

HSL No. 74-2
JANUARY 29, 1974

THIS ISSUE CONTAINS:

HS-013 654 - HS-013 705; HS-800 793; 887; 908; 912; 915;
917; 924; 935-936; 957-958; 967-970; 977; 993
HS-820 276-278; 303

U.S. Department of
Transportation

National Highway
Traffic Safety
Administration



*Shelve in Stacks
S.B.t.*

Highway Safety Literature

... A SEMI-MONTHLY ABSTRACT JOURNAL

AVAILABILITY OF DOCUMENTS

Documents listed in **Highway Safety Literature** are **not** available from the National Highway Traffic Safety Administration. They must be ordered from the sources indicated on the citations, usually at cost. Ordering information for each of the sources is listed below.

NTIS: National Technical Information Service, Springfield, Va. 22151. **Order by title and accession number: PB, AD, or HS.**

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Corporate author: Contact corporate author.

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SAE: Society of Automotive Engineers, Dept. HSL, 2 Pennsylvania Plaza, New York, N.Y. 10001. **Order by title and SAE report numbers.**

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

Material directly related to Highway and/or Motor Vehicle Safety is solicited for inclusion in Highway Safety Literature. Topics must fall within the scope of the mission of the National Highway Traffic Safety Administration. Submit material, together with a written statement of approval for publication to:

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**National Highway Traffic
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400 7th Street, S.W.
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Entries in **Highway Safety Literature** are arranged in numerical order by HS accession number. Documents related directly to the National Highway Traffic Safety Administration (NHTSA) are numbered according to the following series: Accident Investigation Reports HS 600 000; Compliance Test Reports HS 610 000; Contractor's Reports HS 800 000; Staff speeches, papers, etc. HS 810 000; Imprints HS 820 000.

A document containing several articles is announced as complete volume under an HS number referring to it as a whole. Entries for individual articles are listed under their own HS numbers.

SAMPLE ENTRIES

JOURNAL ENTRY

Title of Document { **SYNTHESIS OF CASE LAW JURISPRUDENCE RELATING TO WET-WEATHER HIGHWAY CONDITIONS**

Journal Citation → Highway Research Record n 376 p29-36 (1971)
D. C. Oliver 1971

Author(s) → Sponsored by Highway Res. Board Steering Com. for Workshop on Anti-Skid Program Management and presented at the workshop.

Search Terms { Descriptors: *Liability, *Negligence, *Accident responsibility, *Legal responsibility, *Wet road conditions, *Court decisions, *State government, *Skidding accidents, *Warning signs, *Highway maintenance, *Litigation, *Icy road conditions.

Abstract { The extant case law on legal liability for accidents occurring on icy and wet highways has established three central areas and one subarea in the jurisprudence of maintenance liability. These areas are compliance with general duties in order to escape liability; damages resulting from noncompliance (negligence); contributory negligence as a bar to recovery; and advisory signing as a technique in meeting general duties. Court decisions covering these four areas are presented.

NHTSA Accession Number → HS-012 289
*Subject heading in Subject Index

CONTRACT REPORT

EQUIPMENT AND PROCEDURES FOR MEASURING GLARE FOR MOTOR VEHICLES. FINAL REPORT

Corporate author → Teledyne Brown Engineering
N. E. Chatterton J. D. Hayes E. W. George 1972 102p
Contract DOT-HS-089-1-139

Availability → NTIS

Descriptors: *Glare, *Glare reduction, *Visual perception, *Photometers, *Luminance, *Hydraulic equipment, *Central vision, *Field of view, *Backgrounds, *Contrast, *Light conditions, *Brightness, *Test facilities, *Test equipment, *Vehicle safety standards, *Simulators, *Light, *Reflectance, *Measuring instruments,

A procedure and description of equipment for measuring glare from a driver's own vehicle are presented. The procedures are based on a disability glare theory as applied to foveal vision. Two pieces of apparatus were constructed to provide the measurement capability. One of them simulates diffuse sky glare and the other simulates direct solar glare. Methods of combining data from these measurements are presented along with scaling laws selected to provide a value for glare as it would be under natural daylight conditions. A standard for allowable glare levels from the vehicle is developed which is independent of the measurement procedure.

Test results from a passenger car are presented and compared with this standard. Recommendations for improvements to the apparatus and additional research requirements for improvement to the theory are made.

HS-800 731

*Subject heading in Subject Index

1. ACCIDENTS

1B. Injuries

DOOR CRASHWORTHINESS CRITERIA. FINAL REPORT

Michigan Univ., Ann Arbor. Hwy. Safety Res. Inst.
For primary bibliographic entry see Fld. 5E.
HS-800 924

TRI-LEVEL ACCIDENT INVESTIGATION STUDY, VOL. 1. FINAL REPORT

Michigan Univ., Ann Arbor, Hwy. Safety Res. Inst.
For primary bibliographic entry see Fld. 1C.
HS800 912

1C. Investigation And Records

INTERNATIONAL CONGRESS ON AUTOMOTIVE SAFETY (2ND) PROCEEDINGS, SAN FRANCISCO, JULY 16-18, 1973. VOL. 1, PT. 2, MOTORCYCLE SAFETY

366P 69REFS
Includes HS-013 655--HS-013 672.
Corporate author

Motorcycle safety, Motorcycle design, Motorcycle handling, Experimental vehicles, Accident avoidance, Vehicle stability, Steering, Drive systems, Motorcycle brakes, Tire design, Chains, Motorcycle riding techniques, Brake system design, Turning, Motorcycle operator experience, Motorcycle visibility, Lamp daytime usage, Vehicle dynamics, Impact tests, Safety design, Motorcycle accidents, Impact protection, Injury prevention, Accident research, Accident prevention, Accident investigation, Minibikes, Mopeds

Topics covered in this volume include motorcycle steering, tire, drive, and brake systems; motorcycle accident avoidance and impact protection with emphasis on motorcycle and rider visibility and motorcycle riding techniques involved in turning; development of an experimental safety motorcycle; motorcycle accident research and investigation methodology; and a discussion of mopeds.
HS-013 654

MOTORCYCLE ACCIDENT RESEARCH--WHERE DO WE GO FROM HERE?

Biotechnology, Inc., Falls Church, Va.
For primary bibliographic entry see Fld. 5C.
HS-013 670

ACCIDENT INVESTIGATION METHODOLOGY PECULIAR TO MOTORCYCLES AND MINIBIKES

University of Southern California, Los Angeles
For primary bibliographic entry see Fld. 5C.
HS-013 671

INTERNATIONAL CONGRESS ON AUTOMOTIVE SAFETY (2ND) PROCEEDINGS, SAN FRANCISCO, JULY 16-18, 1973. VOL. 2, RECREATIONAL VEHICLE SAFETY

282P REFS
Includes HS-013 674--HS-013 691.
Corporate author

Recreational vehicles, Vehicle design, Safety design, Vehicle safety standards, Recreational vehicle accidents, Vehicle handling, Crashworthiness, Travel trailers, Consumer education, Owner manuals, Accident rates, Human factors, Accident causes, Vehicle performance, Campers (truck mounted), Mobile homes, Recreational vehicle safety

Topics covered in this volume include recreational vehicle accident statistics; recreational vehicle safety characteristics; recreational vehicle safety considerations; advanced developments in recreational vehicle safety; and national trends for motorcycle and recreational vehicle safety.
HS-013 673

NATURE AND FREQUENCY OF RECREATIONAL VEHICLE OPERATIONAL AND NON-OPERATIONAL ACCIDENTS AND INJURY AS PERTAINS TO MOTORHOMES

Alexander and Alexander, Inc., New York
For primary bibliographic entry see Fld. 5T.
HS-013 674

DESIGN SAFETY PRINCIPLES FOR RECREATIONAL VEHICLES BASED ON IN-DEPTH ACCIDENT INVESTIGATION

University of Southern California, Los Angeles
H. H. Hurt, Jr. 1973 26p 1ref Rept. No. Paper-73012
In HS-013 673, International Congress on Automotive Safety (2nd) Proceedings. Vol. 2, Recreational Vehicle Safety, Washington, D. C., 1973

Recreational vehicles, Vehicle design, Safety design, Accident causes, Accident investigation, Accident analysis, Crashworthiness, Vehicle handling, Vehicle stability, Vehicle fires, Accident case reports, Driver experience, Vehicle center of gravity, Explosions, Short circuits, Driver vehicle familiarity, Brake performance, Load shifting, Weight distribution, Rollover accidents, Loss of control, Off the road vehicles, Recreational vehicle accidents, Recreational vehicle safety

The most general principles of design that affect the safety of recreational vehicles are presented. Accident investigations included for illustration show the relation between in-depth accident investigation and design principles. The following safety design principles for recreational vehicles are recommended: the living support facilities should demonstrate the same basic safety as contemporary home construction; recreational vehicles should have the same basic features of crash survivability as other vehicles; systematic inspection and testing during the manufacture of recreational vehicles would improve safety performance; and recreational vehicle drivers should be required to demonstrate a minimum safe knowledge and skill in the operation of the vehicles.
HS-013 677

ASPECTS OF RECREATIONAL VEHICLE SAFETY

National Transp. Safety Board, Washington, D.C.
For primary bibliographic entry see Fld. 5T.
HS-013 682

RECREATIONAL VEHICLE SAFETY ON THE HIGHWAY

Liberty Mutual Insurance Co., Boston, Mass.
For primary bibliographic entry see Fld. 5T.
HS-013 687

Group 1C—Investigation And Records

RELATIONSHIPS BETWEEN OFF-ROAD FIXED OBJECT ACCIDENT RATES AND ROADWAY ELEMENTS OF URBAN HIGHWAYS. FINAL REPORT

Georgia Inst. of Tech., Atlanta
 P. H. Wright, K. K. Mak 1972 59p 14refs
 Contract DOT-HS-166-2-260
 Report for Oct 1971-Sep 1972.
 NTIS

Ran off road accidents, Vehicle fixed object collisions, Accident rates, Urban highways, Single vehicle accidents, Urban accidents, Roadside hazards, Accident risk forecasting, Highway design, Traffic volume, Linear regression analysis, Factor analysis, Road width, Two lane roads, Speed limits, Matrix reduction, Highway characteristics, Traffic flow, Sight distances, Highway classification, Driveways, Land usage, Intersections, Road curves, Streets, Correlation analysis, Atlanta

By means of aerial photographs and field surveys, data were collected on ten roadway and traffic characteristics on thirty one-mile sections of arterial and collector streets in Atlanta, Georgia. Rates of single vehicle, ran off road, fixed object accidents, and total accident (all types) were determined by an examination of police accident records for four years. Correlation and factor analyses, simple linear regression, and stepwise multiple linear regression were used to establish relationships between roadway and traffic characteristics and accident rates. It was found that ran off road accidents rates were most closely related to average daily traffic (ADT), pavement width, vertical alignment, and the number of fixed objects per mile. The rate of total accidents was closely related to ADT, speed limit, vertical alignment, and the number of intersections per mile. Complex inter-relationships exist between average daily traffic, general class of roadway, and land use.
 HS-800 793

TRI-LEVEL ACCIDENT INVESTIGATION STUDY, VOL. 1. FINAL TECHNICAL REPORT

Michigan Univ., Ann Arbor. Hwy. Safety Res. Inst.
 P. Cooley, J. De Beaumont, T. Gates, J. O'Day, D. E. Cleveland, D. J. Minahan 1973 152p 19refs Rept. No. HSRI-SA-73-5-Vol-1
 Contract DOT-HS-031-2-454
 Report for 1 Jun 1972-30 Jun 1973.
 NTIS

Trilevel accident investigation, Multidisciplinary teams, Accident studies, Accident causes, Accident records, Time of day, Urban accidents, Rural accidents, Rollover accidents, Day of week, Matrix reduction, Age factor in accidents, Driver performance under stress, Driver physical fitness, Vehicle maintenance, Vehicle safety standards, Roadside hazards, Guardrails, Highway design, Highway maintenance, Highway planning, Vehicle vehicle collisions, Parked vehicles, Side impact collisions, Seat belt failures, Windshield mounting, Driver vehicle familiarity, Hood caused injuries, Windshield penetration, Accidents by vehicle size, Injuries by vehicle size, Vehicle weight, Michigan

In-depth multidisciplinary accident case studies are discussed, together with a description of the methodology used. The effects of driver stress, physical disabilities, and age; vehicle characteristics and maintenance; roadside hazards; guardrails; highway design, maintenance, and planning; pedestrians and bicyclists; and traffic control devices on accidents are examined. Special topics covered include small-car-large-car accident involvements, parked vehicle accidents, vehicle side im-

pact performance, windshield retention failure, seat belt retractor mechanisms, multipurpose vehicles, and hood-windshield penetration.
 HS-800 935

TRI-LEVEL ACCIDENT INVESTIGATION STUDY, VOL. 2. FINAL TECHNICAL REPORT

Michigan Univ., Ann Arbor. Hwy. Safety Res. Inst.
 P. Cooley, J. De Beaumont, T. Gates, D. Swartz, D. J. Minahan, P. Van Luven 1973 326p Rept. No. HSRI-SA-73-5-Vol-2
 Contract DOT-HS-031-2-454
 Report for 1 Jun 1972-30 Jun 1973.
 NTIS

Accident case reports, Trilevel accident investigation, Multidisciplinary teams, Accident analysis, Accident causes, Accident diagrams, Precrash phase, Crash phase, Postcrash phase, Accident location, Highway characteristics, Vehicle characteristics, Driver characteristics, Injury causes, Accident types, Environmental factors

Summaries of 50 level 3 multidisciplinary investigations of accidents which were specifically selected in order to study in-depth particular aspects of the overall highway safety problem are presented.
 HS-800 936

MULTIDISCIPLINARY HIGHWAY COLLISION INVESTIGATION TRAINING, VOL. 1. FINAL REPORT

University of Southern California, Los Angeles
 G. B. Parker 1973 55p Rept. No. USC-MDHCIT-10
 Contract DOT-HS-010-2-402
 Report for 16 May 1972-30 Jun 1973.
 NTIS

