARE DESCRIBED AND TIPS ARE PRESENTED FOR SAFE TRAVELLING WITH CHILDREN.

by C. ERNEST COONEY; SUSAN KUMMEROW
Publ: CHILDREN TODAY V6 N4 P11-5 (JUL-AUG 1977)
1977
Availability: SEE PUBLICATION

HS-023 244

WARNING: IN CARS, PARENTS MAY BE HAZARDOUS TO THEIR CHILDREN'S HEALTH. THE HAZARDS OF ON-LAP TRAVEL

IN CAR CRASHES CHILDREN TRAVELING ON LAPS CANNOT BE ADEQUATELY RESTRAINED, AND ARE SUSCEPTIBLE TO SERIOUS INJURIES CAUSED BY BEING CRUSHED BY THE PERSON HOLDING THEM. A 1974 OBSERVATIONAL SURVEY SHOWED THAT OF THOSE LESS THAN ONE YEAR OF AGE, ALMOST HALF TRAVELED ON ADULTS' LAPS, AS DID ONE-FOURTH OF THE ONE-YEAR OLDS; THE FIGURE DECREASED WITH AGE OF THE CHILD. IN MOST CASES BOTH ADULT AND CHILD WERE UNRESTRAINED, IN A FEW CASES BOTH WERE RESTRAINED BY THE SAME SEAT BELT, AND IN SOME CASES THE HOLDER ALONE WAS USING A SEAT BELT. EACH OF THESE PRACTICES IS LIKELY TO RESULT IN THE ADULT INJURING THE CHILD, PARTICULARLY IF BOTH ARE WEARING THE SAME BELT, SINCE THE CHILD IS COMPRESSED BETWEEN

THE SEAT BELT AND THE HEAVIER FORWARD-MOVING ADULT. THE INJURIES RANGED FROM MINOR SUCH AS LACERATIONS OR ABRASIONS TO FATAL RESULTING FROM MULTIPLE CRUSHING TRAUMA. IN 10 OF THE 14 CRASHES IN WHICH CHILDREN SUSTAINED SEVERE OR FATAL INJURY, THE INJURIES WERE CAUSED OR AGGRAVATED BY CONTACT WITH OTHER VEHICLE OCCUPANTS. ON-LAP TRAVEL IS DIFFICULT TO ELIMINATE THROUGH TECHNIQUES SUCH AS INCREASED INFORMATION, PERSUASION, OR LEGISLATION. MOST COUNTRIES WITH MANDATORY SEATBELT LEGISLATION HAVE EXEMPTED CHILDREN FROM RESTRAINT USE. TENNESSEE'S NEW LAW, EFFECTIVE 1 JAN 1978, WHICH REQUIRES PARENTS OF CHILDREN LESS THAN FOUR TO TRANSPORT THEM IN APPROVED CHILD RESTRAINT SYSTEMS, EXEMPTS CHILDREN FROM RESTRAINT USE IF THEY ARE HELD IN THE ARMS OF OLDER PASSENGERS. THE NEW LAW COULD ACTUALLY INCREASE THE DANGEROUS PRACTICE OF HOLDING YOUNGSTERS AND RESULT IN A NET INCREASE IN INJURIES AND DEATHS AMONG CHILDREN. PRESENT-GENERATION AIR BAGS CAN PROVIDE SUBSTANTIAL CRASH PROTECTION TO UNRESTRAINED CHILDREN AS YOUNG AS THREE YEARS OF AGE, AND IT IS LIKELY THAT THEY WILL PROVIDE SOME PROTECTION TO YOUNGER CHILDREN AND CHILDREN ON LAPS. PEDIATRICIANS AND OTHER PHYSICIANS HAVE AN IMPORTANT ROLE TO PLAY IN DISCOURAGING ON-LAP TRAVEL AND IN ENCOURAGING OTHER TECHNIQUES WHICH REDUCE CRASH INJURIES TO CHILDREN.

by ALLAN F. WILLIAMS
.978 ; 15P 18REFS
Availability: INSURANCE INST. FOR HWY. SAFETY, WATERGATE 600, SUITE 300, WASHINGTON, D.C. 20037

HS-023 250

INTERNATIONAL CONFERENCE OF THE INTERNATIONAL ASSOCIATION FOR ACCIDENT AND TRAFFIC MEDICINE (6TH) PROCEEDINGS, MELBOURNE, AUSTRALIA, JANUARY 31-FEBRUARY 4, 1977

THE BENEFICIAL RESULTS OF MANDATORY SEATBELT LEGISLATION IN MANY COUNTRIES AND HOW THE EFFECTIVENESS OF RESTRAINT SYSTEMS, ESPECIALLY THOSE FOR CHILDREN, MAY BE IMPROVED WERE ADDRESSED. THE CONFERENCE PASSED EIGHT RESOLUTIONS. FIRST, IT IS RECOMMENDED THAT MANDATORY SEATBELT USE LAWS BE INTRODUCED IN ALL COUNTRIES. SECOND, MANDATORY SEATBELT USE LAWS SHOULD COVER ALL OCCUPANTS OF PASSENGER CARS AND DERIVATIVES, IRRESPECTIVE OF SEATING POSITION AND AGE. THIRD, MANDATORY SEATBELT USE LAWS SHOULD COVER NOT ONLY THE DRIVERS OF AND PASSENGERS IN PASSENGER CARS, BUT ALSO THE DRIVERS OF AND PASSENGERS IN TAXIS AND TRUCKS, AND THE DRIVERS OF BUSES. FOURTH, WITH RESPECT TO THE PROTECTION OF CHILD PASSENGERS, THE FOLLOWING ARE RECOMMENDED: CONTINUE RESEARCH CONCERNING CHILD RESTRAINT SYSTEMS AND MAKE AVAILABLE APPROPRIATE FUNDS BY GOVERNMENT AND OTHER AUTHORITIES, USE TESTED DEVICES CURRENTLY APPROVED BY COMPETENT AUTHORITIES FOR PROTECTION OF CHILDREN AND MAKE THESE DEVICES MANDATORY AS THEY BECOME AVAILABLE, DO NOT ALLOW CHILDREN TO RIDE IN THE FRONT COMPARTMENTS OF PASSENGER CARS UNLESS SUITABLE RESTRAINTS ARE AVAILABLE AND USED, AND REQUIRE CHILDREN WHO ARE ABLE TO SIT UP UNSUPPORTED TO USE ADULT SEAT BELTS IF NO MORE SUITABLE DEVICES ARE AVAILABLE. FIFTH, ALL THOSE WORKING WITH AND ANALYZING INJURY DATA SHOULD USE THE ABBREVIATED INJURY SCALE (AIS), AND THE STANDARDIZATION OF THE FORMAT FOR OTHER DATA RELATING TO ACCIDENT AND TRAFFIC MEDICINE RESEARCH SHOULD BE PURSUED. SIXTH, STUDIES SHOULD BE CONTINUED INTO THE EFFECTIVENESS, COST, AND ACCEPTABILITY OF PASSIVE RESTRAINT SYSTEMS, WITH A VIEW TO THE ULTIMATE PROTECTION OF ALL VEHICLE OCCUPANTS. SEVENTH, IMPROVEMENT IN THE OCCUPANT PROTECTION AND GENERAL COMFORT REQUIREMENTS OF VEHICLE SAFETY STANDARDS AND SPECIFICATION OF CRITERIA FOR REPLACEMENT OF SEAT BELTS WHICH HAVE DETERIORATED OR HAVE BEEN INVOLVED IN A CRASH SHOULD BE KEPT UNDER REVIEW. AND, EIGHTH, INCREASED ATTENTION SHOULD BE GIVEN TO ROAD ENGINEERING AND TRAFFIC MANAGEMENT TECHNIQUES TO MINIMIZE OPERATING SPEEDS IN CONFLICT SITUATIONS.

INTERNATIONAL ASSOC. FOR ACCIDENT AND TRAFFIC MEDICINE
1977 ; 574P REFS
INCLUDES HS-023 251--HS-023 293.
Availability: REFERENCE COPY ONLY

HS-023 261

VICTORIAN EXPERIENCE WITH THE COMPULSORY WEARING OF SEAT BELTS AUSTRALIA

VICTORIA'S (AUSTRALIA) COMPULSORY SEATBELT USAGE LEGISLATION, EFFECTIVE 22 DEC 1970, REQUIRES USE OF SEAT BELTS BY CAR PASSENGERS OCCUPYING SEATS FITTED WITH BELTS. THE FOLLOWING PERSONS ARE EXEMPTED FROM WEARING SEAT BELTS: PERSONS ENGAGED IN DRIVING A CAR IN REVERSE, PERSONS WITH A CERTIFIED MEDICAL PROBLEM PRECLUDING WEARING OF SEAT BELTS, PERSONS ENGAGED IN MAKING DELIVERY OF FOOD PRODUCTS AND TRAVELING IN A MOTOR VEHICLE AT A SPEED OF NOT MORE THAN 15 MPH, AND PERSONS ENGAGED IN DRIVING A MOTOR VEHICLE EXCEEDING 10,000 LBS GVW. SEATBELT ANCHORAGES FOR THE DRIVER AND OUTBOARD FRONT-SEAT PASSENGER HAVE BEEN REQUIRED IN VICTORIA FOR NEW CARS SINCE 1 OCT 1964. BY MID 1970, SEAT BELTS WERE FITTED TO ABOUT 60% OF FRONT SEATS, AND ABOUT ONE FOURTH OF THESE WERE BEING WORN. FURTHER LEGISLATION (AUSTRALIAN DESIGN RULES NOS. 4 AND 5A) REQUIRES BELTS TO BE FITTED TO ALL SEATING POSITIONS IN NEW CARS AND OTHER VEHICLES UNDER 10,000 LBS GVW FROM 1 JAN 1971; THESE RULES REQUIRE THE OUTBOARD-POSITION BELTS IN BOTH FRONT AND REAR