Accident investigation training, Multidisciplinary teams, Program evaluation, Curricula, Instructors, Accident reconstruction, Accident analysis

The Safety Center at the University of Southern California was contracted to organize and present two courses of multidisciplinary highway collision investigation training (MDHCIT). The courses of two weeks duration each were held 18-29 September 1972 and 5-16 February 1973. Included in the task was the development of a course syllabus emphasizing the information and techniques required to conduct on-scene multidisciplinary investigations and establish a control system of high quality reports. The course consisted of five parts--investigative techniques, human factors, vehicle factors, environmental factors, and field exercises. The organization of the program (administration, faculty, syllabus, support functions, and reports); the conduct of the two courses; and recommendations for further training programs are presented.
 HS-800 957

MULTIDISCIPLINARY HIGHWAY COLLISION INVESTIGATION TRAINING, VOL. 2. FINAL REPORT

University of Southern California, Los Angeles
 G. B. Parker 1973 54p refs
 Contract DOT-HS-010-2-402
 Report for 16 May 1972-30 Jun 1973.
 NTIS

Accident investigation training, Curricula, Multidisciplinary teams, Accident analysis, Accident reconstruction

The curriculum developed to be used in a course of instruction to train members of multidisciplinary highway collision investigation teams is presented. Outlines of specific subjects are given: the methodology employed by the human factors specialist, with emphasis on man-machine interfaces; the collection of data regarding design, maintenance, and operation of the vehicle, as used by the vehicle specialist; and the highway, the accident scene, ambience, and other environmental influences as they concern the environmental specialist. Classroom and field exercises are to be included in the course, and instruction given on team operations, recording and analysis of data, and the format and formalization of the accident report.
HS-800 958

TWO-CAR COLLISION STUDY
130P

Contract DOT-HS-245-2-478
NTIS

Head on collisions, Rear end collisions, Accident statistics, Vehicle weight, Driver age, Age factor in accidents, Accident studies, Injury rates, Seat belt usage, Fatality rates, Impact angle, Vehicle vehicle collisions

One hundred and twenty tables of statistics for vehicle vehicle collisions occurring in New York State in 1969, 1970, and 1971 are presented to compare the injury-producing characteristics of various vehicle classes in collision with one another; and to determine the degree to which interactions of these vehicle groups with each other can be determined solely from knowledge of the total number of involvements for each class of vehicles. The statistics are divided by weight categories of the involved vehicles or driver age and include a record of seat belt usage. The accidents are broken down into head on and rear end collisions.
HS-800 977

OCCUPANT MOTION SENSORS: DEVELOPMENT AND TESTING OF A PIEZORESISTIVE MOUTHPIECE ROTATIONAL ACCELEROMETER

Department of Transp., Cambridge, Mass. Transp. Systems Center
G. Plank, D. Ofsevit, A. Warner 1973 38p Rept. No.
DOT-TSC-NHTSA-73-5
Sponsored by National Hwy. Traf. Safety Administration.
NTIS

Accelerometers, Acceleration detection, Head acceleration tolerances, Acceleration response, Impact tests, Calibration, Impact sleds, High speed photography, Photogrammetry, Data reduction, Computer programs, Mathematical analysis

A miniature piezoresistive mouthpiece rotational accelerometer has been developed to measure the angular acceleration of a head during a simulated vehicle crash. Corrections have been electronically applied to the rotational accelerometer to reduce its linear sensitivity. The device has been successfully tested in the laboratory on a high speed shake table and in the field using humans and dummies. New techniques in photogrammetry have been developed to speed the reduction of motion picture data.
HS-820 303

TRI-LEVEL ACCIDENT INVESTIGATION STUDY, VOL. 1. FINAL REPORT

Michigan Univ., Ann Arbor, Hwy. Safety Res. Inst.
P. Cooley, J. O'Day, S. Schultz 1973 198p refs Rept. No.
HSRI-010111-1
Contract DOT-HS-031-1-135
Report for 1 Jun 1971-30 Jun 1972.
NTIS

Trilevel accident investigation, Multidisciplinary teams, Electronic accident analysis, Accident research, Accident factors, Accident causes, Injury causes, Injury severity, Ejection, Windshield damage, Injury severity index, Wrong way driving, Vehicle fires, Suicide by vehicle, Truck accidents, Human factors, Environmental factors, Accident types, Accident rates, Time of accidents, Vehicle train collisions, Accidents by vehicle make, Multivariate analysis, Injury classification, Accident reconstruction, Truck handling, Vehicle safety standards. Computer programs, Automated accident records, Accident report forms

The first year of a trilevel accident study is described. Program design and methodology, level three accident data characteristics, accident data analysis, and topical areas relating to highway safety are discussed. Of the 85 trilevel in-depth accidents investigated, four involved destructive fires, 13 involved trucks, two were determined to be vehicular suicides, and three were vehicle train collisions. These accidents and an accident involving wrongway driving are discussed in some detail. The trilevel concept of incorporating various levels of detail in accident data, with a broad program of field accident investigations within a fixed geographic area, was found to be an effective approach toward identifying problem areas in highway safety, including assessing the effectiveness of vehicle safety performance as well as evaluating standards and new safety features. Recommendations to improve motor vehicle safety derived from the study are included.
HS800 912

2. HIGHWAY SAFETY

TWO-CAR COLLISION STUDY

130P
Contract DOT-HS-245-2-478
NTIS

Head on collisions, Rear end collisions, Accident statistics, Vehicle weight, Driver age, Age factor in accidents, Accident studies, Injury rates, Seat belt usage, Fatality rates, Impact angle, Vehicle vehicle collisions

One hundred and twenty tables of statistics for vehicle vehicle collisions occurring in New York State in 1969, 1970, and 1971 are presented to compare the injury-producing characteristics of various vehicle classes in collision with one another; and to determine the degree to which interactions of these vehicle groups with each other can be determined solely from knowledge of the total number of involvements for each class of vehicles. The statistics are divided by weight categories of the involved vehicles or driver age and include a record of seat belt usage. The accidents are broken down into head on and rear end collisions.
HS-800 977

Field 2—HIGHWAY SAFETY

HSL 74, No. 1r

Group 2D—Design And Construction

2. HIGHWAY SAFETY

2D. Design And Construction

RELATIONSHIPS BETWEEN OFF-ROAD FIXED OBJECT ACCIDENT RATES AND ROADWAY ELEMENTS OF URBAN HIGHWAYS. FINAL REPORT

Georgia Inst. of Tech., Atlanta

For primary bibliographic entry see Fld. 1C.

HS-800 793

2H. Police Traffic Services

DESIGN MANUAL FOR STATE TRAFFIC RECORDS SYSTEMS. VOL. 2, STANDARD DATA ELEMENTS AND CODING. SECT. 6, TRAFFIC LAW ENFORCEMENT AND ADJUDICATION DATA SUBSYSTEM

85P

GPO

Information system design, Computerized records management, Coding systems, Data processing, Traffic law enforcement, Police traffic services, Court decisions, Traffic records, Manuals, State planning

The Traffic Law Enforcement and Adjudication Data Subsystem of the State Traffic Records System is designed to support the activities of State and local government authorities associated with the management of police traffic services and provide a means for monitoring and evaluating the processes for adjudication of traffic violation citations in order to increase their efficiency and impact on the traffic safety situation. The subsystem consists of an enforcement and adjudication directory file, a selective countermeasures actions file, a convictions data file, and a non-convictions data file. The data contents of the four subsystem files are summarized and detailed recommended coding formats and codes for the data elements contained in the subsystem files are described.

HS-820 276

2K. Traffic Records

DESIGN MANUAL FOR STATE TRAFFIC RECORDS SYSTEMS. VOL. 2, STANDARD DATA ELEMENTS AND CODING. SECT. 6, TRAFFIC LAW ENFORCEMENT AND ADJUDICATION DATA SUBSYSTEM

85P

GPO

Information system design, Computerized records management, Coding systems, Data processing, Traffic law enforcement, Police traffic services, Court decisions, Traffic records, Manuals, State planning

The Traffic Law Enforcement and Adjudication Data Subsystem of the State Traffic Records System is designed to support the activities of State and local government authorities associated with the management of police traffic services and provide a means for monitoring and evaluating the processes for adjudication of traffic violation citations in order to increase

their efficiency and impact on the traffic safety situation. The subsystem consists of an enforcement and adjudication directory file, a selective countermeasures actions file, a convictions data file, and a non-convictions data file. The data contents of the four subsystem files are summarized and detailed recommended coding formats and codes for the data elements contained in the subsystem files are described.

HS-820 276

DESIGN MANUAL FOR STATE TRAFFIC RECORDS SYSTEMS. VOL. 2, STANDARD DATA ELEMENTS AND CODING. SECT. 7, EDUCATIONAL SERVICES DATA SUBSYSTEM

89P

GPO

Information system design, Computerized records management, Coding systems, Data processing, Driver education, Traffic records, Manuals, State planning, Driver education laws

The Educational Services Data Subsystem of the State Traffic Records System is designed to support the operational requirements for management of primary driver education services; support the State's requirements for exercising control over the quality of driver education available at the commercial level through licensing procedures, training program standards, and regulatory activities for the commercial schools; and support State operation of remedial education programs designed for problem drivers. The subsystem consists of an educational services directory file, an educational institutions inventory file, a commercial companies inventory file, and a state remedial services inventory file. The data contents of the four subsystem files are summarized and detailed recommended coding formats and codes for the data elements contained in the subsystem files are described.

HS-820 277

DESIGN MANUAL FOR STATE TRAFFIC RECORDS SYSTEMS. VOL. 2, STANDARD DATA ELEMENTS AND CODING. SECT. 8, SAFETY PROGRAM MANAGEMENT DATA SUBSYSTEM

195P

GPO

Information system design, Computerized records management, Coding systems, Data processing, Automated accident records, Highway safety programs, Safety program effectiveness, Manuals, Traffic records, State planning

The Safety Program Management Data Subsystem of the State Traffic Records System is designed to provide the capability for management review and decision making with respect to the traffic safety environment and specific programs within the State. It would provide the functional capabilities for evaluating the current highway traffic safety situation, identifying problem areas and potential countermeasures programs, and monitoring and evaluating the effectiveness of the countermeasures programs in terms of improvement in traffic safety. To satisfy these objectives the subsystem files will provide key summary data on operational factors, accident incidence, and possible relationships between operational factors and accident incidence rates. The subsystem consists of an operational summary file, an accident incidence summary file, and an accident factors summary file. The data contents of the files are sum-

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HUMAN FACTORS—Field 3
Driver Education—Group 3E

marized and detailed recommended coding formats and codes for the data elements in the files are described.
HS-820 278

3. HUMAN FACTORS

HUMAN FACTORS PSYCHOLOGY AND THE RECREATIONAL VEHICLE

Recreational Activities Corp.; Rollins Coll., Winter Park, Fla.
F. D. Fowler 1973 13p Rept. No. Paper-73010
In HS-013 673, International Congress on Automotive Safety (2nd) Proceedings. Vol. 2, Recreational Vehicle Safety, Washington, D. C., 1973

Recreational vehicles, Vehicle design, Human factors engineering, Interior design, Biomechanics, Driver vehicle interface, Driver performance, Manufacturers liability, Owner manuals, Consumer education, Recreational vehicle safety

The need to apply human factors engineering to recreational vehicle (RV) design is discussed. A study is presently being conducted by the Recreational Activities Corp. and Rollins College which will examine a spectrum of recreational vehicles and assess safety and human factors design problems; examine through consumer test RV operational problems; and determine consumer education requirements for safe RV utilization. Some preliminary findings regarding interior design problems of RV's from a human factors viewpoint are presented and the need to develop adequate consumer information regarding RV's is emphasized.
HS-013 675

3A. Alcohol

EXPERIMENTAL EVALUATION OF SECOND-GENERATION ALCOHOL SAFETY-INTERLOCK SYSTEMS. INTERIM REPORT

Dunlap and Associates, Inc., Darien, Conn.
J. F. Oates, Jr. 1973 112p refs Rept. No. DOT-TSC-NHTSA-73-9 DOT-TSC-251-6
Report of Feb-Mar 1973.
NTIS

Alcohol detection and interlock systems, Performance characteristics, Driver intoxication, Blood alcohol levels, Alcohol effects, Laboratory tests, Data analysis, Driver performance, Variance analysis, Driver age, Driver sex, Driver reaction time, Acceptability, Evaluation, Test volunteers, Divided Attention Test, Critical Tracking Tester, Complex Coordinator, Reaction Analyzer

Laboratory tests were conducted to evaluate the performance of four second generation alcohol safety-interlock systems--the Critical Tracking Tester (CTT), the Reaction Analyzer (RA), the Complex Coordinator (CC), and the Divided Attention Test. Interlock performance is defined; experimental procedures employed are described; descriptions of four interlocks are presented; training and testing procedures applied to each are stated; equipment problems encountered are noted; tabulations of performance as a function of blood alcohol concentration are presented for each device; and results are given in a manner permitting comparison of alternate pass/fail criteria, various implementation strategies, and different categories of subjects. It was concluded that with the possible exception of the RA, criteria and strategies can be identified for each device that

offer large-scale discrimination between intoxicated and sober drivers and at least two of the devices, the CTT and the CC, produce this discrimination without penalizing sober drivers.
HS-800 967

3C. Cyclists

INTERNATIONAL CONGRESS ON AUTOMOTIVE SAFETY (2ND) PROCEEDINGS, SAN FRANCISCO, JULY 16-18, 1973. VOL. 1, PT. 2, MOTORCYCLE SAFETY

366P 69REFS
Includes HS-013 655--HS-013 672.
Corporate author

Motorcycle safety, Motorcycle design, Motorcycle handling, Experimental vehicles, Accident avoidance, Vehicle stability, Steering, Drive systems, Motorcycle brakes, Tire design, Chains, Motorcycle riding techniques, Brake system design, Turning, Motorcycle operator experience, Motorcycle visibility, Lamp daytime usage, Vehicle dynamics, Impact tests, Safety design, Motorcycle accidents, Impact protection, Injury prevention, Accident research, Accident prevention, Accident investigation, Minibikes, Mopeds

Topics covered in this volume include motorcycle steering, tire, drive, and brake systems; motorcycle accident avoidance and impact protection with emphasis on motorcycle and rider visibility and motorcycle riding techniques involved in turning; development of an experimental safety motorcycle; motorcycle accident research and investigation methodology; and a discussion of mopeds.
HS-013 654

MOTORCYCLE HANDLING AND COLLISION AVOIDANCE: ANATOMY OF A TURN

University of Southern California, Los Angeles
For primary bibliographic entry see Fld. 5C.
HS-013 660

MOTORCYCLE HANDLING PERFORMANCE FOR OBSTACLE AVOIDANCE

Honda R and D Co. Ltd., Tokyo (Japan)
For primary bibliographic entry see Fld. 5C.
HS-013 661

3E. Driver Education

SAFETY: TOMORROW'S RECREATIONAL VEHICLE GROWTH DEPENDS ON TODAY'S VISIBILITY

Eaz-Lift Spring Corp., Sun Valley, Calif.
For primary bibliographic entry see Fld. 5T.
HS-013 691

DESIGN MANUAL FOR STATE TRAFFIC RECORDS SYSTEMS. VOL. 2, STANDARD DATA ELEMENTS AND CODING. SECT. 7, EDUCATIONAL SERVICES DATA SUBSYSTEM

89P
GPO

Information system design, Computerized records management, Coding systems, Data processing, Driver education, Traffic records, Manuals, State planning, Driver education laws

Field 3—HUMAN FACTORS

HSL 74, No. 1r

Group 3E—Driver Education

The Educational Services Data Subsystem of the State Traffic Records System is designed to support the operational requirements for management of primary driver education services; support the State's requirements for exercising control over the quality of driver education available at the commercial level through licensing procedures, training program standards, and regulatory activities for the commercial schools; and support State operation of remedial education programs designed for problem drivers. The subsystem consists of an educational services directory file, an educational institutions inventory file, a commercial companies inventory file, and a state remedial services inventory file. The data contents of the four subsystem files are summarized and detailed recommended coding formats and codes for the data elements contained in the subsystem files are described.

HS-820 277

3F. Driver Licensing

SAFETY: TOMORROW'S RECREATIONAL VEHICLE GROWTH DEPENDS ON TODAY'S VISIBILITY

Eaz-Lift Spring Corp., Sun Valley, Calif.
For primary bibliographic entry see Fld. 5T.
HS-013 691

3L. Vision

SOME DAY AND NIGHTTIME VISUAL ASPECTS OF MOTORCYCLE SAFETY

Minnesota Mining and Mfg. Co., St. Paul
For primary bibliographic entry see Fld. 5C.
HS-013 664

4. OTHER SAFETY-RELATED AREAS

4C. Cost Effectiveness

AUTOMOBILE CRASH SENSOR SIGNAL PROCESSOR. FINAL REPORT

Burroughs Corp., Paoli, Pa.
For primary bibliographic entry see Fld. 5N.
HS-800 970

4E. Information Technology

SOME FURTHER TESTS ON A COMPUTER PROGRAM TO SIMULATE INTERNAL COMBUSTION ENGINES

Manchester Univ., Lancs. (England)
For primary bibliographic entry see Fld. 5D.
HS-013 705

DESIGN MANUAL FOR STATE TRAFFIC RECORDS SYSTEMS. VOL. 2, STANDARD DATA ELEMENTS AND CODING. SECT. 6, TRAFFIC LAW ENFORCEMENT AND ADJUDICATION DATA SUBSYSTEM

85P
GPO

Information system design, Computerized records management, Coding systems, Data processing, Traffic law enforcement, Police traffic services, Court decisions, Traffic records, Manuals, State planning

The Traffic Law Enforcement and Adjudication Data Subsystem of the State Traffic Records System is designed to support the activities of State and local government authorities associated with the management of police traffic services and provide a means for monitoring and evaluating the processes for adjudication of traffic violation citations in order to increase their efficiency and impact on the traffic safety situation. The subsystem consists of an enforcement and adjudication directory file, a selective countermeasures actions file, a convictions data file, and a non-convictions data file. The data contents of the four subsystem files are summarized and detailed recommended coding formats and codes for the data elements contained in the subsystem files are described.

HS-820 276

DESIGN MANUAL FOR STATE TRAFFIC RECORDS SYSTEMS. VOL. 2, STANDARD DATA ELEMENTS AND CODING. SECT. 7, EDUCATIONAL SERVICES DATA SUBSYSTEM

89P
GPO

Information system design, Computerized records management, Coding systems, Data processing, Driver education, Traffic records, Manuals, State planning, Driver education laws

The Educational Services Data Subsystem of the State Traffic Records System is designed to support the operational requirements for management of primary driver education services; support the State's requirements for exercising control over the quality of driver education available at the commercial level through licensing procedures, training program standards, and regulatory activities for the commercial schools; and support State operation of remedial education programs designed for problem drivers. The subsystem consists of an educational services directory file, an educational institutions inventory file, a commercial companies inventory file, and a state remedial services inventory file. The data contents of the four subsystem files are summarized and detailed recommended coding formats and codes for the data elements contained in the subsystem files are described.

HS-820 277

DESIGN MANUAL FOR STATE TRAFFIC RECORDS SYSTEMS. VOL. 2, STANDARD DATA ELEMENTS AND CODING. SECT. 8, SAFETY PROGRAM MANAGEMENT DATA SUBSYSTEM

195P
GPO

Information system design, Computerized records management, Coding systems, Data processing, Automated accident records, Highway safety programs, Safety program effectiveness, Manuals, Traffic records, State planning

The Safety Program Management Data Subsystem of the State Traffic Records System is designed to provide the capability for management review and decision making with respect to the traffic safety environment and specific programs within the State. It would provide the functional capabilities for evaluating the current highway traffic safety situation, identifying problem areas and potential countermeasures programs, and monitoring and evaluating the effectiveness of the countermeasures programs in terms of improvement in traffic safety. To satisfy these objectives the subsystem files will provide key summary

data on operational factors, accident incidence, and possible relationships between operational factors and accident incidence rates. The subsystem consists of an operational summary file, an accident incidence summary file, and an accident factors summary file. The data contents of the files are summarized and detailed recommended coding formats and codes for the data elements in the files are described.

HS-820 278

4F. Insurance

NATURE AND FREQUENCY OF RECREATIONAL VEHICLE OPERATIONAL AND NON-OPERATIONAL ACCIDENTS AND INJURY AS PERTAINS TO MOTORHOMES

Alexander and Alexander, Inc., New York
For primary bibliographic entry see Fld. 5T.
HS-013 674

TITLE 2. AUTOMOBILE CONSUMER INFORMATION STUDY. MOTOR VEHICLE INFORMATION AND COST SAVINGS ACT. PUBLIC LAW 92-513, OCTOBER 20, 1972. PLANNING TASK FORCE REPORT 38P

Includes Public Law 92-513.
Corporate author

Consumer information regulations, Public information programs, Consumer protection, Consumer education, Insurance industry, Insurance claims, Insurance rates, Automobile comparisons, Repair industry, Accident statistics, Crashworthiness, Benefit cost analysis, Mathematical models

An economic impact study must be performed to focus on the economic, sociological, psychological, environmental, and political impacts of consumer information on affected societal groups. A consumer information dissemination study must also be performed to concentrate on information dissemination techniques, media considerations, and trade-off analyses of methods for direct-to-consumer and point-of-sale information. A study report of activities underway and completed should be prepared and submitted to the Congress in October 1973. This report would highlight the status of the Automobile Consumer Information Study and would provide a target schedule for publication of consumer information packages. Both new car and used car consumer information must be provided to the public. Potential data sources on vehicle damage susceptibility, crashworthiness, and reparability include vehicle test and design and repair and insurance industry data, mathematical modeling, car owners and drivers, and accident records.

HS-800 993

4G. Mathematical Sciences

MOTORCYCLE HANDLING PERFORMANCE FOR OBSTACLE AVOIDANCE

Honda R and D Co. Ltd., Tokyo (Japan)
For primary bibliographic entry see Fld. 5C.
HS-013 661

DYNAMICS OF MOTORCYCLE IMPACT

Denver Univ., Colo.; Caliber Design Ltd., Stratford-on-Avon (England)

For primary bibliographic entry see Fld. 5C.
HS-013 663

THE DYNAMICS AND HANDLING PERFORMANCE OF AUTOMOBILE-TRAVEL TRAILER COMBINATION

Bendix Res. Labs., Southfield, Mich.
For primary bibliographic entry see Fld. 5R.
HS-013 680

RVI TRAILER HANDLING TEST PROGRAM

Recreational Vehicle Inst., Inc., Washington, D.C.
For primary bibliographic entry see Fld. 5T.
HS-013 681

SIMULATION OF A TANDEM AXLE TRACTOR-TRAILER WITH EXPERIMENTAL VALIDATION

Lord Corp., Erie, Pa.; Mack Trucks, Inc., Allentown, Pa.
For primary bibliographic entry see Fld. 5T.
HS-013 692

STABILIAIRE TRUCK DRIVE AXLE SUSPENSION: SERIES 400

Western Unit Corp.
For primary bibliographic entry see Fld. 5T.
HS-013 693

TRACTOR-SEMITRAILER HANDLING: A DYNAMIC TRACTOR SUSPENSION MODEL

Cornell Univ., Buffalo, N. Y.
For primary bibliographic entry see Fld. 5T.
HS-013 694

ANALYSIS AND CONTROL OF TRANSIENT FLOW IN THE DIESEL INJECTION SYSTEM. PT. 1, THE ANALYTICAL CONTROL METHOD

Michigan Univ., Ann Arbor
For primary bibliographic entry see Fld. 5F.
HS-013 699

ANALYSIS AND CONTROL OF TRANSIENT FLOW IN THE DIESEL INJECTION SYSTEM. PT. 2. DESIGN RESULTS OF CONTROLLED AFTER-INJECTION

Michigan Univ., Ann Arbor
For primary bibliographic entry see Fld. 5F.
HS-013 700

COMPUTER TECHNIQUE FOR EVALUATION OF CAVITATION CHARACTERISTICS OF CERTAIN PHASES OF FUEL INJECTION IN FUEL INJECTION SYSTEM

Yanmar Diesel Engine Co. Ltd. (Japan)
For primary bibliographic entry see Fld. 5F.
HS-013 701

ANALYSIS OF BYPASS CONTROL FUEL INJECTION SYSTEMS FOR SMALL DIESEL ENGINES BY DIGITAL COMPUTER

Yanmar Diesel Engine Co. Ltd. (Japan)
For primary bibliographic entry see Fld. 5F.
HS-013 702



Group 4G—Mathematical Sciences

IMPROVEMENT IN TRANSIENT PERFORMANCE OF A TURBOCHARGED DIESEL ENGINE BY AIR INJECTION INTO THE COMPRESSOR

Manchester Univ., Lancs. (England)
For primary bibliographic entry see Fld. 5F.
HS-013 703

RELATIONSHIPS BETWEEN OFF-ROAD FIXED OBJECT ACCIDENT RATES AND ROADWAY ELEMENTS OF URBAN HIGHWAYS. FINAL REPORT

Georgia Inst. of Tech., Atlanta
For primary bibliographic entry see Fld. 1C.
HS-800 793

STABILITY AND HANDLING CRITERIA OF ARTICULATED VEHICLES. PT. 1, TECHNICAL REPORT (FINAL)

IIT Res. Inst., Chicago, Ill.
For primary bibliographic entry see Fld. 5R.
HS-800 915

OCCUPANT MOTION SENSORS: DEVELOPMENT AND TESTING OF A PIEZORESISTIVE MOUTHPIECE ROTATIONAL ACCELEROMETER

Department of Transp., Cambridge, Mass. Transp. Systems Center
For primary bibliographic entry see Fld. 1C.
HS-820 303

5. VEHICLE SAFETY**WHEN DOES AN OVERLOAD PROBLEM BECOME A SAFETY-RELATED DEFECT WITHIN THE MEANING OF THE NATIONAL TRAFFIC AND MOTOR VEHICLE SAFETY ACT OF 1966**

Recreational Vehicle Inst., Inc., Washington, D.C.
D. J. Humphreys 1973 17p Rept. No. Paper-73038
In HS-013 673, International Congress on Automotive Safety (2nd) Proceedings. Vol. 2, Recreational Vehicle Safety, Washington, D. C., 1973

National Traffic and Motor Vehicle Safety Act of 1966, Recreational vehicles, Defects, Defective vehicles, National Hwy. Traf. Safety Administration, Load bearing capacity, Court decisions, Failures, Recall campaigns, Legal factors, Vehicle weight limits, Rule making

An investigation of the phrase defect which relates to motor vehicle safety or, as it is more commonly paraphrased, safety-related defect as it is used in the National Traffic and Motor Vehicle Safety Act of 1966 as amended and an effort to assess its relevance and consequence in relation to overload situations involving recreational vehicles is presented. In order to determine what a safety-related defect is, the language of the National Traffic and Motor Vehicle Safety Act of 1966; the legislative history of safety-related defects; National Highway Traffic Safety Administration procedures, rule making, and interpretative opinions to date; a judicial review of safety-related defects; and new legislative proposals bearing on the problem are reviewed. The vehicle overload problem is defined in terms of gross axle weight rating and gross vehicle weight rating. An approach to making a determination of safety-related defects is suggested.