SEATS TO PROVIDE UPPER TORSO RESTRAINT. MORE RECENT LEGISLATION REQUIRES RETROFITTING OF BELTS IN OLDER CARS. SURVEYS SINCE MAY 1971 HAVE SHOWN THAT WHILE FITTING AND USAGE RATES ARE SOMEWHAT LOWER IN THE COUNTRY THAN IN MELBOURNE, BOTH RATES HAVE BEEN INCREASING STEADILY THROUGHOUT THE STATE. THE LEGISLATION HAS RESULTED IN AN IMMEDIATE AND A SUSTAINED DROP IN VEHICLE OCCUPANT DEATHS, WHILE THERE HAS BEEN NO CORRESPONDING DROP IN THE TOTAL OF ALL OTHER ROAD USER DEATHS. A SIMILAR TREND EXISTS FOR TRAFFIC INJURIES, BUT WITH EVEN LARGER REDUCTIONS. THE TOTAL REDUCTION IN VEHICLE OCCUPANT DEATHS FROM 1971 TO 1976 IS OVER 1400. ALSO TO BE TAKEN INTO CONSIDERATION IN THE TRAFFIC CASUALTY REDUCTIONS, BESIDES THE COMPULSORY SEATBELT USE LAW, IS A SERIES OF ROAD SAFETY INITIATIVES INTRODUCED OVER THE PAST FEW YEARS BY THE GOVERNMENT. FINALLY, IN JAN 1976 LEGISLATION WAS PASSED REQUIRING CHILDREN UNDER EIGHT YEARS OF AGE AND TRAVELING IN THE FRONT SEATS OF CARS TO WEAR AN APPROVED CHILD RESTRAINT. PRELIMINARY RESULTS FOR THE FIRST NINE MONTHS OF 1976 SHOW 384 CASUALTIES OF CHILD PASSENGERS UNDER SEVEN YEARS OF AGE, COMPARED WITH 436 CASUALTIES OVER THE SAME PERIOD IN 1975.

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Publ: HS-023 250, "INTERNATIONAL CONFERENCE OF THE INTERNATIONAL ASSOCIATION FOR ACCIDENT AND TRAFFIC MEDICINE (6TH) PROCEEDINGS," MELBOURNE, 1977 P99-114
1977 ; 7REFS
Availability: IN HS-023 250

HS-023 268

SEAT BELTS AND ANCHORAGES - AUSTRALIAN DESIGN RULES LEGISLATION

FOLLOWING A BRIEF OUTLINE OF THE OPERATION OF THE AUSTRALIAN DESIGN RULE (ADR) SYSTEM IN WHICH THE COUNTRY'S SEATBELT SPECIFICATIONS ARE EMBODIED, THE DEVELOPMENT OF SEAT BELTS AND ANCHORAGES IN AUSTRALIA IS REVIEWED. THE FIRST SEATBELT RULES, ADR 4 (SPECIFICATIONS FOR SEAT BELT ASSEMBLY STRENGTH UNDER A STATIC TEST, RESISTANCE TO CORROSION AND SUNLIGHT, METHOD OF ADJUSTMENT, ADJUSTMENT FORCE AND BUCKLE RELEASE FORCE, INSTRUCTIONS FOR INSTALLATION, AND INSTRUCTIONS FOR USE) AND ADR 5A (SPECIFICATIONS FOR NUMBER OF SEATING POSITIONS TO BE FITTED WITH BELTS, THE TYPE OF BELT TO BE FITTED, AND THE STRENGTH OF AND LOCATION FOR ANCHORAGES), CAME INTO EFFECT ON 1 JAN 1969 AND APPLIED ONLY TO THE FRONT SEATS OF PASSENGER CARS AND DERIVATIVES (IN JAN 1971, CHANGED TO INCLUDE REAR SEATS). SINCE THAT TIME, ADR 4 HAS BEEN UPGRADED AND APPLIED TO OTHER VEHICLE TYPES (ADR 4A, JAN 1974 (PASSENGER CARS AND DERIVATIVES, MULTIPURPOSE PASSENGER CARS) AND JUL 1974 (OTHER VEHICLES LESS THAN 4.5 TON GVW); ADR 4B (JAN 1975 AND JUL 1975); AND ADR 4C (JAN 1976 AND JUL 1976)). ADR 5A WAS UPGRADED TO ADR 5B IN JAN 1975 AND JUL 1975 (APPLIED TO VEHICLES LESS THAN 4.5 TON GVW). ON 1 JUL 1977, A NEW ADR, ADR 32, WAS ENACTED WHICH REQUIRES THE FITTING OF SEAT BELTS IN THE DRIVER POSITION OF BUSES AND HEAVY COMMERCIAL VEHICLES, AND THE OUTBOARD FRONT-SEAT PASSENGER POSITION IN TRUCKS. A UNIQUE RULE, ADR 34, WHICH WAS ENACTED IN JUL 1976 REQUIRES THE PROVISION OF ANCHORAGE POINTS FOR CHILD RESTRAINTS IN PASSENGER CARS. A NUMBER OF WAYS IN WHICH THE PERFORMANCE OF THE PRESENT SEATBELT SYSTEM MIGHT BE IMPROVED ARE OUTLINED, TOGETHER WITH OTHER ASPECTS WHICH REQUIRE INVESTIGATION OR FURTHER ACTION, AND INCLUDE THE FOLLOWING: UNIFORM BUCKLE LATCHING AND RELEASE; STANDARD MEANS OF ADJUSTMENT ON NONRETRACTOR BELTS; SEAT BELTS ATTACHED TO SEATS; LACK OF PROTECTION OF A SEATBELT WEARER'S HEAD; PROBLEM OF VEHICLE INTRUSION FOR THE SEATBELT WEARER; POSSIBLE NEED FOR DESIGNS TO LIMIT PEAK FORCE AND CONTACT PRESSURE E[illegible]PTED BY BELT; EFFECT OF USAGE ON SEAT BE[illegible]NGTH; INTERNATIONAL UNIFORMITY OF VEHICLE STANDARDS; AND PASSIVE RESTRAINT SYSTEMS.

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1977
Availability: IN HS-023 250

HS-023 269

RECENT AND FUTURE IMPROVEMENTS IN SEAT BELT DESIGN GERMANY

DAIMLER-BENZ HAS CONTRIBUTED TO SEATBELT DESIGN PROGRESS FOR MORE THAN 20 YEARS. BESIDES AMPLIFICATION OF BASIC PROTECTION, CONTINUOUS EFFORT HAS BEEN MADE TO IMPROVE BELT CHARACTERISTICS WHICH WILL PROMOTE PASSENGER ACCEPTANCE OF SEAT BELTS (I.E. THREE-POINT SAFETY BELT INTEGRATED INTO THE MID-DOOR PILLAR, BUCKLE TONGUE AND SASH GUIDE DESIGNED TO EASE BELT APPLICATION AND REMOVAL, RETRACTOR WITH COMFORT ZONE, LOCATION AND DESIGN OF BELT ANCHORAGES, AND BELT PRETENSIONERS DESIGNED TO ELIMINATE BELT SLACK). A PRELIMINARY SET OF SPECIFICATIONS, AS WELL AS POSSIBLE DESIGN SOLUTIONS FOR PRETENSIONERS, ARE PRESENTED. TEST RESULTS SHOW THAT IN SOME CASES IMPACT LOADS ON CAR OCCUPANTS CAN BE REDUCED BY ONE HALF. FOR THE DRIVER, AN AIR BAG IN THE STEERING WHEEL IS CONSIDERED AN APPROPRIATE SUPPLEMENT TO A CONVENTIONAL THREE-POINT BELT. CONFIRMATIVE FLEET TESTING OF THESE NEW SYSTEMS ON THE ROAD IS NEEDED. AN OP-

TIMUM CHILD RESTRAINT HAS BEEN DEVELOPED AND IS ILLUSTRATED.