HS-013 684

5A. Brake Systems**SOME CONSIDERATIONS FOR SAFETY OF MOTORCYCLE BRAKE SYSTEMS**

Yamaha Motor Co. Ltd., Hamamatsu (Japan)
For primary bibliographic entry see Fld. 5C.
HS-013 659

BRAKING OF AUTOMOBILE/TRAILER COMBINATIONS

Airstream, Inc., Jackson Center, Ohio
K. D. Kroll 1973 17p
In HS-013 673, International Congress on Automotive Safety (2nd) Proceedings. Vol. 2, Recreational Vehicle Safety, Washington, D. C., 1973

Braking, Trailer brakes, Travel trailers, Equalizer hitches, Brake tests, Brake performance, Performance tests, Vehicle weight, Electric braking

Braking of automobile travel trailer combinations including proper hitching, sequencing, and adjustment is discussed. Electrically actuated trailer brakes operated in sequence with the hydraulic brake system of the tow vehicle are the most adequate brakes for the size of travel trailers in general use today. The development of SAE recommended practices for the braking of automobile/trailer combinations is reviewed. Specifications of the final recommended practice consist of preburnish, effectiveness tests, emergency system effectiveness tests, and fade and recovery tests. Some typical test results obtained with three different vehicle trailer combinations are presented. Improvements needed in the present trailer electric braking system include development of an easier and more effective way to insure proper sequencing between trailer and automobile brakes and improvement of the modulation of trailer brakes so that they are applied in the same intensity as the automobile brakes.

HS-013 678

DETERMINING SAFETY CHARACTERISTICS OF RECREATIONAL VEHICLES

Ultrasystems, Inc., Newport Beach, Calif.
For primary bibliographic entry see Fld. 5T.
HS-013 679

5C. Cycles**INTERNATIONAL CONGRESS ON AUTOMOTIVE SAFETY (2ND) PROCEEDINGS, SAN FRANCISCO, JULY 16-18, 1973. VOL. 1, PT. 2, MOTORCYCLE SAFETY**

366P 69REFS
Includes HS-013 655--HS-013 672.
Corporate author

Motorcycle safety, Motorcycle design, Motorcycle handling, Experimental vehicles, Accident avoidance, Vehicle stability, Steering, Drive systems, Motorcycle brakes, Tire design, Chains, Motorcycle riding techniques, Brake system design, Turning, Motorcycle operator experience, Motorcycle visibility, Lamp daytime usage, Vehicle dynamics, Impact tests, Safety design, Motorcycle accidents, Impact protection, Injury prevention, Accident research, Accident prevention, Accident investigation, Minibikes, Mopeds

Topics covered in this volume include motorcycle steering, tire, drive, and brake systems; motorcycle accident avoidance and impact protection with emphasis on motorcycle and rider visibility and motorcycle riding techniques involved in turning; development of an experimental safety motorcycle; motorcycle accident research and investigation methodology; and a discussion of mopeds.

HS-013 654

THE OUTLOOK OF IMPROVING STEERING ON MOTORCYCLE

Nihon Univ., Tokyo (Japan)

K. Kageyama 1973 12p Rept. No. Paper-73027

In HS-013 654, International Congress on Automotive Safety (2nd) Proceedings. Vol. 1, Pt. 2, Motorcycle Safety, Washington, D. C., 1973

Motorcycle stability, Motorcycle performance, Roll, Yaw, Steering, Motorcycle handling, Vehicle control, Moments of inertia, Oscillation, Shimmy, Wheel wobble, High speed, Vehicle center of gravity

Motorcycle movement is characterized by three angular oscillations which affect motorcycle steering and stability. These are oscillations of steer, roll, and yaw angle. Abrupt rises in effective value of steering angle at low speeds is a phenomenon peculiar to the motorcycle. The effects of vehicle center of gravity, trail, and moments of inertia on motorcycle stability are presented in graphs. To eliminate wheel wobble at high speed, the motorcycle should be designed so that the speed at which resonance occurs will be shifted up until it exceeds the actual maximum speed limit. Reduction of the motorcycle front weight ratio will help to prevent shimmy.

HS-013 655

MOTORCYCLE TIRE DEVELOPMENT

Goodyear Tire and Rubber Co., Akron, Ohio

D. E. Johnson 1973 16p 6refs Rept. No. Paper-73028

In HS-013 654, International Congress on Automotive Safety (2nd) Proceedings. Vol. 1, Pt. 2, Motorcycle Safety, Washington, D. C., 1973

Pneumatic tires, Tire design, Tire tread patterns, Tire tests, Tire performance, Motorcycle safety, Bias tires, Bias belted tires, Radial tires, Off the road vehicles, Tire inflation pressure, Tire wear, Tire load limits, Durability tests, Tire sidewalls, Reflective materials, Tire traction, Tubeless tires, Tire pavement interface, Tire maintenance, Camber, Motorcycle tires

The functional requirements of motorcycle and automobile tires are quite similar except that a motorcycle tire must operate at higher camber angles and generate more of its cornering power through camber thrust. The most common types of motorcycle tires are bias, bias belted, and radial. Motorcycle tire tread designs can be broken down into three basic functional categories: street or over the road designs, off the road or knobby designs, and combinations of the two that are intended for both on and off the road use. Typical motorcycle tire laboratory tests include braking energy, high speed, and endurance or overload tests. Treadwear, handling, and traction evaluation are the more common motorcycle tire road tests. Future tire developments may result in reflective sidewalls, traction improvements, and tubeless tires.

HS-013 656

POSSIBILITIES OF IMPROVING SAFETY FOR MOTORCYCLE TIRES

Bridgestone Tire Co. Ltd., Tokyo (Japan)

M. Satake 1973 10p Rept. No. Paper-73029

In HS-013 654, International Congress on Automotive Safety (2nd) Proceedings. Vol. 1, Pt. 2, Motorcycle Safety, Washington, D. C., 1973

Tire performance, Tire traction, Braking, Tire failures, Motorcycle safety, Cornering, Camber, Tire tread patterns, Stiffness, Tire inflation pressure, Tire side forces, Coefficient of friction, Tire road contact forces, Tire cords, Tire design, Tire wear, Tire sidewalls

A motorcycle tire should have good lateral traction which can be achieved by a high cord modulus for side stiffness and good camber performance. Side stiffness and a high coefficient of friction are necessary for good braking performance. It is possible to increase the friction coefficient of rubber itself but very difficult to design a safe and economical tire without decreasing wear resistance. A runflat tubeless tire with a reinforced sidewall, which has slightly less camber and riding comfort, has been developed. Although the tire's endurance without air pressure has not yet been tested, it is believed that the tire may be able to run about 400 kilometers without air pressure at 60 kmh.

HS-013 657

TECHNICAL REPORT ON THE ADVANCED SAFETY DRIVE-CHAIN FOR MOTORCYCLE

Kawasaki Heavy Industries Ltd. (Japan); Enuma Chain Mfg. Co. Ltd. (Japan)

A. Shiomi, T. Takeuchi, K. Kusaka, J. Watanabe 1973 25p

Rept. No. Paper-73030

In HS-013 654, 654, International Congress on Automotive Safety (2nd) Proceedings. Vol. 1, Pt. 2, Motorcycle Safety, Washington, D. C., 1973

Drive systems, Chains, Motorcycle safety, Wear resistance, Heat resistance, Tensile strength, Surface roughness, Lubrication, Hardness, Temperature endurance tests, Microstructure, Tempering, Elongation, Durability tests, Wear tests

In order to improve motorcycle drive chain breakage resistance it is necessary to decrease chain elongation and improve the materials used and the method of heat treatment. The pins and bushes are the parts subjected to the most wear. The pins account for 60-70% and the bushes for 30-40% of the wear. To improve wear resistance directed at the pins it is necessary to reduce surface roughness, increase surface hardness and hardening depth, improve the lubrication between the pins and bushes, and use heat resistant material.

HS-013 658

SOME CONSIDERATIONS FOR SAFETY OF MOTORCYCLE BRAKE SYSTEMS

Yamaha Motor Co. Ltd., Hamamatsu (Japan)

M. Taguchi, K. Sunayama 1973 21p 6refs Rept. No. Paper-73031

In HS-013 654, International Congress on Automotive Safety (2nd) Proceedings. Vol. 1, Pt. 2, Motorcycle Safety, Washington, D. C., 1973

Motorcycle brakes, Drum brakes, Caliper disc brakes, Shoe brakes, Antiskid brakes, Brake system design, Brake performance, Coefficient of friction, Brake lining wear, Warning systems, Brake pads, Brake cylinders, Brake fluids, Sensors, Pressure modulators, Stopping distance, Vehicle stability,

Group 5C—Cycles

Coefficient of friction, Water effect on brakes, Servomechanisms

Motorcycle brake systems require short stopping distance, reliability, vehicle stability, good sensitivity, and easy maintenance. Brake drums protect the brake from mud, water, and dust. Drum brakes are generally used on the front and rear of small motorcycles. The newest large motorcycles use a front disc-rear drum brake combination. Usually two leading shoes or a leading-trailing shoes combination are used in motorcycle drum brakes. Only spot type disc brakes are used for motorcycles. The three types of spot caliper brake construction are fixed caliper, floating caliper, and floating disc. Disc brake systems have high anti-fade and water recovery characteristics, braking power is not overly affected by the variation of friction coefficient, brake effectiveness is less affected by speed variations, and pad wear is self adjusting and easy to inspect. The development of motorcycle antiskid brakes is outlined. HS-013 659

MOTORCYCLE HANDLING AND COLLISION AVOIDANCE: ANATOMY OF A TURN

University of Southern California, Los Angeles
H. H. Hurt, Jr. 1973 8p 3refs Rept. No. Paper-73032
In HS-013 654, International Congress on Automotive Safety (2nd) Proceedings. Vol. 1, Pt. 2, Motorcycle Safety, Washington, D. C., 1973

Motorcycle handling, Accident avoidance, Turning, Steering, Driver vehicle interface, Driver emergency responses, Motorcycle riding techniques

The single track vehicle has a special requirement for out-tracking to enter a turn and then later in-tracking to recover from a turn. The first steering input must be away from the intended turn direction. A hazard is avoided by first steering toward it. The motorcycle operator then must lean in the direction of the desired turn and simultaneously push on that side of the handlebars. Because lack of training and unfamiliarity with this phenomenon reduces the ability to avoid collisions, motorcycle operator education should include coverage of this topic. HS-013 660

MOTORCYCLE HANDLING PERFORMANCE FOR OBSTACLE AVOIDANCE

Honda R and D Co. Ltd., Tokyo (Japan)
Y. Watanabe, K. Yoshida 1973 25p Rept. No. Paper-73033
In HS-013 654, International Congress on Automotive Safety (2nd) Proceedings. Vol. 1, Pt. 2, Motorcycle Safety, Washington, D. C., 1973

Motorcycle handling, Accident avoidance, Driver emergency responses, Motorcycle operator experience, Driver skills, Motorcycle performance, Braking, Vehicle size, Automobile handling, Driver reaction time, Steering, Turning, Equations of motion, Weight transfer, Computerized simulation, Velocity

Accident avoidance test results indicate that braking distance increases in proportion to the square of the velocity, where as the required evasion distances increases in direct proportion to velocity. Braking is advantageous when velocity is in the lower range, but evasive action is preferable when velocity is in the higher range. Braking and avoidance require the same distance at approximately 30 kmh. The motorcycle completes effective evasion travel within an extremely short time, but requires a

longer preliminary turning interval than an automobile. However, motorcycles and automobiles are nearly equal in avoidance ability because the automobile requires greater lateral displacement due to its width. A 20% difference exists in the avoidance distance required for highly skilled and low skilled motorcycle operators. A motion analysis performed by computerized simulation shows that changes in rider feedback can have greater effect on motorcycle handling than changes in motorcycle specifications. HS-013 661

MOTORCYCLE NOTICEABILITY AND SAFETY DURING THE DAYTIME

Franklin Inst. Res. Labs., Philadelphia, Pa.
M. S. Janoff 1973 19p 1ref Rept. No. Paper-73034
In HS-013 654, International Congress on Automotive Safety (2nd) Proceedings. Vol. 1, Pt. 2, Motorcycle Safety, Washington, D. C., 1973

Motorcycle visibility, Headlamp daytime usage, Taillamp daytime usage, Headlamp regulations, Motorcycle laws, Accident prevention, Vehicle motorcycle collisions, Day vs night accidents, High beamed headlamps, Low beamed headlamps, Weather, Running lamp daytime usage, Design of experiments, Variance analysis, Oncoming vehicles, Sight distances

An analysis of motorcycle accidents indicates that there has been a 43% decrease in daytime motorcycle accidents in Indiana, Montana, Oregon, and Wisconsin, which have daytime motorcycle headlamp laws. On an annual basis a projected reduction of over 7,000 motorcycle accidents would result from the daytime use of motorcycle headlamps and taillamps. Daytime headlamp usage causes an increase in visibility ranging from 46% at 50 feet to 220% at 300 feet. Standard taillamps, even modified by intensity, height, number, or contrasting background, did not increase daytime visibility. Front and rear running lamp daytime usage also improved visibility, but less than headlamps. HS-013 662

DYNAMICS OF MOTORCYCLE IMPACT

Denver Univ., Colo.; Caliber Design Ltd., Stratford-on-Avon (England)
H. C. Peterson, P. W. Bothwell 1973 25p Rept. No. Paper-73035
In HS-013 654, International Congress on Automotive Safety (2nd) Proceedings. Vol. 1, Pt. 2, Motorcycle Safety, Washington, D. C., 1973

Vehicle dynamics, Motorcycle performance, Computerized simulation, Restraint system tests, Barrier collision tests, Vehicle vehicle impact tests, Head on impact tests, Angle impact tests, Side impact tests, Anthropometric dummies, Skidding, Front end impact tests, Air bag restraint systems, Degrees of freedom, Motorcycle safety standards, Motorcycle design, Crashworthy fuel tanks, Injury severity index, Occupant kinematics, Safety design, Motorcycle restraint systems, Motorcycle safety

Head on, angle, side, and vehicle vehicle impact; barrier collision; and skidding and sliding tests were conducted using motorcycles with anthropometric dummy riders to determine the dynamic behavior of motorcycles involved in accidents. Pre-inflated air bags were used in some of the tests. A two dimensional 10 degree of freedom and a three dimensional nine degree of freedom digital computer simulation of a motorcycle and rider were developed to study impact performance. An air

bag impact simulation was also developed to study changes in the postcrash motion of the motorcycle which are produced by use of air bag restraint systems. Recommendations for motorcycle safety design standards based on the test results are presented.