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1977
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HS-023 272

EVOLUTION OF AUSTRALIAN STANDARD FOR CHILD RESTRAINTS

THE REALIZATION OF THE INADEQUACY OF CHILDREN'S CHAIRS HOOKED OVER THE BACK OF THE FRONT SEAT FOR THE PURPOSES OF CRASH PROTECTION LED TO THE 1970 ISSUE OF THE FIRST AUSTRALIAN STANDARD FOR CHILD RESTRAINTS, AS E46-1970, WHICH SET DESIGN RESTRICTIONS AND PERFORMANCE GOALS FOR DEVICES THOUGHT TO BE SUITED TO CHILDREN OVER THE ENTIRE AGE RANGE FROM BIRTH TO 11 YEARS OF AGE. IT WAS INTENDED TO INCLUDE ALL ESTABLISHED CHILD RESTRAINT SYSTEMS, REPRESENTED BY THE SWEDISH VOLVO REAR-FACING SEAT, THE BRITISH JEENAY FORWARD-FACING SEAT, AND THE AMERICAN FORD TOT-GARD FORWARD-FACING BARRIER TYPE OF ENCLOSURE. IN ADDITION TO THESE RESTRAINTS FOR TODDLERS, THE STANDARD INCLUDED FULL HARNESSES FOR OLDER CHILDREN AND A SCHEME FOR STRENGTHENING, PADDING, AND SECURING BASSINETS FOR BABIES. IN 1975 THE AUSTRALIAN STANDARD WAS COMPLETELY REWRITTEN. THE CHIEF TECHNICAL CHANGES MADE AND INCLUDED IN AS 1754-1975 WERE THE INCLUSION OF A RANGE OF DYNAMIC TESTS, REQUIREMENTS FOR EASIER ADJUSTMENT OF ALL STRAPS, AND A SIMPLER METHOD FOR SECURING BASSINETS. ALL EXISTING DESIGNS OF CHILD RESTRAINT HAD TO BE UPGRADED IN ORDER TO COMPLY WITH THE NEW REQUIREMENTS. THE STANDARDS ASSOCIATION OF AUSTRALIA HAS APPROVED SEVERAL MAKES OF CHILD SEATS AND SEVERAL HARNESSES TO AS 1754. IN PRINCIPLE THERE IS NO REASON WHY MANY MORE MAKES SHOULD NOT RECEIVE APPROVAL IF SUBMITTED, BUT OTHERS MAY NEED MODIFICATION. SHORTCOMINGS OF NONAPPROVED FORWARD-FACING BARRIER TYPES OF ENCLOSURES INCLUDE THE POSSIBILITY OF EJECTION OF A CHILD IN ROLLOVER CRASHES AND APPLICATION OF MAIN DECELERATION ON THE ABDOMEN OF THE CHILD. DEVELOPMENT OF REAR-FACING SEATS TO ACCOMPLISH DECELERATION BY DISTRIBUTING THE FORCES OVER THE BACK IS ENCOURAGED. THIS TYPE OF SEAT IS WELL COVERED BY THE AUSTRALIAN STANDARD. THE BRITISH JEENAY SEAT SEEMS TO HAVE PROVIDED THE BASIS FOR MOST AUSTRALIAN CHILD SEATS APPROVED SO FAR. IT IS USUALLY FITTED IN THE REAR COMPARTMENT AND LIFTS THE CHILD ABOVE THE BENCH SEAT SO THAT HE/SHE CAN SEE WHERE THE CAR IS GOING. THE BENCH SEAT PROVIDES A NATURAL FOOT REST. RESTRAINT IN FRONTAL CRASHES IS PROVIDED BY MEANS OF A FULL HARNESS. THE SEAT BACK IS PROVIDED WITH SIDE WINGS WHICH HELP TO CONTAIN THE CHILD'S HEAD IN OFF-LINE FRONTAL AND REAR IMPACTS.

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Publ: HS-023 250, "INTERNATIONAL CONFERENCE OF THE INTERNATIONAL ASSOCIATION FOR ACCIDENT AND TRAFFIC MEDICINE (6TH) PROCEEDINGS," MELBOURNE, 1977 P252-76
1977
Availability: IN HS-023 250

HS-023 273

CHILD RESTRAINT SYSTEMS IN SWEDEN

A RESTRAINT SYSTEM FIRMLY ANCHORED TO THE CAR, WITH HARD, NONRECOILING PADDINGS, WHICH PLACES THE CHILD IN A REARWARD-FACING DIRECTION WITH RESPECT TO THE DIRECTION OF DECELERATION, AND WHICH SUPPORTS THE ENTIRE BODY SURFACE OF THE CHILD, IS THE MOST EFFECTIVE MEANS OF PROTECTING A CHILD PASSENGER. IN ADDITION, THE RESTRAINT SYSTEM SHOULD HAVE THE FOLLOWING PRACTICAL FEATURES: EASY TO REMOVE CHILD FROM THE SEAT, INABILITY FOR YOUNG CHILDREN TO CLIMB OUT OF THE RESTRAINT SYSTEM THEMSELVES, EASY INSTALLATION, AND COMFORTABILITY OF SEAT TO THE EXTENT THAT A CHILD SHOULD BE ABLE TO SLEEP IN IT. IN SWEDEN IT IS RECOMMENDED THAT PARENTS BUY A REARWARD-FACING CHILD SEAT AND THAT IT BE USED AS SOON AS THE CHILD IS ABLE TO SIT UP (AT ABOUT SIX MONTHS OF AGE) UNTIL HE/SHE HAS OUTGROWN THE SEAT (FOR MOST SEATS, NORMALLY AT ABOUT AGE FOUR). ONLY REARWARD-FACING SEATS HAVE BEEN APPROVED IN SWEDEN, SHOWN BY A SPECIAL APPROVAL SIGN GIVEN TO SEATS WHICH HAVE PASSED THE CRASH TESTS AND HAVE SHOWN GOOD HANDLING QUALITIES. PARENTS ARE ADVISED TO AVOID TRANSPORTING THEIR CHILDREN WHO ARE UNDER THE AGE OF SIX MONTHS. IF THEY MUST DO SO, HOWEVER, THEY ARE ADVISED TO USE A STRONG CRADLE STABLY MOUNTED TRANSVERSELY IN THE MIDDLE OF THE CAR, DIRECTLY BEHIND THE FRONT SEAT. A SURVEY IN THE SPRING OF 1976 IN LINKOPING, SWEDEN SHOWED THAT OUT OF 1575 PARENTS HAVING CHILDREN UNDER FIVE YEARS OF AGE, 88% OWNED A CAR, AND OF THIS GROUP, AS MANY AS 80% UTILIZED CAR SEATS FOR THEIR CHILDREN (72% WERE REARWARD-FACING SEATS AND 96% WERE INSTALLED IN THE FRONT SEAT). REARWARD-FACING CHILD SEATS WILL PROBABLY BECOME STANDARD, WORLDWIDE. NOW IT IS IMPORTANT TO GIVE ATTENTION TO THE OLDER CHILD'S PROTECTION, I.E. CHILDREN BETWEEN THE AGES OF FOUR AND TEN.

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Publ: HS-023 250, "INTERNATIONAL CONFERENCE OF THE INTERNATIONAL ASSOCIATION FOR ACCIDENT

AND TRAFFIC MEDICINE (6TH) PROCEEDINGS," MELBOURNE, 1977 P277-83
1977
Availability: IN HS-023 250

HS-023 274

CHILD RESTRAINT USAGE IN MELBOURNE AND CANBERRA: EVALUATION OF VICTORIAN LEGISLATION - A PRELIMINARY ANALYSIS AUSTRALIA

USING THE RESULTS OF ROADSIDE SURVEYS OF VARIOUS ASPECTS OF THE TRANSPORT OF CHILDREN IN VEHICLES (E.G. SEATING POSITION, AGE, SEX, AND AVAILABILITY AND USAGE OF RESTRAINTS) IN MELBOURNE (VICTORIA) AND CANBERRA (AUSTRALIAN CAPITAL TERRITORY), A BEFORE/AFTER ANALYSIS OF VICTORIA'S LEGISLATION REGARDING THE TRANSPORT OF CHILDREN IN VEHICLES WAS CONDUCTED. CANBERRA PROVIDED CONTROL DATA, THERE BEING NO EQUIVALENT LEGISLATION IN THE AUSTRALIA CAPITAL TERRITORY. LATE IN 1975 THE VICTORIAN PARLIAMENT PASSED LEGISLATION, EMBODIED IN THE MOTOR CAR (CHILD SEAT RESTRAINTS) ACT 1975, RELATING TO CHILDREN RIDING IN VEHICLES. AS OF 17 JAN 1976, A CHILD LESS THAN EIGHT YEARS OF AGE MAY NOT TRAVEL IN THE FRONT SEAT OF A MOTOR CAR (PASSENGER AND PASSENGER-DERIVATIVE VEHICLES HAVING REAR SEATING POSITIONS) UNLESS PROPERLY RESTRAINED BY A CHILD SEAT RESTRAINT THAT IS APPROVED BY THE CHIEF COMMISSIONER OF POLICE AND IS SUITABLE FOR SAFE AND EFFECTIVE USE BY A CHILD OF THE BODY MASS AND HEIGHT OF THE CHILD, OR SEATED AND PROPERLY RESTRAINED BY A SAFETY BELT (CHILD HARNESSES AND ADULT SEAT BELTS) THAT IS SUITABLE FOR SAFE AND EFFECTIVE USE BY A CHILD OF THE BODY MASS AND HEIGHT OF THE CHILD, AND PROPERLY ADJUSTED AND SECURELY FASTENED. FOLLOWING INTRODUCTION OF THE LEGISLATION THERE HAS BEEN A STATISTICALLY SIGNIFICANT RELOCATION OF CHILDREN LESS THAN EIGHT YEARS OF AGE (MAINLY LESS THAN FIVE YEARS OF AGE) FROM FRONT TO REAR SEATING POSITIONS. OF THE 14% OF CHILDREN STILL LOCATED IN FRONT SEATING POSITIONS, THREE OUT OF FOUR WERE UNRESTRAINED, REFLECTING THE NON-WEARING OF ADULT SEAT BELTS BY CHILDREN AGED FIVE TO SEVEN YEARS AND THE PRACTICE OF NURSING CHILDREN, PARTICULARLY INFANTS LESS THAN TEN MONTHS OF AGE, IN FRONT SEATING POSITIONS. RELOCATION TO REAR SEATING POSITIONS APPARENTLY INCREASES THE PROBABILITY OF BEING RESTRAINED, BUT ONLY FOR CHILDREN LESS THAN FIVE YEARS OF AGE. THE LEGISLATION OBVIOUSLY HAS HAD SOME EFFECT, BUT WHETHER THE SHIFT HAS BEEN SUFFICIENT TO CAUSE A SIGNIFICANT REDUCTION IN THE NUMBER OF CHILDREN KILLED AND INJURED IN MOTOR VEHICLE ACCIDENTS IS STILL TO BE SHOWN.

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Publ: HS-023 250, "INTERNATIONAL CONFERENCE OF THE INTERNATIONAL ASSOCIATION FOR ACCIDENT AND TRAFFIC MEDICINE (6TH) PROCEEDINGS," MELBOURNE, 1977 P284-98
1977 ; 6REFS
Availability: IN HS-023 250

HS-023 277

QUEENSLAND SURVEY ON INSTALLATION OF CHILD RESTRAINTS AUSTRALIA

A SURVEY WAS CONDUCTED TO INVESTIGATE WHETHER OR NOT CHILD RESTRAINT SYSTEMS WERE CORRECTLY FITTED TO A POPULATION OF VEHICLES IN BRISBANE (QUEENSLAND, AUSTRALIA). GENERALLY, THE FITTING OF CHILD RESTRAINTS TO VEHICLES ENTAILS THE LOCATION OF A SUITABLE ANCHORAGE POINT IN THE VEHICLE STRUCTURE, DRILLING A HOLE TO TAKE THE ANCHORAGE BOLT, AND CONNECTING THE CHILD RESTRAINT. FINALLY, IN THE CASE OF CHILD SAFETY SEATS, IT IS NECESSARY TO ADJUST THE WEBBING, THUS FIXING THE SEAT FIRMLY TO THE VEHICLE. THIS PROCEDURE HAS BEEN SIMPLIFIED TO A CERTAIN EXTENT FOLLOWING THE INTRODUCTION OF AUSTRALIAN DESIGN RULE 34 WHICH CAME INTO EFFECT ON 1 JUL 1976. IT ENSURES THAT ALL PASSENGER CARS MANUFACTURED ON OR AFTER THIS DATE HAVE INCORPORATED ONE CHILD RESTRAINT UPPER ANCHORAGE POINT FOR EACH REAR SEATING POSITION. THIS ANCHORAGE POINT CATERS FOR CHILD HARNESSES AND SEVERAL OF THE CURRENTLY APPROVED CHILDREN'S SAFETY SEATS. OTHER SEATS STILL REQUIRE ADDITIONAL FIXING POINTS AND ALL REQUIRE THE RESTRAINT ANCHORAGE STRAPS TO BE FIRMLY ADJUSTED. SEVENTY-TWO VEHICLES WERE FOUND TO HAVE AT LEAST ONE APPROVED CHILD RESTRAINT FITTED (A TOTAL OF 86 RESTRAINTS COMPRISING 75 CHILD SEATS AND 11 CHILD SAFETY HARNESSES), AND 38 (ABOUT 44%) OF THESE RESTRAINTS WERE INCORRECTLY FITTED. THE MOST SERIOUS FAULT, THAT OF NOT HAVING ALL STRAPS CONNECTED TO THEIR RESPECTIVE ANCHORAGE POINTS, ACCOUNTED FOR 30.6% OF INCORRECTLY INSTALLED SEATS. OTHER MAJOR AREAS IN WHICH THE SEATS DEVIATED FROM THE RECOMMENDED FITTING PROCEDURE INCLUDED STRAP(S) NOT TIGHTENED (36.1%), ANCHORAGES POORLY LOCATED (27.7%), AND OTHER (5.6%). OF THE 11 CHILD SAFETY HARNESSES INCLUDED IN THE SURVEY, TWO HAD THEIR UPPER ANCHORAGE POINT LOCATED IMMEDIATELY BEHIND THE VEHICLE CUSHION; NO OTHER FITTING FAULTS WERE RECORDED.

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Publ: HS-023 250, "INTERNATIONAL CONFERENCE OF THE INTERNATIONAL ASSOCIATION FOR ACCIDENT

AND TRAFFIC MEDICINE (6TH) PROCEEDINGS," MELBOURNE, 1977 P345-50
1977
Availability: IN HS-023 250

HS-023 402

STEPCHILD OF AMERICAN PEDIATRICS: CHILD TRANSPORTATION SAFETY

Traffic accidents are the number-one killer of young Americans over the age of one. Body dimensions and proportions of children do not allow standard seat belts to be fitted securely; but when no specially designed restraints are available, children should be restrained with regular seat belts. Also, the rear seat is always safer than the front seat. The first safety standard for child restraint systems became effective in 1971, but the test requirements of this standard were very quickly shown to be inadequate. More than six years later, the preliminary proposal for a meaningful standard has yet to be issued. Fortunately, most car seat manufacturers have taken the initiative to market a wide choice of crashworthy devices, anticipating a safety standard based on "dynamic" crash criteria. In their role, pediatricians must not merely recommend to parents the use of crashworthy devices for their children, they must also try to explain that the protective properties of any restraint depend on parents doing their part. The parents must purchase child restraints that have been dynamically tested and proved to offer effective crash protection, and properly use the restraints on every trip. How the child accepts restraints depends directly on the consistent concern and discipline of the parents for the child's safety. Physicians for Automotive Safety has made child-restraint information available to health and safety professionals and to the public for many years. other areas of concern involve the child pedestrian, transportation in school buses, bicycling, motorcycling, and use of mopeds. Involvement of the primary physician in providing direct patient education can be the most effective preventive medicine for the number-one killer of youth. The article reviews highway mortality and injury statistics, the first and second collisions of a crash, recommended vehicle improvements, and seat belts and air bags.

by Seymour Charles
Publ: Pediatric Annals v6 n11 p726(77)-741(101) (Nov 1977)
1977 ; 53refs
Availability: See publication

HS-023 421

RESTRAINT SYSTEM USAGE SURVEYS: A LITERATURE REVIEW. 3RD ED.

THIS LITERATURE REVIEW CONTAINS REFERENCES TO 59 SURVEYS CONDUCTED IN THE U.S. ON THE USAGE OF AUTOMOBILE PASSENGER RESTRAINT SYSTEMS. LISTED FIRST ARE THE REFERENCES, ARRANGED BY AUTHOR OR CORPORATE AUTHOR. SECONDARY TREATMENTS OF THE SAME SURVEYS HAVE BEEN OMITTED. THE SECOND SECTION GIVES, IN TABULAR FORM, SEATBELT, SHOULDER HARNESS, AND/OR CHILD RESTRAINT USAGE RATES AND SURVEY INFORMATION (YEAR OF STUDY, AREA OF STUDY, HOW CONDUCTED, YEARS OF AUTOMOBILES, DAY/NIGHT, RESTRICTIONS/NOTES, AND SAMPLE SIZE) FOR EACH REFERENCE; ENTRIES ARE ARRANGED IN CHRONOLOGICAL ORDER. NO ASSUMPTIONS HAVE BEEN MADE REGARDING THE VALIDITY OF THE REPORTED STUDIES; HENCE, IT MAY BE NECESSARY TO REFER TO THE ACTUAL REPORT IN SOME INSTANCES, FOR CLARIFICATION.

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Rept. No. UM-HSRI-78-22 ; 1978 ; 16P
Availability: CORPORATE AUTHOR

HS-023 470

SOME INTERNATIONAL COMPARISONS OF THE EFFECTS OF MOTOR VEHICLE SEAT BELT USE AND CHILD RESTRAINT LAWS

Original data on seatbelt usage collected in 19 cities of five countries (Australia, Canada, Japan, New Zealand, and the U.S.) within the past three years are presented, as well as preliminary data on child restraint use before and after the recent child restraint law in Tennessee. Some tentative principles regarding the effectiveness of belt use and child restraint laws have been derived from this research. First, compliance with the laws is greater when there are fewer exemptions. In Ontario and Quebec, Canada, where shoulderbelt use in pre-1974 cars was exempted, belt use was halved within six months after the law. A subsequent enforcement campaign regained some of the reduction, but not nearly to the point of countries with laws that have few exemptions. In Australia and New Zealand, where there are few exemptions to the belt laws and retrofitting of older vehicles has subsequently been required, belt use remains relatively high. In Japan, where belt use is required only on freeways and there are no penalties for nonuse, belt use is virtually nil. In Victoria, Australia, child restraint use in front seats is not nearly as high as adult belt use after the law, perhaps partially a result of the exemption of children in rear seats. In Tennessee, with its exemption of children held in adult arms, child restraint use increased only slightly after the law, relative to use in Kentucky without a child restraint use law. Second, belt use laws do not reduce deaths and injuries as much as expected, from known effectiveness of belts when worn voluntarily. Belts are less often worn by persons disproportionately involved in severe crashes, particularly teenagers and persons driving with high blood alcohol concentrations. Also, belts are often worn too loosely to reduce severity of contact with interior surfaces in even moderate-to-low-speed crashes. The limitations in the effectiveness of belt use laws should not be taken as arguments against such laws. However, because of their limited effectiveness, belt use laws should not be considered as alternatives to improved crashworthiness of vehicles, and to environments that do not require special action by vehicle occupants when they use the vehicle.

by Leon S. Robertson; Allan F. Williams
Insurance Inst. for Hwy. Safety, 600 New Hampshire Ave., N.W., Washington, D.C.
1978 ; 19p 12refs
Presented at Child Passenger Safety Conference, Nashville, Tenn., 10 May 1978.
Availability: Corporate author