HS-013 663

SOME DAY AND NIGHTTIME VISUAL ASPECTS OF MOTORCYCLE SAFETY

Minnesota Mining and Mfg. Co., St. Paul

H. L. Woltman, R. L. Austin 1973 27p 15refs Rept. No. Paper-73036

In HS-013 645, International Congress on Automotive Safety (2nd) Proceedings. Vol. 1, Pt. 2, Motorcycle Safety, Washington, D. C., 1973

Motorcycle visibility, Fluorescent materials, Color, Vehicle size, Night visibility, Contrast, Field of view, Protective clothing, Sight distances, Low beamed headlamps, Target detection, Weather, Reflective materials, Distance perception, Velocity perception, Depth perception

The visual area offered to motorists of the motorcycle and rider is approximately 1/3 that of an automobile. The conventional automobile is the size of hazard to which the motorist most frequently and successfully accomodates. The more frequent failure to correctly cope with the smaller motorcycle hazard may be improved by such perceptual aids as employment of highly visible and contrasting colors such as fluorescent orange in sufficient size to be readily seen at distances when head on and right angle encounters are experienced. At night similar enhancement by reflectorizing both the vehicle and operator provides perception of depth, and thus relative distance and relative speed, both of which may be difficult to communicate with traditional motorcycle lighting in most encounter situations. The nighttime treatment employed provides two times the light to a motorist on low beam lights that the traditional motorcycle lighting provides at some angles of approach.

HS-013 664

NEAR-TERM EXPERIMENTAL SAFETY MOTORCYCLE PROGRAM

National Hwy. Traf. Safety Administration, Washington, D.C.

D. C. Bischoff 1973 16p 10refs Rept. No. Paper-73042

In HS-013 654, International Congress on Automotive Safety (2nd) Proceedings. Vol. 1, Pt. 2, Motorcycle Safety, Washington, D. C., 1973

Experimental safety motorcycles, Motorcycle design, Safety design, Accident prevention, Crashworthiness, Single headlamp, Motorcycle visibility, Impact protection, Antiskid brakes, Fender design, Tire traction, Motorcycle brakes, Tire design, Headlamp design, Windshield design, Rear visibility, Theft prevention devices, Wheel design, Rim failures, Tire failures, Cables, Vehicle motorcycle collisions, Side impact collisions, Fuel systems, Injury prevention

An experimental safety motorcycle is being designed with emphasis on antiskid brakes, improved traction tires, headlamp systems visibility, rear visibility, theft prevention devices, wheels designed to prevent rim failures, control cable strength and reliability, impact proof windshields, side impact protection, crashworthy fuel systems, and improved fender design for rider protection. Accident avoidance is stressed over crashworthiness because sizeable improvements can probably be realized without significantly altering the cost, weight, maneu-

verability, or configuration of existing motorcycles; the role of motorcycle defects and instabilities in motorcycle accidents has been well documented; and the National Highway Traffic Safety Administration is already conducting a research project on motorcycle crashworthiness and rider protection.

HS-013 665

INVESTIGATION OF SOME EXPERIMENTAL SAFETY MOTORCYCLE PARAMETERS

Harley-Davidson Motor Co., Inc., Milwaukee, Wis.

N. R. Hirsch, R. J. Miennert 1973 20p Rept. No. Paper-73043

In HS-013 654, International Congress on Automotive Safety (2nd) Proceedings. Vol. 1, Pt. 2, Motorcycle Safety, Washington, D. C., 1973

Experimental safety motorcycles, Motorcycle design, Safety design, Antiskid brakes, Motorcycle visibility, Headlamp design, Tire traction, Tire failures, Night visibility, Reflective materials, Brake system design, Motorcycle brakes, Sensors, Pumps, Caliper disc brakes, Brake performance, Hydraulic brakes, Vacuum brakes, Air brakes, Horns, Quartz halogen tungsten headlamps, Motorcycle electric systems, Tire tests, Rims, Tire beads

Tests conducted in preparation for design of an experimental safety motorcycle indicate that an antiskid brake system is feasible on a motorcycle and even in early development stages, greatly reduced stopping distance over a skidding vehicle. Vehicle conspicuity can be greatly improved at night with the use of reflective tire sidewalls, rider clothing, and vehicle paint and reflective tapes. A substantial improvement in the headlight system was realized by use of a two-lamp system. A tungsten halogen lamp was used in conjunction with a conventional tungsten two-beam headlamp, with only the two-beam lamp used for low beam operation. Improved traction tires did not produce conclusive results due to the short time interval available. Dynamic tire failure can be made less hazardous by use of a method which retains the tire bead in the rim bead seat.

HS-013 666

DEVELOPMENT OF SIDE IMPACT PROTECTION FOR AN ESM

AMF, Inc., White Plains, N. Y.

J. A. Bartol, G. D. Livers 19p 8refs Rept. No. Paper-73044

In HS-013 654, International Congress on Automotive Safety (2nd) Proceedings. Vol. 1, Pt. 2, Motorcycle Safety, Washington, D. C., 1973

Experimental safety motorcycles, Motorcycle design, Safety design, Impact protection, Side impact collisions, Injury prevention, Vehicle motorcycle collisions, Anthropomorphic dummies, Side impact tests, Vehicle vehicle impact tests, Energy absorbing frames, Angle impact tests, Impact angle, Impact velocity, Occupant protection

An experimental motorcycle frame was developed which is capable of protecting the rider's leg from direct as well as oblique side impacts. The structure is a welded double-loop frame constructed of seamless AISI 4130 tubing. Front and rear wheels, forks, and brakes along with controls, engine, transmission, and electrical system were conventional Harley-Davidson components. The motorcycle was subjected to a 90 direct side impact with a car, a 22-1/2 off-center rear oblique impact with a car, and a 45 off-center oblique impact frontal with a car. An induced slide test resulting in a road surface impact was also conducted. All tests were run using a male 50th percentile

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anthropomorphic rider at impact speeds of 30 mph. Evaluation of the limited test results to date indicates that preliminary design objectives for side protection were met.
HS-013 667

STUDY OF ESM'S IN JAPAN

Japan Automobile Manufacturers Assoc., Inc., Tokyo
D. Aoki 1973 11p Rept. No. Paper-73045
In HS-013 654, International Congress on Automotive Safety (2nd) Proceedings. Vol. 1, Pt. 2, Motorcycle Safety Washington, D. C., 1973

Experimental safety motorcycles, Motorcycle design, Safety design, Accident prevention, Injury prevention, Postcrash phase, Pedestrian safety, Motorcycle safety, Motorcycle performance, Accident avoidance, Japanese vehicles, Motorcycle visibility

Specifications for the Experimental Safety Motorcycle (ESM) cover accident avoidance by improving motorcycle and rider visibility and motorcycle systems performance; injury prevention; postcrash safety, including fire and burn prevention; pedestrian protection by eliminating sharp protrusions from the front end of the motorcycle; and safety of the motorcycle when not in operation by improving the stand, simplifying maintenance, and increasing theft protection. The main ESM research programs to be carried out in 1973 include research on colors and vehicle lighting for improved visibility, improved brake performance and noise control, improved headlamp and signal lamp requirements, handling and stability, measurement of tire traction, injury criteria for riders, and analysis of accidents and helmets. Motorcycle operator education and improved licensing procedures are needed along with development of the ESM for effective motorcycle accident prevention.
HS-013 668

CHANGES IN MOTORCYCLE STRUCTURE FROM THE VIEWPOINT OF SAFETY

Suzuki Motor Co. Ltd., Hamamatsu (Japan)
T. Yamauchi 1973 20p Rept. No. Paper-73046
In HS-013 654, International Congress on Automotive Safety (2nd) Proceedings. Vol. 1, Pt. 2, Motorcycle Safety, Washington, D. C., 1973

Motorcycle design, Safety design, Motorcycle safety, Motorcycle safety standards, Japan, Motorcycle brakes, Drum brakes, Brake design, Disc brakes, Wheel balancing, Rims, Switches, Control location, Seat design, Throttles, Dials, Vehicle lighting, Reflectors, Headlamps, Taillamps, Turn signals, Passing lamps, Tire inflation pressure, Impact attenuation, Occupant protection, Fender design

Since the 1950's transitions in motorcycle structural safety have included the addition of front disc brakes; improved wheel balance and rim lock devices; switches mounted compactly on the handlebar; a forced throttle control system; improved dial visibility; speed warning, position, and passing lamps; side reflex reflectors; turn signals; improved taillamp and headlamp design; stop lamp activation by application of the front brake; labels of recommended tire pressure and pre-ride checks and services; improved seat design; a fuel tank shut-off vacuum valve; and emergency engine kill switch; flexible fenders; a helmet securing device; and treatments for projections and edges of handlebar mounted levers, stands, brake pedals, foot pegs, rear view mirrors, and muffler and fender ends. The role of government and manufacturers in motorcycle safety is briefly described.

HS-013 669

MOTORCYCLE ACCIDENT RESEARCH--WHERE DO WE GO FROM HERE?

Biotechnology, Inc., Falls Church, Va.
M. L. Reiss 1973 13p 14refs Rept. No. Paper-73050
In HS-013 654, International Congress on Automotive Safety (2nd) Proceedings. Vol. 1, Pt. 2, Motorcycle Safety, Washington, D. C., 1973

Motorcycle accidents, Accident research, Accident prevention, Accident investigation, Automated accident records, Motorcycle registration, Age factor in accidents, Motorcycle operator experience

Accident research indicates that motorcycle accidents and injuries could be prevented through: effective programs in licensing and testing and operator education; improved motorcycle operator visibility; and by the use of protective clothing, helmets, and eye protection. There is a need for in-depth motorcycle accident investigations, a training manual for motorcycle accident investigators, and an automated national data collection and analysis system in order to accurately define the parameters of the motorcycle accident population.
HS-013 670

ACCIDENT INVESTIGATION METHODOLOGY PECULIAR TO MOTORCYCLES AND MINIBIKES

University of Southern California, Los Angeles
H. H. Hurt, Jr., J. D. Baird 1973 20p 6refs Rept. No. Paper-73051
In HS-013 654, International Congress on Automotive Safety (2nd) Proceedings. Vol. 1, Pt. 2, Motorcycle Safety, Washington, D. C., 1973

Motorcycle accidents, Minibikes, Accident investigation, Accident reconstruction, Vehicle vehicle interface, Motorcycle maintenance, Failure caused accidents, Accident caused fires, Motorcycle brakes, Braking, Precrash phase, Speed estimation from skidmarks, Steering, Tire failures, Wheel wobble, Postcrash phase, Vehicle dynamics, Accident causes, Final drive chains

Analysis of precrash speeds, skidmarks, vehicle vehicle interface, and postcrash dynamics for motorcycles and minibikes involved in accidents requires special consideration because motorcycle systems and performance characteristics differ from those of conventional vehicles. Headlamp failure resulting in loss of visibility, transmission failure or malfunction resulting in rear wheel locking, a broken chain which binds and locks the rear wheel, fuel tank rupture, loose fasteners due to vibration, and other failures due to improper maintenance can all contribute to motorcycle accidents. Accident reconstruction techniques involving collision damage analysis are outlined.
HS-013 671

A NEW OPPORTUNITY FOR SAFETY AND ECOLOGY--PIAGGIO CIAO MOPEDS

21P Rept. No. Paper-73053
Mopeds; European vehicles; Vehicle design; Vehicle performance; Vehicle characteristics; Accident statistics; Vehicle registration; Frame design; Transmission design; Starters; Fuel consumption; Acoustic measurement; Sound intensity; Noise control; Mufflers; Exhaust emission control; Europe; Accident rates

A moped is defined as a bicycle equipped with an engine having a piston displacement lower than 50 cc. A survey is made of the

diffusion of mopeds in Europe, of their markets, their popularity, and of moped laws and standards in existence in Italy, Switzerland, Germany, France, Belgium, Austria, and the Netherlands. The design and operation of the Ciao moped are described. This vehicle can travel over 70 kilometers on 1/4 gallon of gasoline-oil mixture. A comparison of accident rates indicates that mopeds are between 1.52 and 1.81 times safer than motorcycles, and between 1.68 and 3.08 times safer than automobiles. Moped noise and exhaust emission levels are lower than those of motorcycles and automobiles. It is proposed that U. S. Federal and State authorities consider issuing special laws and standards for mopeds to encourage their use.
HS-013 672

DYNAMICS OF MOTORCYCLE IMPACT. VOL. 3: COMPUTER SIMULATION OF THREE-DIMENSIONAL MOTION OF MOTORCYCLE. FINAL REPORT

Denver Res. Inst., Colo.
R. E. Knight, H. C. Peterson 1973 279p Rept. No. DRI-2614
Contract DOT-HS-126-1-186
Report for Jul 1971-Mar 1973.
NTIS

Motorcycle accidents, Computerized simulation, Barrier collision tests, Air bag restraint systems, Motorcycle restraint systems, Restraint system tests, Degrees of freedom, Computer programs, Flow charts, Vehicle mass, Angular velocity, Vehicle center of gravity, Plotters, Pitch, Mathematical models, Air bag inflation pressure, Postcrash phase, Vehicle kinematics, Motorcycle operators, Fortran, Equations of motion

A digital computer simulation of the three-dimensional post-impact motion of a motorcycle is presented. The motorcycle model has nine degrees of freedom (DOF) (three rigid body translations, three rigid body rotations, and three internal DOF). The three internal DOF are rotation of the steering assembly, rotation of the front wheel, and rotation of the rear wheel. The equations of motion for the nine DOF system are derived, and the method of solving these equations and the associated FORTRAN 4 computer program are described. A listing of the program and instructions for preparing the data input are given. Test results are included along with the plotted results obtained on a Calcomp Plotter. A significantly simpler eight DOF program is also described; this simulation does not include rotation of the steering assembly. Results of a parametric study of two-dimensional motion of a motorcycle/airbag/point-mass-rider are included.
HS-800 908