HS-023 471

EVALUATION OF THE TENNESSEE CHILD RESTRAINT LAW

An evaluation has been made of a Tennessee law which came into effect on 1 Jan 1978, requiring parents to properly restrain their children under the age of four years in child restraint systems during travel in motor vehicles. Alternatively, the law permits children to be held in the arms of adult passengers. Before and after the law went into effect, observations were made of children in cars exiting from shopping centers in Knoxville and Nashville, Tenn. and in Lexington and Louisville, Ky., and in an adjacent state not having a child restraint law. More than 80% of the children observed in Tennessee in the fourth month the law was in force were not using child restraints anchored by seatbelts, although usage rates increased in Tennessee (8% to 16%) to a greater extent than in Kentucky (11% to 15%). In Nashville, but not in Knoxville or in the Kentucky cities, there was a substantial increase in the number of children two and three years of age who were traveling in the arms or on the laps of adult passengers. Almost four in ten children less than four years of age were traveling in such a manner in the fourth month of the law. The reason for this increase could be related to an extensive public information and education campaign concerning the law which had begun in Nashville before the post-law observations were made. The public information campaign material does not mention travel in arms as an option under the law. However, there is the possibility that as general awareness of the law increases, travel in arms or on laps will also increase, in addition to or instead of child restraint use. This may also occur in response to police enforcement which had not yet begun at the time of the study. In any case, the hazards of children traveling in the arms or on the laps of adult passengers have been well documented, and it is important that consideration be given to removing this unfortunate exemption to the law as soon as possible. Despite the results thus far in Tennessee, seatbelt legislation based on scientific knowledge concerning crash protection remains a potentially important strategy for increasing the protection of children in cars, and should be encouraged.

by Allan F. Williams
Insurance Inst. for Hwy. Safety, 600 New Hampshire Ave., N.W., Washington, D.C.
1978 ; 16p 9refs
Availability: Corporate author

HS-023 753

OCCUPANT RESTRAINT IN MOTOR VEHICLES IN AUSTRALIA

Over 70% of cars have had seat belts fitted as a result of the Australian Design Rule (ADR) program. Seat belts must be three-point lap-sash (sash not detachable) in all outboard seating positions with lap belts in center seating positions. In addition, the seat belts fitted to the front outboard seats must have dual sensitive retractors. In older cars, seat belts have been fitted to comply with retrofitting legislation and pre-ADR state requirements, while some have been fitted voluntarily by owners and manufacturers. There are no requirements to fit child restraints. Almost all cars on the road are fitted with seat belts for the front outboard positions, but rear seats have lower fitting rates. At least nine out of every ten car occupants at least eight years of age have a seat belt available, and very high wearing rates are now observed. The minimum age of eight years for compulsory wearing of seat belts applies throughout Australia with two exceptions; in the Australian Capital Territory the age limit is 14, while in Western Australia the age limit is five. In addition, children less than eight years of age in Victoria may only occupy front seating positions if suitably restrained, while in New South Wales children in both front and rear seats must use any available suitable restraint. Although significant reductions in casualties have occurred as a result of the ADR program for fitting seat belts and the compulsory wearing legislation and its enforcement, there are a number of groups who are not obtaining the benefits from being restrained. Wearing rates of rear-seat occupants are only one third those of front-seat occupants. It is difficult to enforce seatbelt wearing for rear-seat occupants because the wearing is not readily observable. Rear seat occupants are not provided with inertia reel belts so adjustment is more difficult, and there is a belief that rear seats are safer than front seats so there is no need for a seat belt. Wearing rates decrease with increasing occupant age. The youngest age group required to wear seat belts, the 8-13-year-olds, have the lowest wearing rate. A significant proportion of restrained car occupants do not wear their seat belt correctly adjusted; television public education ads have been effective in alleviating this problem. The use of restrained bassinets for infants is very low. Child seats (9 months-4 years of age) have the [illegible] fitting and usage of all child restraints. Child harnesses, for the 5-7 age group, are also nearly always used if fitted. However, over two-thirds of children in cars are not restrained; an extensive publicity campaign to inform parents about the need to restrain their children in cars is underway throughout Australia.

by C. J. Boughton; P. W. Milne
Commonwealth Dept. of Transport, Office of Road Safety, Melbourne, Vic., Austral
Publ: HS-023 752, "American Association for Automotive Medicine Conference (22nd), and International Association for Accident and Traffic Medicine Conference (7th) Proceedings, Vol. 2," Morton Grove, Ill., 1978 p1-14
1978 ; 20refs
Conference held at Ann Arbor, Mich. 10-14 Jul 1978.
Availability: In HS-023 752

HS-700 341

HOW TO BELT IN YOUR CHILDREN

The right safety restraint for a child will vary according to his age. A well-padded bassinet with netting or straps fastened across its top offers the best protection for infants. Safety harness vests and safety seats are recommended for toddlers nine months to five years, or until their weight exceeds 50 pounds. Once a child weighs 50 pounds, he is ready for an adult belt. Three recommended safety harnesses and two safety seats are briefly described.

by F. G. Loyd
Publ: Today Health v47 p14-5 (Jan 1969)
1969
Availability: see publication

HS-700 361

SEATBELTS: A HABIT TO LAST A LIFETIME

A study of 46 collisions in which 82 passengers were less than 13 years old showed that 63 of the children were injured, seven fatally. Children younger than five were injured more

severely than those in the 5 to 12 age group. Recommendations are made for different types of restraint systems to be used as child age associated changes take place. The influence of the physician in recommending restraint systems to the parents and the parents' own example of using seat belts are discussed.

by S. P. Baker; C. S. Springate
Publ: Maryland State Medical Journal v19 n5 p50-2 (May 1970) 1970
Availability: see publication

HS-800 376

CHILD SEAT AND RESTRAINT SYSTEMS TEST PROGRAM. FINAL REPORT

The three objectives of this research program were to: (1) define the state of the art in child seating and restraint systems; (2) evaluate the various types of devices which are in use; and, (3) recommend performance requirements and compliance test procedures for child seating and restraint systems. After an extensive market survey, 37 devices manufactured by 26 companies were selected for the test programs. These devices were tested in frontal, side, oblique, and rear impact. Oscillographic transducer data and high speed motion picture data were obtained and studied.

by A. W. Henke; D. H. Robbins; V. L. Roberts
Michigan Univ. Highway Safety Research Inst.
FH-11-6962
1970 ; 80p
Appendices are announced under the following HS numbers: Vol. 1, HS-800 382; Vol. 2, HS-800 383; Vol. 3, HS-800 384.
Availability: NTIS

HS-800 382

CHILD SEAT AND RESTRAINT SYSTEMS TEST RESULTS. APPENDIX D. VOl. 1

This report contains the data records obtained in a test program studying the safety performance of child car seats and restraint systems. Included with each test result is an HSRI Summary Data Sheet, a copy of an oscillographic record of transducer data and high speed photographic documentation of occupant kinematics. In cases where the oscillographic record or the photographic documentation is missing, the data was not obtained.

by A. W. Henke; D. H. Robbins; V. L. Roberts
Michigan Univ. Highway Safety Research Inst.
FH-11-6962
1970 ; 130p
Final Report is announced under HS-800 376.
Availability: NTIS

HS-800 383

CHILD SEAT AND RESTRAINT SYSTEMS TEST RESULTS. APPENDIX D. VOL 2

This report contains the data records obtained in a test program studying the safety performance of child car seats and restraint systems. Included with each test result is an HSRI Summary Data Sheet, a copy of an oscillographic record of transducer data, and high speed photographic documentation of occupant kinematics. In cases where the oscillographic record or the photographic documentation is missing, the data was not obtained.

by A. W. Henke; D. H. Robbins; V. L. Roberts
Michigan Univ. Highway Safety Research Inst.
FH-11-6962
1970 ; 254p
Final Report is announced under HS-800 376.
Availability: NTIS

HS-800 384

CHILD SEAT AND RESTRAINT SYSTEMS TEST RESULTS. APPENDIX D. VOL. 3

This report contains the data records obtained in a test program studying the safety performance of child car seats and restraint systems. Included with each test result is an HSRI Summary Data Sheet, a copy of a oscillographic record of transducer data, and high speed photographic documentation of occupant kinematics. In cases where the oscillographic record or the photographic documentation is missing, the data was not obtained.

by D. H. Robbins; A. W. Henke; V. L. Roberts
Michigan Univ. Highway Safety Research Inst.
FH-11-6962
1970 ; 129p
Final Report is announced under HS-800 376.

HS-800 535

ANTHROPOMETRY FOR CHILD RESTRAINTS. FINAL REPORT

Review and discussion of anthropometric inputs which will describe children for purposes of crash kinematic modeling and construction of anthropometric dummies for use in crash tests. In addition, techniques for obtaining such data are described. Two lists of measurements needed for the dummy and mathematical model construction were developed. One lists 43 body dimensions considered to be a bare minimum of those needed. The other more comprehensive list contains 196 body measurements, few of which are presently available for children. The selection of subjects to be described anthropometrically is also a major problem. In addition to anthropometric data, biomechanical data are also needed for children.

by Howard W. Stoudt
Harvard School of Public Health
FH-11-7333
1971 ; 65p 90refs
Availability: NTIS

HS-800 717

SAFETY BELT INSTRUCTIONAL BOOKLET

This programmed instructional text for children beings with a pre-program attitude survey, presents questions on safety belts, describes types of safety belts and how to use them, and

safety devices for children, and concludes with a post-program attitude survey.

by B.E. Haughey; P.A. Alter; H.H. Shettel
American Institutes for Res.
FH-11-7522
1972 ; 27p
Availability: GPO $0.20

HS-800 748

CHILD RESTRAINT DEVELOPMENT. FINAL REPORT

Two child seats were designed and constructed which gave superior impact protection over those which are available commercially. Performance standards and a compliance test procedure for the evaluation of child seating systems were developed. Test results are presented in graphs.

by V. L. Roberts
Michigan Univ. Hwy. Safety Res. Inst.
DOT-HS-031-1-180
1972 ; 133p
Report for 1 Jul 1971 - 28 Aug 1972.
Availability: NTIS

HS-801 029

RESTRAINT SYSTEMS

A special bibliography on restraint systems lists publications dated 1967 or later. The documents cited are in the NHTSA Technical Reference Division collection. Citations and abstracts are those that have previously appeared in the NHTSA publication Highway Safety Literature.

National Hwy. Traffic Safety Administration, Washington, D. C.
Rept. No. SB-1 ; 1973 ; 86p
Availability: NHTSA

HS-801 034

CHILD AND INFANT RESTRAINT SYSTEMS AND SEATING

A special bibliography is presented, generally covering documents published from 1967 to October, 1973. The documents are in the NHTSA Technical Reference Division collection. Citations and abstracts have previously appeared in Highway Safety Literature.

National Hwy. Traffic Safety Administraiton, Washington, D. C.
Rept. No. SB-6 ; 1973 ; 13p
Availability: NHTSA

HS-801 384

FABRICATION OF A STANDARD BENCH VEHICLE SEAT. FINAL REPORT

The development of a standard bench seat for the testing of child restraint systems based on the configuration and performance parameters of the 1974 Chevrolet Impala production bench seat is discussed. Both static and dynamic characteristics of the production seat were modeled into the frame deformation and foam stiffness of the standard seat, and impact sled tests were conducted on each using a representative sample of child restraint systems to provide direct comparison between the two seats. The standard seat was shown to be a durable, repeatable test platform for child restraints that provided reasonable simulation of the production seat. Its economic breakeven point occurs when more than four new production bench seats are required for testing. Child restraint tests on the standard seat tend to give slightly lower head and chest peak resultant acceleration, HIC and severity index values, and, in some cases, larger head excursion values than comparable tests with the production seat.

by R. L. Stalnaker; J. B. Benson; J. W. Melvin
Hwy. Safety Res. Inst., Univ. of Michigan, Ann
DOT-HS-4-00865
1974 ; 59p
Report for 5 Mar 1974 - 14 Sep 1974. See also HS-801 385; HS-801 386.
Availability: NTIS

HS-801 385

DATA FROM FABRICATION OF A STANDARD BENCH VEHICLE SEAT. APPENDIX C

Specifications, photographs, and graphs are presented regarding fabrication of a standard bench vehicle seat for child restraint systems testing. Both static and dynamic characteristics of the production seat were modeled into the frame deformation and foam stiffness of the standard seat, and impact sled tests were conducted on each using a representative sample of child restraint systems.

Hwy. Safety Res. Inst., Univ. of Michigan, Ann
DOT-HS-4-00865
1974 ; 147p
See also HS-801 384; HS-801 386.
Availability: NTIS

HS-801 386

BELT RETRACTOR TESTING WITH STANDARD VEHICLE SEAT. APPENDIX D. MODIFICATION 1.

Safety problems with various 1974 belt systems and child restraints during crash conditions were investigated, and the acceptability of use of such systems with the DOT Standard Vehicle Seat versus the General Motors Production seats was verified. Data were collected on differences between using non-retractor belts and retractor belt systems used in current production automobiles, and the effects of various sled pulses on retractor, vehicle seat, and child restraint performance was studied. The various belt systems were mounted in locations similar to actual vehicle positions. Test data are presented in columnar form, including child seat manufacturer and model, impact direction, retractor type, dummy age and seating position, sled parameters, head and chest accelerations, belt loads, and head excursion data. Dynamic restraint characteristics of the various belt systems are discussed.

Hwy. Safety Res. Inst., Univ. of Michigan, Ann
DOT-HS-4-00865
1974 ; 205p
See also HS-801 384; HS-801 386
Availability: NTIS

HS-801 446

OCCUPANT RESTRAINT SYSTEMS. MONTHLY PROGRESS REPORT OF RESEARCH ACTIVITIES, JANUARY 1975

Research status is presented on several restraint system activities. New instrumentation and data reduction capability added to the Safety Research Laboratory Dynamic Sled Facility include: improved hybrid 2 femur force transducer and resultant computer calibration, and SAE J 211 instrumentation. The child restraint rollover test development program completed and successfully tested the prototype test fixture in its electrical drive configuration, and began testing of child restraints on the fixture. In the dynamic sled testing operations, improvements were made in camera placement, the overhead lighting system, and instrumentation, but a data transmittal problem is noted in the tape search control unit. Several pieces of computer equipment were received and installed in the PDP-11 computer system, and a new program called SCOPE has been written. The leg testing program reports maintenance and performance of the foot load cell device. Photographs, graphs, and tables are provided for all activities.

by M. P. Haffner; J. Haines; C. H. Melton; J. L. Prince; E. C. Cooke; G. Cohen; F. da Costa; D. Buchalter; S. Gordon
National Hwy. Traffic Safety Administration, Safety Res. Lab., Washington, D. C. 20590
Rept. No. PR-Jan-75 ; 1975 ; 48p
Availability: NHTSA

HS-801 745

NTERNATIONAL CONGRESS ON AUTOMOTIVE SAFETY (4TH) PROCEEDINGS, JULY 14-16, 1975

Separate presentations cover the following topics: vehicle safety improvements using vehicle characteristic ratings; setting relevant safety standards for fatal tractor trailer crashes; the individual versus collective responsibility for safety; cost-benefit versus total benefit for safety standards; decision making criteria for ranking standards; fire in motor vehicle accidents; state participation in the development of federal safety standards; safety versus cost savings; societal costs of motor vehicle accidents; cost-benefit and cost-effectiveness analyses in determining priorities among standards, programs, and projects; European approaches to safety standards; a review and critique of the National Highway Traffic Safety Administration's (NHTSA) revised restraint system cost-benefit analysis; compulsory seat belt wearing in France; the role of legislation in shaping future automobile safety; a new proposed code of standards for the automobile industry; the evaluation and improvement of automobile safety through regulation; recommendations for increased occupant safety; and automobile transportation cost tradeoffs. Also considered are the following aspects of motor vehicle safety: safety standards for the handicapped driver; considerations of priority in standards; a program for evaluating active restraint systems; enhancing the cost effectiveness of safety regulations; judicial versus legislative methods of standard setting; integrating vehicle safety, costs, and consumer attitudes; and research and development in future automobile regulation. Topics of a more technical nature include: vehicle safety legislation and international trade; practical aspects of child restraint system standatds; the political determinants of occupant restraint; seat belt use laws on the national and international scene; cost-benefit considerations of safety versus energy consumption; ccident investigation in the evaluation of safety standards; the reduction in societal costs by safety systems; factors contributing to accident fatalities in 1974; the effects of standards on international trade; the Australian approach to automobile safety standards; an array of social values relating to safety regulations; societal priorities in occupant crash protection; and NHTSA's approach for determining the consumer costs of motor vehicle regulations.

National Hwy. Traffic Safety Administration
1975 ; 990p refs
Includes HS-016 894, HS-017 129--135, HS-017 137--168, and HS-017 751--756.
Availability: GPO $10.10, stock no. 050-003-00223-2

HS-801 765

CHILD RESTRAINT ROLLOVER TEST DEVELOPMENT: FINAL TECHNICAL REPORT

The development of test equipment and procedures which will permit the evaluation of the protective potential of child restraint systems in the rollover environment is described. The test fixture, which was intended to become a prototype for compliance test use in conjunction with possible future rule-making activity, was to simulate the essential features of the rollover environment while providing repeatable inputs to the restraint systems under test. Cost and relative simplicity of design were factors of major importance. An Alderson VIP-3C 3-year-old clothed dummy and an unclothed CAMI infant dummy were used in the tests. The test was defined as two revolutions of the test seat from the upright, with duration of the test being between 1.37 and 1.95 seconds. Notation was made of head excursion if violation of specified boundaries occurred. The mode of ejection, if it occurred, was noted. It is concluded that the general test procedure simulates several major features of the rollover environment at reasonable cost and offers unambiguous characterization of performance. It is recommended that a compliance-type rollover test fixture include instrumentation for angular velocity and head excursion. On-board high-speed photographic coverage is highly recommended as an aid to interpretation of test results. Consideration should be given to rotation of the test fixture in both directions in order to better simulate actual crash conditions. Restraint straps should be adjusted before test to a no-slack condition, but without additional tension. Dummy clothing was found to be an important variable of the test and should be standardized. Dummy joints are recommended to be set completely loose to best simulate the likely occurrence of a sleeping child. Shoulder structure of the test dummy and fit of the restraint harness to the dummy are important determinants of rollover test performance. Photographs of equipment, restraints, and tests are included.

by Claude H. Melton; Mark P. Haffner
National Hwy. Traffic Safety Administration, Safety Res. Lab., 6501 Lafayette Ave., Bldg. 2, Riverdale, Md. 20840
1975 ; 96p 17refs
Report for Jul-Oct 1975.
Availability: NTIS

HS-801 788

CHILD RESTRAINT LATERAL IMPACT TESTS. FINAL REPORT

A series of six 20 mph 60° lateral impact tests with various child restraints were conducted to provide a brief overview of

the state-of-the-art in lateral protection of child restraints which have been developed through dynamic testing. Tests were performed on an impact sled utilizing a standard vehicle seat with safety belts with no retractors or reels. Two test dummies were used; an Alderson VIP-3C child dummy and a six-month old infant dummy. Both dummies were run in each of the six tests. Ten child restraint systems were tested and instrumentation included a film camera, a sled mounted accelerometer, four belt load cells, and discrete magnetic proximity probes for sled velocity determination. Full test results are reported in terms of dummy target motion with time, anchorage belt loads versus time, sequence camera coverage and a brief narrative evaluation of the performance of each system. Photographs of the tests are provided.

by J. W. Melvin
University of Michigan, Hwy. Safety Res. Inst., Ann Arbor, Mich. 48109
NHTSA-6-5180
Rept. No. UM-HSRI-BI-75-7 ; 1976 ; 92p
Report for 1 Sep-1 Oct 1975.
Availability: NTIS

HS-802 193

NATIONAL MOTOR VEHICLE SAFETY ADVISORY COUNCIL. ANNUAL REPORT. 1975

The major concerns of the National Motor Vehicle Safety Council during 1975 were centered on the very important issues of motorcycle helmet laws, continued high-volume field testing of passive restraint systems, improved child restraint systems, and mandatory seat belt usage laws. In addition, the Council laid the groundwork for in-depth reviews of on-going safety defect and recall campaigns, and safety research programs in the National Highway Traffic Safety Administration (NHTSA). The report contains sections on the legislative history, organization, and 1975 highlights of the Council; resolutions and departmental replies; special correspondence; and membership.