5D. Design

INTERNATIONAL CONGRESS ON AUTOMOTIVE SAFETY (2ND) PROCEEDINGS, SAN FRANCISCO, JULY 16-18, 1973. VOL. 1, PT. 2, MOTORCYCLE SAFETY

366P 69REFS
Includes HS-013 655--HS-013 672.
Corporate author

Motorcycle safety, Motorcycle design, Motorcycle handling, Experimental vehicles, Accident avoidance, Vehicle stability, Steering, Drive systems, Motorcycle brakes, Tire design, Chains, Motorcycle riding techniques, Brake system design,

Turning, Motorcycle operator experience, Motorcycle visibility, Lamp daytime usage, Vehicle dynamics, Impact tests, Safety design, Motorcycle accidents, Impact protection, Injury prevention, Accident research, Accident prevention, Accident investigation, Minibikes, Mopeds

Topics covered in this volume include motorcycle steering, tire, drive, and brake systems; motorcycle accident avoidance and impact protection with emphasis on motorcycle and rider visibility and motorcycle riding techniques involved in turning; development of an experimental safety motorcycle; motorcycle accident research and investigation methodology; and a discussion of mopeds.
HS-013 654

DYNAMICS OF MOTORCYCLE IMPACT

Denver Univ., Colo.; Caliber Design Ltd., Stratford-on-Avon (England)
For primary bibliographic entry see Fld. 5C.
HS-013 663

NEAR-TERM EXPERIMENTAL SAFETY MOTORCYCLE PROGRAM

National Hwy. Traf. Safety Administration, Washington, D.C.
For primary bibliographic entry see Fld. 5C.
HS-013 665

INVESTIGATION OF SOME EXPERIMENTAL SAFETY MOTORCYCLE PARAMETERS

Harley-Davidson Motor Co., Inc., Milwaukee, Wis.
For primary bibliographic entry see Fld. 5C.
HS-013 666

DEVELOPMENT OF SIDE IMPACT PROTECTION FOR AN ESM

AMF, Inc., White Plains, N. Y.
For primary bibliographic entry see Fld. 5C.
HS-013 667

STUDY OF ESM'S IN JAPAN

Japan Automobile Manufacturers Assoc., Inc., Tokyo
For primary bibliographic entry see Fld. 5C.
HS-013 668

INTERNATIONAL CONGRESS ON AUTOMOTIVE SAFETY (2ND) PROCEEDINGS, SAN FRANCISCO, JULY 16-18, 1973. VOL. 2, RECREATIONAL VEHICLE SAFETY

282P REFS
Includes HS-013 674--HS-013 691.
Corporate author

Recreational vehicles, Vehicle design, Safety design, Vehicle safety standards, Recreational vehicle accidents, Vehicle handling, Crashworthiness, Travel trailers, Consumer education, Owner manuals, Accident rates, Human factors, Accident causes, Vehicle performance, Campers (truck mounted), Mobile homes, Recreational vehicle safety

Topics covered in this volume include recreational vehicle accident statistics; recreational vehicle safety characteristics; recreational vehicle safety considerations; advanced developments in recreational vehicle safety; and national trends for motorcycle and recreational vehicle safety.
HS-013 673

Group 5D—Design

DESIGN SAFETY PRINCIPLES FOR RECREATIONAL VEHICLES BASED ON IN-DEPTH ACCIDENT INVESTIGATION

University of Southern California, Los Angeles
For primary bibliographic entry see Fld. 1C.
HS-013 677

DETERMINING SAFETY CHARACTERISTICS OF RECREATIONAL VEHICLES

Ultrasystems, Inc., Newport Beach, Calif.
For primary bibliographic entry see Fld. 5T.
HS-013 679

WHEN DOES AN OVERLOAD PROBLEM BECOME A SAFETY-RELATED DEFECT WITHIN THE MEANING OF THE NATIONAL TRAFFIC AND MOTOR VEHICLE SAFETY ACT OF 1966

Recreational Vehicle Inst., Inc., Washington, D.C.
For primary bibliographic entry see Fld. 5T.
HS-013 684

THE EVOLUTION OF THE MOTOR HOME CHASSIS

Chrysler Corp., Detroit, Mich.
For primary bibliographic entry see Fld. 5T.
HS-013 685

ADVANCED DEVELOPMENTS IN RV SAFETY MOTOR HOMES

Winnebago Industries, Inc., Forest City, Iowa
C. M. Schaninger 1973 13p Rept. No. Paper-73047
In HS-013 673, International Congress on Automotive Safety (2nd) Proceedings. Vol. 2, Recreational Vehicle Safety, Washington, D. C., 1973

Recreational vehicle safety, Safety design, Instrument panel design, Exits, Pushout emergency windows, Seat belt anchorages, Preventive maintenance, Owner manuals, Winnebago Industries, Inc., Motor homes

As a major manufacturer of recreational vehicles, Winnebago is engaged in advanced research and engineering to assure the safety and crashworthiness of motor homes. Safety developments in instrument panel design, emergency escape systems, and seat belt systems for motor homes are described. Another aspect of motor home safety involves operator education. Winnebago has developed comprehensive owner manuals for each of the four major lines of motor homes to educate the operator about the proper operation of the motor home and the need for a preventive maintenance program to keep the vehicle in proper condition.
HS-013 688

A REVIEW OF THE G.M.C. MOTOR HOME SAFETY PROGRAM

General Motors Corp., Detroit, Mich.
K. Stubenvol 1973 17p Rept. No. Paper-73048
In HS-013 673, International Congress on Automotive Safety (2nd) Proceedings. Vol. 2, Recreational Vehicle Safety, Washington, D. C., 1973

Vehicle design, Recreational vehicle safety, General Motors Corp., Safety design, Fatigue tests, Performance tests, Road tests, Durability tests, Motor homes

Safety considerations used in the design of the General Motor Corporation's (GMC) motor home are discussed. The basic

design of the GMC motor home and some of the vehicle and component tests to which motor home is subjected are briefly described.
HS-013 689

STABILAIR TRUCK DRIVE AXLE SUSPENSION: SERIES 400

Western Unit Corp.
For primary bibliographic entry see Fld. 5T.
HS-013 693

TRUCK VIBRATION DIAGNOSTICS USING A NEW ELECTRONIC TECHNIQUE

Northrop Corp., Los Angeles, Calif.
For primary bibliographic entry see Fld. 5T.
HS-013 695

SOME FURTHER TESTS ON A COMPUTER PROGRAM TO SIMULATE INTERNAL COMBUSTION ENGINES

Manchester Univ., Lancs. (England)
R. S. Benson, P. C. Baruah 1973 16p 8refs Rept. No. SAE-730667
Presented at Combined Commercial Vehicle Engineering and Operations and Powerplant Meetings, Chicago, 18-22 Jun 1973.
SAE

Engine performance, Computerized simulation, Engine tests, Diesel engines, Turbochargers, Calibration, Intake systems, Exhaust systems, Engine operation conditions, Air flow rates, Heat transfer, Temperature, Performance characteristics

The results are presented of tests on a turbocharged four stroke diesel engine in which the test results are compared with predictions using a generalized computer program. An examination is made of the influence of the cylinder heat transfer coefficient, the cylinder wall temperature, the exhaust pipe wall temperature, and the air valve flow areas on the engine and turbocharger performance predictions in order to establish the limits of accuracy required for these data. The effect of including the intake system in the calculation is also examined. Results are presented comparing the actual performance of the turbocharger with the predicted performance using steady flow data. From this investigation, it is concluded that the engine simulation programs give good predictions of the engine performance and matching data over a wide spread and power range, provided the input data are representative of what one might expect for the engine.
HS-013 705

BASIC RESEARCH IN CRASHWORTHINESS 2. SUMMARY FINAL REPORT

Calspan Corp., Buffalo, N. Y.
P. M. Miller, ed. 1973 162p 36refs Rept. No. YB-2987-V-21
Contract FH-11-7622
Report for Jul 1970-May 1973.
NTIS

Crashworthiness, Vehicle design, Structural design, Automobile modification, Vehicle performance, Dynamic structural analysis, Structural deformation analysis, Side impact tests, Vehicle vehicle impact tests, Low speed impact tests, Head on impact tests, Restraint system tests, Computerized simulation, Crash response forecasting, Luxury automobiles, Occupant protection, Compact automobiles, Data reduction, Steering

columns, Sensors, Vehicle kinematics, Rollover tests, Drop tests, Crush tests, Energy absorption

Major structural effort was directed toward development of a crashworthy design suitable for full size automobiles to provide protection during front, side, and rollover collisions. More limited effort was directed towards development of modified front structures for luxury, compact, and subcompact automobiles. Test results from these modified vehicles were compared to similar data for conventional automobiles. Generally, the structural modifications resulted in considerable reduction in passenger compartment intrusions while maximum decelerations were nominally unchanged. Information on the crash performance of steering column assemblies, crash detectors, and restraint systems was obtained in piggyback manner within the overall test objectives of the project. Analytical methods for analyzing frame structures undergoing dynamic impact with fixed objects were developed for both two and three-dimensional frame structures. Reasonable correlation was obtained between analytical and experimental results.
HS-800 887

MODEL 0102 FLAT PLATE ANTENNA FOR USE IN AUTOMOBILE RADAR ANTICIPATORY CRASH SENSORS. FINAL REPORT

Cutler-Hammer, Deer Park, N. Y.
K. V. Toth, R. M. Rudish 1973 29p Rept. No.
DOT-TSC-NHTSA-73-8
Contract DOT-TSC-437
Report for Jun-Sep 1972.
NTIS

Antennas, Radar, Polyurethane foams, Connectors, Sensors, Costs, Manufacturing

A flat plate antenna based on the use of etched circuit techniques has been developed. The antenna is a minimal volume planar array structure, ideally suited for low cost production. The radiating elements and feed circuitry are etched on the same substrate. The antenna is 2-5/8 x 4-5/8 x 15/16 inches (exclusive of output connector). Although its active region is only a fraction of this space, a breadboard version of this antenna achieves more than 13-dB gain over the required one percent region of X-band, with radiation patterns having excellent suppression of side lobes. A production design is postulated which is suitable for automated production processes. The resulting antenna is a sandwich of one printed circuit between two layers of foam; this sandwich is encased in a molded, metalized lexan housing, and is faced with a lexan radome.

HS-800 968

FABRICATION TECHNIQUES AND PRINCIPLES FOR FLAT PLATE ANTENNAS. FINAL REPORT

31P2REFS Rept. No. DOT-TSC-NHTSA-73-7
Contract DOT-TSC-390
Report for May-Aug 1972.
NTIS

Antennas, Production control, Manufacturing, Frequencies, Die casting, Molding, Costs, Sensors, Radar

An analysis of the reliability, electrical integrity, repeatability, and cost is made for a production run of both one and ten million flat plate antennas per year. The fabrication techniques selected to produce the antennas include die casting, pierce and

blanking, injection molding, and cold heading. The flat plate antenna would be fabricated in six elements. An automatic assembly center would be used to achieve the high volume production runs. One such unit operating at maximum efficiency will produce one million units per year at a cost of —0.41 per unit. Two additional stations will achieve production runs of over 10 million per year at a cost of —0.30 per unit, excluding overhead. The flat plate antennas can be scaled to a frequency of 17.5 gigahertz with no significant effect of cost or performance. Scaling to a frequency of 21 gigahertz is possible at a higher cost per unit.
HS-800 969

TITLE 2. AUTOMOBILE CONSUMER INFORMATION STUDY. MOTOR VEHICLE INFORMATION AND COST SAVINGS ACT. PUBLIC LAW 92-513, OCTOBER 20, 1972. PLANNING TASK FORCE REPORT

38P
Includes Public Law 92-513.
Corporate author

Consumer information regulations, Public information programs, Consumer protection, Consumer education, Insurance industry, Insurance claims, Insurance rates, Automobile comparisons, Repair industry, Accident statistics, Crashworthiness, Benefit cost analysis, Mathematical models

An economic impact study must be performed to focus on the economic, sociological, psychological, environmental, and political impacts of consumer information on affected societal groups. A consumer information dissemination study must also be performed to concentrate on information dissemination techniques, media considerations, and trade-off analyses of methods for direct-to-consumer and point-of-sale information. A study report of activities underway and completed should be prepared and submitted to the Congress in October 1973. This report would highlight the status of the Automobile Consumer Information Study and would provide a target schedule for publication of consumer information packages. Both new car and used car consumer information must be provided to the public. Potential data sources on vehicle damage susceptibility, crashworthiness, and repairability include vehicle test and design and repair and insurance industry data, mathematical modeling, car owners and drivers, and accident records.

HS-800 993

5E. Door Systems

DOOR CRASHWORTHINESS CRITERIA. FINAL REPORT

Michigan Univ., Ann Arbor. Hwy. Safety Res. Inst.
For primary bibliographic entry see Fld. 5E.
HS-800 924

DOOR CRASHWORTHINESS CRITERIA. FINAL REPORT

Michigan Univ., Ann Arbor. Hwy. Safety Res. Inst.
R. L. Stalnaker, V. L. Roberts, J. H. McElhaney 1973 95p
71refs Rept. No. HSRI-B1-73-2
Contract DOT-HS-031-2-382
Report for 12 Jun 1972-11 Jun 1973.
NTIS

Group 5E—Door Systems

Side impact tests, Head impact tolerances, Chest impact tolerances, Abdominal impact tolerances, Animal impact tolerances, Cadavers in testing, Monkeys, Baboons, Chimpanzees, Animal experiments, Accelerometers, Autopsies, Brain injuries, Impact forces, Crashworthiness, Door design, Chest injuries, Abdominal injuries, Loading (mechanical), Stress strain characteristics, Impact velocity

A series of primate side impacts to the head and body was conducted in parallel with a series of impacts to human cadavers. Dimensional analysis techniques were employed to estimate in vivo human tolerance to side impacts. The threshold of closed brain injury to humans was found to be 76G's for a pulse duration of 20 milliseconds and an impact velocity of 29.5 mph. The maximum tolerable penetration to the chest was found to be 2.65 inches for both the left and right sides. Scaling of abdominal injuries to humans was accomplished by employing a factor which relates impact contact area, animal mass, impact force, and pulse duration, to injury severity. The maximum tolerable contact pressure to the upper abdomen of a human was found to be 32 pounds per square inch.
HS-800 924

5F. Fuel Systems

DIESEL SMOKE ANALYSIS ON CHASSIS DYNAMOMETER

White Motor Corp., Cleveland, Ohio; Clayton Mfg. Co., El Monte, Calif.