National Motor Vehicle Safety Advisory Council, Washington, D.C. 20590
1976 ; 51p
Availability: NHTSA

HS-802 598

SAFETY BELTS: THE UNCOLLECTED DIVIDENDS. A MANUAL FOR USE BY STATE LEGISLATORS AND STATE OFFICIALS ON TECHNIQUES TO INCREASE SAFETY BELT USAGE. FINAL REPORT

A manual for use by state legislators and other officials is an aid to promote the use of safety belts as the most cost-effective highway safety measure that can be adopted by any state. An overview of safety belt effectiveness is presented, and a statewide coordinated plan to increase safety belt usage is described that includes a coordinating committee, an executive committee, subcommittees, and a key coordinator. Techniques for increasing safety belt usage are linked to state agencies having primary responsibility for the particular area. Ten areas are considered: police traffic services, accident investigation, traffic accident records, traffic courts, infant and child restraints, periodic motor vehicle inspection, driver licensing, driver and traffic safety education, codes and laws, and public information and education. The police officer who supports safety belt use brings to the cause the influence inherent in the uniform. Accident investigation is information gathering and reporting for use in later statistical analysis; such information includes use of safety belts, crash configuration, human injury and vehicle damage. The National Accident Sampling System (NASS), still in a pilot stage, will contain nationally representative data. State traffic records systems should include information on safety belt use as part of their accident reporting system. If judges are educated about the value of safety belt use they can be influential in dealing with traffic safety cases. The courthouse is a good place to display and give away materials promoting safety belt use. Use of infant and child restraints can be promoted by the physician and by programs to recycle restraint systems. Periodic motor vehicle inspection should include inspection of safety belts. Driver licensing procedures should require both knowledge of safety belt use and use of safety belts during the driving test. Driver and traffic safety programs in the schools should strongly promote safety belt usage. Legislation can mandate either the presence of belts in vehicles or their use. A proposed law for safety belt use is presented. Public information campaigns could work through radio, television, newspapers and various printed matter and through special events. A list of sources of safety belt material is included.

by Patricia F. Waller; Livia K. Li; B. J. Campbell; Michael L. Herman
University of North Carolina, Hwy. Safety Res. Center, Chapel Hill, N.C. 27514
DOT-HS-6-01520
1977 ; 134p 29refs
Rept. for 30 Sep 1976-31 May 1977.
Availability: NTIS

HS-803 322

CHILD RESTRAINT SYSTEMS EVALUATION USING BABOONS AND CHILD-SIZED DUMMIES. VOL. 1. FINAL REPORT AND APPENDICES A-C

Impact tests were carried out on the Aerospace Medical Res. Lab.'s Impulse Accelerator Facility to evaluate the relative performance characteristics in child restraint systems of two proposed three-year-old child dummies, the Civil Aeromedical Inst.'s CAMI dummy, and an Alderson VIP-3C dummy. Side-by-side impact comparisons were made in the forward and lateral impact directions at velocities ranging up to 30 mph. Performance of the dummies was compared with the responses of juvenile baboons used as surrogates for the three-year-old child. Comparisons were made using three types of child restraints on a standardized automobile bench seat. Data to make the comparisons were restraint loads, head and chest accelerations, and kinematic displacement of various body parts. The results showed that there were significant differences between the two dummies. Neither dummy provided a good match to the young baboon responses, at least in terms of Head Injury Criteria (HIC) value, although the CAMI dummy produced HIC values nearer those measured on the baboon than on the VIP dummy. Two major deficiences in the impact testing of restraint systems were revealed: procedures and methods for nondummy instrumentation and data processing must be developed, and dummy evaluations in terms of predicting human response or injury cannot be well made. Appendix A contains the head and chest resultant accelerations from both the internal and external accelerometer groups. Appendix B gives the peak acceleration for the x axis and resultant. Severity indices computed for the x acceleration alone and on the resultants are listed. Appendix C is concerned with the

HIC index calculation. HIC values are given and the time interval from which they were calculated.

by John T. Shaffer; Robert M. Letscher
Aerospace Medical Res. Lab., Wright-Patterson AFB, Ohio 45433
DOT-HS-017-1-017-IA
Rept. No. AMRL-TR-76-99-Vol-1 ; 1976 ; 315p 2refs
Rept. for Aug 1974-Oct 1975. Subcontracted to Dynalectron Corp., subcontract-F33615-74-C-4050, and Univ. of Dayton Res. Inst., subcontract-F33615-73-C-4157. Vol. 2 is HS-803 323.
Availability: NTIS

HS-803 323

CHILD RESTRAINT SYSTEMS EVALUATION USING BABOONS AND CHILD-SIZED DUMMIES. VOL. 2. APPENDICES D AND E

Appendix D provides the subject displacement plots and the raw x-y coordinates for all points tracked in the testing. The times given for each subject within a test are identical. Appendix E furnishes the impact data as a function of time in oscillograph form. Each location is covered and represents the waveform for that data point.

by John T. Shaffer; Robert M. Letscher
Aerospace Medical Res. Lab., Wright-Patterson AFB, Ohio 45433
DOT-HS-017-1-017-IA
Rept. No. AMRL-TR-76-99-Vol-2 ; 1976 ; 369p
Rept. for Aug 1974-Oct 1975. Subcontracted to Dynalectron Corp., subcontract-F33615-74-C-4050, and Univ. of Dayton Res. Inst., subcontract-F33615-73-C-4157. Vol. 1 is HS-803 322.
Availability: NTIS

HS-803 346

CHILD RESTRAINT SYSTEMS TESTING. FINAL REPORT

THE PHYSICAL CHARACTERISTICS OF CHILD RESTRAINT SYSTEMS, DESIGNED FOR USE IN MOTOR VEHICLES, WERE DETERMINED, AND SAFETY PERFORMANCE DATA WERE OBTAINED BY PERFORMING WEBBING TENSILE AND STRETCH TESTS, HEADFORM IMPACT TESTS AND SLED TESTS, AS WELL AS EXAMINING A CALIBRATION PROCEDURE FOR THE THREE-YEAR-OLD CHILD DUMMY. THE FOLLOWING CHILD RESTRAINT SYSTEMS WERE TESTED: FORD TOT GUARD, CHRYSLER GUARDWELL, PETERSON SAFETY SHELL 75, STROLEE WEE CARE, BUNNY BEAR NEW MOULDED CAR SEAT (FOUR-POSITION MODEL), KANTWET MODEL 988, GENERAL MOTORS INFANT CARRIER, GENERAL MOTORS CHILD LOVE SEAT, BOBBY MAC DELUXE 7812, HEDSTROM POSITEST, CENTURY TRAVEL GUARD 4448, PRIDE TRIMBLE, ROSE AUTO SAFETY HARNESS, BUILT-RITE MODEL K92, KANTWET 486, KANTWET 584, KANTWET 986, SWYNGOMATIC 302, PRIDE TRIMBLE 876, TEDDY-TOT UNIVERSAL 7316, TEDDY-TOT ASTRO SEAT V 8900, TEDDY-TOT TILT-A-BABE 7600, AND COSCO SAFE AND EASY. BASED ON THE DATA OBTAINED IN THIS TEST PROGRAM, IT IS CONCLUDED THAT ALL SEATS EXHIBITED MINOR PROBLEMS, AND SEVERAL SEATS SUSTAINED MAJOR STRUCTURAL DAMAGE. A MAJOR FAILURE, TETHER STRAP BREAKAGE, OCCURRED IN TWO CHILD RESTRAINTS DURING THE SLED TESTING. ALL CHILD RESTRAINTS RETAINED THE TEST DUMMY THROUGHOUT THE SLED TEST. ONLY 38 RESTRAINTS OUT OF THE 56 TESTED PREVENTED THE DUMMY'S HEAD FROM PENETRATING THE FORWARD 30-INCH PLANE. OF EIGHT CHILD RESTRAINTS SEATED IN THE RIGHT PASSENGER SEATING POSITION DURING THE 60° LATERAL SLED IMPACT TESTS, SEVEN ALLOWED THE DUMMY'S HEAD TO HIT THE SIMULATED PASSENGER DOOR PANEL. OF 13 CHILD RESTRAINTS TESTED ON THE SLED WITH TETHER STRAPS, TWO TETHER STRAPS FAILED. FINALLY, OF 46 RESTRAINTS THAT USED A BUCKLED HARNESS, SIX BUCKLES OPENED DURING SLED TESTING.

by JR. BAYER, ANTHONY R.; BILLY S. PETERSON
NATIONAL HWY. TRAFFIC SAFETY ADMINISTRATION, ENGINEERING TEST FACILITY, P.O. BOX
Rept. No. OCW-477-1; OCW-1277-3 ; 1978 ; 85P
REPT. FOR APR 1977-MAY 1978. APPENDIX IS HS-803 347.
Availability: NHTSA

HS-803 347

CHILD RESTRAINT SYSTEMS TESTING. APPENDIX

GRAPHS OF DUMMY ACCELERATION DATA FOR SLED TESTS CONDUCTED TO EVALUATE CHILD RESTRAINT SYSTEMS ARE PRESENTED. THE TESTING CONSISTED OF 60° LATERAL IMPACTS, 30 MPH FRONTAL IMPACTS, AND 20 MPH FRONTAL IMPACTS. THE FOLLOWING CHILD RESTRAINT SYSTEMS WERE TESTED: FORD TOT GUARD, CHRYSLER GUARDWELL, PETERSON SAFETY SHELL 75, STROLEE WEE CARE, BUNNY BEAR NEW MOULDED CAR SEAT (FOUR-POSITION MODEL), KANTWET MODEL 988, GENERAL MOTORS INFANT CARRIER, GENERAL MOTORS CHILD LOVE SEAT, BOBBY MAC DELUXE 7812, HEDSTROM POSITEST, CENTURY TRAVEL GUARD 4448, PRIDE TRIMBLE, ROSE AUTO SAFETY HARNESS, BUILT-RITE MODEL K92, KANTWET 486, KANTWET 584, KANTWET 986, SWYNGOMATIC 302, PRIDE TRIMBLE 876, TEDDY-TOT UNIVERSAL 7316, TEDDY-TOT ASTRO SEAT V 8900, TEDDY-TOT TILT-A-BABE 7600, AND COSCO SAFE AND EASY.

by JR. BAYER, ANTHONY R.; BILLY S. PETERSON
NATIONAL HWY. TRAFFIC SAFETY ADMINISTRATION, ENGINEERING TEST FACILITY, P.O. BOX
Rept. No. OCW-477-1; OCW-1277-3 ; 1978 ; 268P
FINAL REPT. IS HS-803 346.
Availability: NHTSA

HS-803 393

FINAL DESIGN AND IMPLEMENTATION PLAN FOR EVALUATING THE EFFECTIVENESS OF FMVSS 213: CHILD SEATING SYSTEMS. FINAL REPORT FEDERAL MOTOR VEHICLE SAFETY STANDARD

The final design and implementation plan for evaluating the effectiveness of Federal Motor Vehicle Safety Standard (FMVSS) 213, Child Seating Systems, considers measurability criteria, alternative statistical and laboratory techniques, data

availability/ collectability, resource requirements, work schedule, and other factors. The objective of FMVSS 213 is injury reduction, to be achieved through specifying performance requirements for all child seats manufactured after 1 Apr 1971. These systems now undergo static tests approximating a 30 mph frontal crash, after which a torso block representing a child is measured for horizontal movement. FMVSS 213 is unique in that it applies to a regulated device which is an optional item, purchased by a relatively small percentage of the car-owning population. Accident statistics indicate about 1000 child deaths and 60,000 child injuries per year. Current estimates put the use of child seating systems at less than 10%, even though the actual number of child seats produced (about 7 million since 1971) is approximately 40% of the 0-5 child population (about 16 million). The plan described contains seven analyses. Mass accident data will be analyzed to determine if the use of child seating systems has resulted in a reduction in the number of deaths and severity of injury to young children. Detailed accident bases will be investigated for effects of various variables on injury to restrained and unrestrained children. Task three is a National Accident Sampling System (NASS) special data collection and analysis. Mail surveys of pediatricians and hospital emergency rooms will take place in the fourth task, and task five includes an on-site real world survey on the use of child restraints and a mail survey on attitudes toward these systems. Task six involves dynamic testing of commercial systems and the final analysis is of the direct costs of implementing FMVSS 213. Carrying out these tasks will take four years, at a total cost of $781,000. If the on-site and mail survey and dynamic lab tests are not conducted under Tasks four and five, the entire study would be reduced to $453,000. Appended are a copy of FMVSS 213, discussions of statistical techniques and of proposed standard implementation cost categories, proposed rule changes for FMVSS 213, and a copy of the Tennessee Child Restraint Law, effective 1 Jan 1978.

by Kayla Costenoble; Gaylord M. Northrop
Center for the Environment and Man, Inc., 275 Windsor St., Hartford, Conn. 0612
DOT-HS-7-01675
Rept. No. CEM-4229-597 ; 1977 ; 143p refs
Rept. for tasks 4 and 5. See also HS-803 388--HS-803 392 and HS-803 394.
Availability: NTIS

HS-810 310

THE FUTURE OF THE NATIONAL HIGHWAY SAFETY PROGRAM. REMARKS BEFORE THE NATIONAL SAFETY CONGRESS, CHICAGO, ILLINOIS, OCTOBER 17, 1977

THE MOST IMPORTANT ISSUE FACING THE TRAFFIC SAFETY ESTABLISHMENT, BOTH IN THE PRIVATE SECTOR AND IN GOVERNMENT, REGARDS ITS REACTION TO THE CONGRESSIONAL DECISION ON PASSIVE RESTRAINTS. THAT DECISION IS SEEN AS AN OPPORTUNITY FOR SAFETY ADVOCATES FROM MANY DIFFERENT FIELDS TO REORGANIZE AND COALESCE THEIR EFFORTS TOWARD GREATER VEHICLE AND HIGHWAY SAFETY. RESPONSIBILITIES FACING THE PRIVATE SECTOR INCLUDE REORIENTATION OF PROGRAMS TO ADDRESS THE VEHICLE, HIGHWAY, AND DRIVER AS A COORDINATED ISSUE, AND THE TASK OF SELLING HIGHWAY SAFETY TO THE AMERICAN PUBLIC. THE INSURANCE INDUSTRY AND THE AMERICAN AUTOMOBILE ASSOC. HAVE BEGUN THIS PROCESS, AND THE NATIONAL SAFETY COUNCIL IN PARTICULAR IS ADMONISHED TO FOLLOW SUIT BY ACKNOWLEDGING THE ROLE OF THE VEHICLE IN AUTO CRASHES AND INJURIES. NOW THAT CONGRESS HAS VOTED IN FAVOR OF PASSIVE RESTRAINT REQUIREMENTS THE PRIVATE SECTOR AT LARGE IS EXPECTED TO SUPPORT THAT DECISION. THE PROCESS OF SELLING VEHICLE SAFETY TO THE PUBLIC CAN BE ACCOMPLISHED USING DEMONSTRATION AIRBAG CARS, AND GENERAL COORDINATION OF ALL KINDS OF PUBLIC INFORMATION ON VEHICLE AND HIGHWAY SAFETY, INCLUDING SEAT BELTS, ALCOHOL PROGRAMS, THE 55 MPH PROGRAM, AND CHILD RESTRAINTS. FUTURE GOALS AT THE FEDERAL LEVEL INCLUDE CONTINUATION OF THE PUBLIC EDUCATION PROGRAM ON PASSIVE RESTRAINTS, FURTHER VEHICLE IMPROVEMENTS, AND PEDESTRIAN PROTECTION. INDIVIDUAL STATES ARE IN THE PROCESS OF GAINING MORE AUTONOMY IN THEIR HIGHWAY SAFETY PROGRAMS, WITH CONTINUED UNIFORMITY OF FEDERAL REGULATIONS. ADVERTISING AND PUBLIC RELATIONS OPPORTUNITIES TO IMPROVE VEHICLE AND HIGHWAY SAFETY ARE OPEN TO SUPPLIERS, AND MOTOR VEHICLE AND ALCOHOL BEVERAGE INDUSTRIES. PRIVATE SECTOR PURCHASE OF FLEET CARS EQUIPPED WITH PASSIVE RESTRAINTS IS ENCOURAGED. THE NATIONAL SAFETY COUNCIL IS ENCOURAGED TO PRESSURE COMMERCIAL AND POLITICAL INTERESTS TO PUSH FOR VEHICLE SAFETY ITEMS, TO EDUCATE YOUNG PEOPLE, AND TO PRESS FOR PUBLIC SERVICE ATTENTION TO TRAFFIC SAFETY VIA DRIVER PROGRAMS AND NHTSA'S DEFECT SAFETY PROGRAM.

by JOAN CLAYBROOK
NATIONAL HWY. TRAFFIC SAFETY ADMINISTRATION, WASHINGTON, D.C. 20590
1977 ; 13P
Availability: CORPORATE AUTHOR

HS-820 170

WHAT TO BUY IN CHILD RESTRAINT SYSTEMS

Most of the 10,000 children under four years of age killed in the past ten years in highway crashes diet because they had no restraints to protect them. Investigations also determined that many restrainges installed in cars to protect children proved to be no protection at all during the crash. Many products sold before the Federal safety standard on child car seats took effect in April 1971 are unsafe. Infants up to nine months are particularly vulnerable, so a safety standard is being developed for infant car bed and carriers which should be anchored by seat belts. From ages of eight or nine months to four years, child car seats and harnesses are indicated. Older children can use a lap belt, which may be combined with a shoulder strap if they are over 55 inches tall.

National Hwy. Traf. Safety Administration
1971 ; 13p
Availability: GPO $.20

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