G. Williams, F. W. Hartman, Jr., G. R. Mackey 1973 18p 15refs Rept. No. SAE-730660

Presented at Combined Commercial Vehicle Engineering and Operations and Powerplant Meetings, Chicago, 18-22 Jun 1973. SAE

Diesel engine exhaust emissions, Exhaust emission tests, Chassis dynamometers, Smoke meters, Exhaust emission measurement, Exhaust emission standards, Vehicle air pollution, Air pollution laws

Enactment and enforcement of stringent smoke emission regulations has created need for a method to determine if the exhaust opacity of in-service vehicles exceeds legal limits as they are driven on the road. This can be accomplished by running a three min. chassis dynamometer test cycle, which is based upon the Environmental Protection Agency diesel engine certification procedure. Simultaneous recordings of speed and exhaust opacity permit modal analysis for identification of specific malfunctioning components and consequent improved cost effectiveness of maintenance expenditures.
HS-013 698

ANALYSIS AND CONTROL OF TRANSIENT FLOW IN THE DIESEL INJECTION SYSTEM. PT. 1, THE ANALYTICAL CONTROL METHOD

Michigan Univ., Ann Arbor

M. F. El-Erian, E. B. Wylie, J. A. Bolt 1973 19p 11refs Rept. No. SAE-730661

Grant EPA-R800424

Presented at Combined Commercial Vehicle Engineering and Operations and Powerplant Meetings, Chicago, 18-22 Jun 1973. SAE

Fuel injection, Diesel engines, Computerized simulation, Computerized design, Fuel pumps, Nozzles, Equations, Valves, Pressure waves, Fuel flow

The residual transients which cause after-injection are analytically investigated. The average instantaneous elastic energy stored in the system was found to be a well-behaved function of time and was therefore selected as the control parameter. A design procedure to control after-injection was formulated. In this procedure, design changes required to achieve improved system characteristics were obtained by specification of the average elastic energy function. Two design changes were considered. These included the design of an additional control valve in the pump delivery chamber and the redesign of the pump spill port. The design techniques used in the control method are described.
HS-013 699

ANALYSIS AND CONTROL OF TRANSIENT FLOW IN THE DIESEL INJECTION SYSTEM. PT. 2. DESIGN RESULTS OF CONTROLLED AFTER-INJECTION

Michigan Univ., Ann Arbor

M. F. El-Erian, E. B. Wylie, J. A. Bolt 1973 14p 6refs Rept. No. SAE-730662

Grant EPA-R800424

Presented at Combined Commercial Vehicle Engineering and Operations and Powerplant Meetings, Chicago, 18-22 Jun 1973. SAE

Fuel injection, Diesel engines, Computerized simulation, Computerized design, Fuel pumps, Valves, Fuel flow

The analytical control method described in part 1 (HS-013 699) is used to determine design means by which after-injection may be controlled. Further investigation and evaluation of two design changes which release the injection system excess elastic energy in a controlled manner are considered. One design change is the addition of a control valve in the pump delivery chamber. The other is the modification of the pump spill port. In both cases, pressures and flows are not altered during the main injection period. The ability of both design changes to control after-injection is confirmed by use of a simulation program. Experimental data from a system with the pump spill port modified in accordance with theoretical design calculations provide satisfactory confirmation of the analyses.
HS-013 700

COMPUTER TECHNIQUE FOR EVALUATION OF CAVITATION CHARACTERISTICS OF CERTAIN PHASES OF FUEL INJECTION IN FUEL INJECTION SYSTEM

Yanmar Diesel Engine Co. Ltd. (Japan)

K. Yamaoka, A. Saito 1973 17p 14refs Rept. No. SAE-730663

Presented at Combined Commercial Vehicle Engineering and Operations and Powerplant Meetings, Chicago, 18-22 Jun 1973. SAE

Fuel injection, Diesel engines, Computerized simulation, Cavitation, Equations

Equations are presented that are applicable to both the compressed state and void state of a fuel injection system, taking into account the effect of void volume in all parts of the system. The calculation method and the results for the propagation phenomenon in high-pressure pipe are described. Simulation calculation was carried out by use of a computer and calculated and experimental results were compared. The simulated results were found to be in good agreement with the actual phenomenon, even under the situation where a void was present.
HS-013 701

ANALYSIS OF BYPASS CONTROL FUEL INJECTION SYSTEMS FOR SMALL DIESEL ENGINES BY DIGITAL COMPUTER

Yanmar Diesel Engine Co. Ltd. (Japan)
K. Yamaoka, A. Saito, N. Abe, M. Okazaki 1973 38p 14refs
Rept. No. SAE-730664
Presented at Combined Commercial Vehicle Engineering and Operations and Powerplant Meetings, Chicago, 18-22 Jun 1973.
SAE

Fuel injection, Diesel engines, Computerized simulation, Fuel pumps, Oil pumps, Fuel oil, Throttle valves, Nozzles, Flow charts, Injection timing, Oil pressure, Oil flow, Damping, Valve lifters, Valve springs, Leakage, Lift, Equations of motion, Mathematical analysis

An analysis of a bypass control pump, a fuel tank, an oil pipe, and a feed chamber is performed. Potential energy and fluid resistance of oil pipes and fluid resistance in the high-pressure pipe is considered. In conventional analyses, when a void appeared in the fuel injection system, a different equation was substituted and the treatment of the volume of void was unsatisfactory. Improvements on these points have been attempted. When simulating a fuel injection system, it is necessary to determine fuel oil compressibility, specific weight, sonic velocity, and flow coefficient. In the experimental characteristics obtained previously, there have been unclear questions regarding mixed air, oil temperature, and pressure. These characteristics of the fuel and the injection system are measured experimentally. By incorporating these results in the simulated calculation, the results have good agreement with the actual phenomenon, even when there is a void in the system and computation time is short.

HS-013 702

IMPROVEMENT IN TRANSIENT PERFORMANCE OF A TURBOCHARGED DIESEL ENGINE BY AIR INJECTION INTO THE COMPRESSOR

Manchester Univ., Lancs. (England)
J. D. Ledger, R. S. Benson, H. Furukawa 1973 12p 5refs Rept. No. SAE-730665
Presented at Combined Commercial Vehicle Engineering and Operations and Powerplant Meetings, Chicago, 18-22 Jun 1973.
SAE

Diesel engines, Turbocharging, Air injection, Engine performance, Turbochargers, Nozzles, Air pressure, Fluid flow, Computerized simulation, Simulation models, Flow charts, Torque, Engine speeds, Injection timing, Mathematical analysis

Experiments with a centrifugal compressor on a turbocharger test rig have shown that the main results of injecting air through nozzles onto the rotor tips are: the delivery pressure ratio is slightly increased for the same speed and mass flow parameter; the torque parameter is greatly decreased with the decrease being approximately constant for the same air injection pressure and about 70% of that theoretically calculated; and effect on surge line is small, and surging is not anticipated as a problem for the range of injection pressures investigated. These results have been incorporated into a digital simulation model of a medium-speed diesel engine using a compressor similar to that tested. By applying air injection at the onset of a step-load change, the transient response of the engine model shows considerable improvements (with reductions in both recovery time and speed droop).

HS-013 703

COMPARISON OF EXPERIMENTAL AND SIMULATED TRANSIENT RESPONSES OF A TURBOCHARGED DIESEL ENGINE

Manchester Univ., Lancs. (England)
R. S. Benson, J. D. Ledger, N. D. Whitehouse, S. Walmsley 1973 24p 16refs Rept. No. SAE-730666
Presented at Combined Commercial Vehicle Engineering and Operations and Powerplant Meetings, Chicago, 18-22 June 1973. Includes discussion by T. S. Dziaiot (International Harvester Co.).
SAE

Diesel engines, Turbocharging, Engine performance, Computerized simulation, Simulation models, Turbochargers, Engine tests, Engine speeds, Loading (mechanical), Steady state, Air flow, Operating temperature, Air fuel ratio, Thermal efficiency

Comparison is made between the transient response of a medium-speed, turbocharged diesel engine subjected to sudden load changes on a test bed and the response of a computer simulation model of the engine. Brief details are given of the simulation techniques involved and the data required to set up the model. Despite close agreement of model and engine steady-state results over the whole normal operating range, the transient responses of the model were initially found to be much faster than the test bed responses. The most important factor causing this difference is the lack of knowledge of the combustion at low air fuel ratios and hence prediction of engine exhaust temperature during transient operation. Good agreement was obtained when this was modified.

HS-013 704

5I. Inspections

MAINTENANCE INDICATOR SYSTEM FOR MILITARY TRUCKS

Teledyne Continental Motors, Warren, Mich.; Army Tank-Automotive Command, Detroit, Mich.
For primary bibliographic entry see Fld. 5T.
HS-013 696

DIAGNOSTIC INSTRUMENTATION FOR MILITARY VEHICLES

RCA Corp., New York; Army Tank-Automotive Command, Detroit, Mich.
N. A. Teixeira, F. Pradko, D. Sarna, P. Garland 1973 11p 6refs Rept. No. SAE-730658
Presented at Combined Commercial Vehicle Engineering and Operations and Powerplant Meetings, Chicago, 18-22 Jun 1973.
SAE

Computerized diagnostic equipment, Military vehicles, Automated inspection, Fleet management, Automated inspection equipment, Vehicle maintenance, Service needs, Feasibility studies

A vehicle readiness unit, suitable for use in on-board monitoring of road tests and sample runs, with provision for a simple engine power test and for detecting marginal ignition systems, and a vehicle test meter, which permits a diagnostic survey to be performed at better than a 10:1 time savings over conventional maintenance procedures, have been developed for military vehicles. In addition, a computer-controlled unit developed for detailed diagnostic tests has been adapted and software developed to permit operation with the built-in instrumentation (diagnostic connector). The basic objectives and operating principles of these devices are presented.

HS-013 697

Group 5J—Lighting Systems

5J. Lighting Systems

MOTORCYCLE NOTICEABILITY AND SAFETY DURING THE DAYTIME

Franklin Inst. Res. Labs., Philadelphia, Pa.
For primary bibliographic entry see Fld. 5C.
HS-013 662

5K. Maintenance And Repairs

MAINTENANCE INDICATOR SYSTEM FOR MILITARY TRUCKS

Teledyne Continental Motors, Warren, Mich.; Army Tank-Automotive Command, Detroit, Mich.
For primary bibliographic entry see Fld. 5T.
HS-013 696

DIAGNOSTIC INSTRUMENTATION FOR MILITARY VEHICLES

RCA Corp., New York; Army Tank-Automotive Command, Detroit, Mich.
For primary bibliographic entry see Fld. 5I.
HS-013 697

TITLE 2. AUTOMOBILE CONSUMER INFORMATION STUDY. MOTOR VEHICLE INFORMATION AND COST SAVINGS ACT. PUBLIC LAW 92-513, OCTOBER 20, 1972. PLANNING TASK FORCE REPORT
38P

Includes Public Law 92-513.
Corporate author

Consumer information regulations, Public information programs, Consumer protection, Consumer education, Insurance industry, Insurance claims, Insurance rates, Automobile comparisons, Repair industry, Accident statistics, Crashworthiness, Benefit cost analysis, Mathematical models

An economic impact study must be performed to focus on the economic, sociological, psychological, environmental, and political impacts of consumer information on affected societal groups. A consumer information dissemination study must also be performed to concentrate on information dissemination techniques, media considerations, and trade-off analyses of methods for direct-to-consumer and point-of-sale information. A study report of activities underway and completed should be prepared and submitted to the Congress in October 1973. This report would highlight the status of the Automobile Consumer Information Study and would provide a target schedule for publication of consumer information packages. Both new car and used car consumer information must be provided to the public. Potential data sources on vehicle damage susceptibility, crashworthiness, and reparability include vehicle test and design and repair and insurance industry data, mathematical modeling, car owners and drivers, and accident records.
HS-800 993

5L. Manufacturers, Distributors, And Dealers

MOTOR COACH SAFETY

Family Motor Coach Assoc., Inc., Cincinnati, Ohio
For primary bibliographic entry see Fld. 5T.
HS-013 676

5N. Occupant Protection

DYNAMICS OF MOTORCYCLE IMPACT

Denver Univ., Colo.; Caliber Design Ltd., Stratford-on-Avon (England)
For primary bibliographic entry see Fld. 5C.
HS-013 663

BASIC RESEARCH IN CRASHWORTHINESS 2. SUMMARY FINAL REPORT

Calspan Corp., Buffalo, N. Y.
For primary bibliographic entry see Fld. 5D.
HS-800 887

DYNAMICS OF MOTORCYCLE IMPACT. VOL. 3: COMPUTER SIMULATION OF THREE-DIMENSIONAL MOTION OF MOTORCYCLE. FINAL REPORT

Denver Res. Inst., Colo.
For primary bibliographic entry see Fld. 5C.
HS-800 908

AUTOMOBILE CRASH SENSOR SIGNAL PROCESSOR. FINAL REPORT

Burroughs Corp., Paoli, Pa.
C. J. Bader 1973 100p 4refs Rept. No. DOT-TSC-NHTSA-73-2
Contract DOT-TSC-409-1
Report for Apr 1972-Feb 1973.
NTIS

Sensors, Air bag restraint systems, Metal oxide semiconductors, Radar, Performance characteristics, Benefit cost analysis, Reliability, Integrated circuits, Frequencies, Flow charts, Failures

The Crash Sensor Signal Processor described interfaces between an automobile-installed doppler radar and an air bag activating solenoid or equivalent electromechanical device. The processor utilizes both digital and analog techniques to produce an output pulse when specified input signal amplitude and frequency conditions are met. The device is intended to be implemented with monolithic metal oxide semiconductor large scale integrated circuitry and Bipolar driver. The design and reliability studies indicate that very low cost and very high reliability can be achieved concurrently by monolithic techniques without compromising Processor performance.
HS-800 970

5Q. Safety Defect Control

WHEN DOES AN OVERLOAD PROBLEM BECOME A SAFETY-RELATED DEFECT WITHIN THE MEANING OF THE NATIONAL TRAFFIC AND MOTOR VEHICLE SAFETY ACT OF 1966

Recreational Vehicle Inst., Inc., Washington, D.C.
For primary bibliographic entry see Fld. 5.
HS-013 684

5R. Steering Control Systems

INTERNATIONAL CONGRESS ON AUTOMOTIVE SAFETY (2ND) PROCEEDINGS, SAN FRANCISCO, JULY 16-18, 1973. VOL. 1, PT. 2, MOTORCYCLE

SAFETY
366P 69REFS

Includes HS-013 655--HS-013 672.
Corporate author

Motorcycle safety, Motorcycle design, Motorcycle handling, Experimental vehicles, Accident avoidance, Vehicle stability, Steering, Drive systems, Motorcycle brakes, Tire design, Chains, Motorcycle riding techniques, Brake system design, Turning, Motorcycle operator experience, Motorcycle visibility, Lamp daytime usage, Vehicle dynamics, Impact tests, Safety design, Motorcycle accidents, Impact protection, Injury prevention, Accident research, Accident prevention, Accident investigation, Minibikes, Mopeds

Topics covered in this volume include motorcycle steering, tire, drive, and brake systems; motorcycle accident avoidance and impact protection with emphasis on motorcycle and rider visibility and motorcycle riding techniques involved in turning; development of an experimental safety motorcycle; motorcycle accident research and investigation methodology; and a discussion of mopeds.
HS-013 654

**THE OUTLOOK OF IMPROVING STEERING ON
MOTORCYCLE**

Nihon Univ., Tokyo (Japan)
For primary bibliographic entry see Fld. 5C.
HS-013 655

**MOTORCYCLE HANDLING AND COLLISION
AVOIDANCE: ANATOMY OF A TURN**

University of Southern California, Los Angeles
For primary bibliographic entry see Fld. 5C.
HS-013 660

**MOTORCYCLE HANDLING PERFORMANCE FOR
OBSTACLE AVOIDANCE**

Honda R and D Co. Ltd., Tokyo (Japan)
For primary bibliographic entry see Fld. 5C.
HS-013 661

**INTERNATIONAL CONGRESS ON AUTOMOTIVE
SAFETY (2ND) PROCEEDINGS, SAN FRANCISCO,
JULY 16-18, 1973. VOL. 2, RECREATIONAL VEHICLE
SAFETY**
282P REFS

Includes HS-013 674--HS-013 691.
Corporate author

Recreational vehicles, Vehicle design, Safety design, Vehicle safety standards, Recreational vehicle accidents, Vehicle handling, Crashworthiness, Travel trailers, Consumer education, Owner manuals, Accident rates, Human factors, Accident causes, Vehicle performance, Campers (truck mounted), Mobile homes, Recreational vehicle safety

Topics covered in this volume include recreational vehicle accident statistics; recreational vehicle safety characteristics; recreational vehicle safety considerations; advanced developments in recreational vehicle safety; and national trends for motorcycle and recreational vehicle safety.
HS-013 673

**DETERMINING SAFETY CHARACTERISTICS OF
RECREATIONAL VEHICLES**

Ultrasystems, Inc., Newport Beach, Calif.
For primary bibliographic entry see Fld. 5T.
HS-013 679

**THE DYNAMICS AND HANDLING PERFORMANCE
OF AUTOMOBILE-TRAVEL TRAILER
COMBINATION**

Bendix Res. Labs., Southfield, Mich.
S. L. Chiang, R. E. Wong, J. S. Elliott 1973 14p 6refs Rept. No. Paper-73024
In HS-013 673, International Congress on Automotive Safety (2nd) Proceedings. Vol. 2, Recreational Vehicle Safety, Washington, D. C., 1973

Travel trailers, Vehicle dynamics, Vehicle handling, Mathematical models, Computerized simulation, Vehicle stability, Brake performance, Trailer brakes, Antiskid devices, Vehicle control, Jackknifing, Equalizer hitches, Actuators, Towing, Braking, Stopping distance, Aerodynamics, Vehicle performance, Weight transfer, Vehicle center of gravity, Crosswind, Yaw, Roll, Pitch, Wheel locking

A computerized mathematical model has been developed for analyzing the dynamic behavior of an intermediate size passenger car towing a travel trailer. The computer program has been used: to evaluate the system responses of a combination vehicle (CV) during straight line braking and combined braking and steering maneuvers; to aid the design of a trailer brake actuator; to illustrate the behavior of weight equalizer bars; and to show the interactions between a weight equalizer and the trailer brake actuator. The computerized simulation was also utilized to examine the causes of trailer sway and jackknifing and vehicle responses to avoidance steering maneuvers and to study the effects on CV stability, control, and path deviation caused by aerodynamically induced forces and moments generated during encounter with intercity buses or large trucks. The simulation results for all of the above case are summarized.
HS-013 680

RVI TRAILER HANDLING TEST PROGRAM

Recreational Vehicle Inst., Inc., Washington, D.C.
For primary bibliographic entry see Fld. 5T.
HS-013 681

**TRACTOR-SEMITRAILER HANDLING: A DYNAMIC
TRACTOR SUSPENSION MODEL**

Cornell Univ., Buffalo, N. Y.
For primary bibliographic entry see Fld. 5T.
HS-013 694

**STABILITY AND HANDLING CRITERIA OF
ARTICULATED VEHICLES. PT. 1, TECHNICAL
REPORT (FINAL)**

IIT Res. Inst., Chicago, Ill.
R. L. Eshleman, S. D. Desai, A. F. D'Souza 1973 355p refs Rept. No. J6281
Contract DOT-HS-105-2-392
Report for Jun 1972-June 1973.
NTIS

Tractor semitrailers, Vehicle handling, Vehicle stability, Articulated vehicle performance, Computerized simulation, Articulated vehicle modeling, Performance tests, Mathematical

Group 5R—Steering Control Systems

models, Validation, Cornering, Lane changing, Accident avoidance, Reviews, Tire side forces, Tire brake force, Equations of motion, Vehicle trajectories, Yaw, Pitch, Roll, Lateral acceleration, Tire pavement interface, Coefficient of friction, Wet road conditions, Dry road conditions, Loading (mechanical), Test equipment

An analytical and experimental investigation on the stability and handling of articulated vehicles was conducted to develop stability criteria for tractor single-, double-, and triple-semitrailer vehicles during commonly encountered road and speed maneuvers subject to environmental influences. To this end, the experimentally validated Articulated Vehicle Dynamic Simulation Model (AVDS3) was further developed and validated. It was utilized to generate physical stability limits for articulated vehicles. During this investigation, the direct method of Lyapunov was employed to generate mathematical stability limits of cornering articulated vehicles. In addition, an effort was made to apply the concept of finite time stability to this problem.

HS-800 915

5T. Trucks And Trailers

INTERNATIONAL CONGRESS ON AUTOMOTIVE SAFETY (2ND) PROCEEDINGS, SAN FRANCISCO, JULY 16-18, 1973. VOL. 2, RECREATIONAL VEHICLE SAFETY

282P REFS

Includes HS-013 674--HS-013 691.

Corporate author

Recreational vehicles, Vehicle design, Safety design, Vehicle safety standards, Recreational vehicle accidents, Vehicle handling, Crashworthiness, Travel trailers, Consumer education, Owner manuals, Accident rates, Human factors, Accident causes, Vehicle performance, Campers (truck mounted), Mobile homes, Recreational vehicle safety

Topics covered in this volume include recreational vehicle accident statistics; recreational vehicle safety characteristics; recreational vehicle safety considerations; advanced developments in recreational vehicle safety; and national trends for motorcycle and recreational vehicle safety.

HS-013 673

NATURE AND FREQUENCY OF RECREATIONAL VEHICLE OPERATIONAL AND NON-OPERATIONAL ACCIDENTS AND INJURY AS PERTAINS TO MOTORHOMES

Alexander and Alexander, Inc., New York

T. Davies 1973 15p Rept. No. Paper-73009

In HS-013 673, International Congress on Automotive Safety (2nd) Proceedings. Vol. 2, Recreational Vehicle Safety, Washington, D. C., 1973

Recreational vehicles, Accident rates, Damage costs, Insurance claims, Accident causes, Consumer demographic data, Vehicle fires, Accident responsibility, Damage claims, Motor homes, Recreational vehicle accidents, Recreational vehicle safety

The three variations of motorhomes--conventional, van-conversion, and chopped-van motorhome--are briefly described and characteristics of motorhome owners and the various uses of motorhomes are discussed. Using insurance claim data, the

frequency of motorhome accidents and losses are compared with passenger car accident rates and losses. Suggestions to improve motorhome safety are presented.

HS-013 674

HUMAN FACTORS PSYCHOLOGY AND THE RECREATIONAL VEHICLE

Recreational Activities Corp.; Rollins Coll., Winter Park, Fla.

For primary bibliographic entry see Fld. 3.

HS-013 675

MOTOR COACH SAFETY

Family Motor Coach Assoc., Inc., Cincinnati, Ohio

K. T. Scott 1973 11p

In HS-013 673, International Congress on Automotive Safety (2nd) Proceedings. Vol. 2, Recreational Vehicle Safety, Washington, D. C., 1973

Vehicle safety, Recreational vehicle safety, Accident rates, Consumer education, Family Motor Coach Assoc., Inc., Safety education

The Family Motor Coach Association's accomplishments in motor coach safety are discussed. The Association has developed the Motor Home Owner's Course which will soon be presented throughout the country by chapters of the Association, manufacturers, dealers and product clubs. The Association has also developed a code of ethics which includes numerous equipment and user safety requirements. All members of the organization are required to adhere to this code. The Family Motor Coach Association acts as a link between the motor coach user and manufacturers. In addition to safety seminars presented at chapter meetings, the Association publishes a magazine which features articles dealing with and describing safety features, devices, and safe operating practices and sponsors an annual national convention where motor coach owners can meet and talk to motor coach manufacturers.

HS-013 676

DESIGN SAFETY PRINCIPLES FOR RECREATIONAL VEHICLES BASED ON IN-DEPTH ACCIDENT INVESTIGATION

University of Southern California, Los Angeles

For primary bibliographic entry see Fld. 1C.

HS-013 677

BRAKING OF AUTOMOBILE/TRAILER COMBINATIONS

Airstream, Inc., Jackson Center, Ohio

For primary bibliographic entry see Fld. 5A.

HS-013 678

DETERMINING SAFETY CHARACTERISTICS OF RECREATIONAL VEHICLES

Ultrasystems, Inc., Newport Beach, Calif.

E. Enserink 1973 32p 5refs Rept. No. Paper-73023

In HS-013 673, International Congress on Automotive Safety (2nd) Proceedings. Vol. 2, Recreational Vehicle Safety, Washington, D. C., 1973

Recreational vehicles, Vehicle handling, Crashworthiness, Performance tests, Performance characteristics, Accident avoidance tests, Brake tests, Steering tests, Barrier collision tests, Pole impact tests, Vehicle vehicle impact tests, Accident simulation, Data processing, Lateral acceleration, Crosswind,

Skid pan tests, Vehicle stability, Test equipment, Rollover tests, Test reproducibility, Data acquisition, Recreational vehicle safety

A basis for developing test methodology for recreational vehicle crashworthiness and handling tests is provided. Tests proposed to quantitatively evaluate the safe performance of recreational vehicles, so that future vehicles can be designed to be integrated into the overall transportation system in a safe manner, include brake performance tests, steering tests, handling tests, overturn immunity tests, barrier collision tests, pole impact tests, vehicle vehicle impact tests, and rollover simulation. A detailed description is presented for each of the proposed tests, including supporting justification for their recommended usage. The presentation highlights the critical parameters that should be monitored and used to obtain quantitative results.

HS-013 679

THE DYNAMICS AND HANDLING PERFORMANCE OF AUTOMOBILE-TRAVEL TRAILER COMBINATION

Bendix Res. Labs., Southfield, Mich.
For primary bibliographic entry see Fld. 5R.
HS-013 680

RVI TRAILER HANDLING TEST PROGRAM

Recreational Vehicle Inst., Inc., Washington, D.C.
R. H. Madison 1973 12p Rept. No. Paper-73025
In HS-013 673, International Congress on Automotive Safety (2nd) Proceedings. Vol. 2, Recreational Vehicle Safety, Washington, D. C., 1973

Travel trailers, Vehicle handling, Computerized simulation, Research methods, Laboratory tests, Road tests, Performance tests, Test equipment, Instrumentation, Design of experiment, Brake tests

A cost effective plan for identifying and quantifying trailer design and loading parameters which affect trailer handling is presented. Utilization of a computer simulation followed by a limited road test to verify computer results is proposed. Test conditions, test equipment and instrumentation, and record keeping needs are outlined.

HS-013 681

ASPECTS OF RECREATIONAL VEHICLE SAFETY

National Transp. Safety Board, Washington, D.C.
A. L. Schmieg 1973 21p refs Rept. No. Paper-73026
In HS-013 673, International Congress on Automotive Safety (2nd) Proceedings. Vol. 2, Recreational Vehicle Safety, Washington, D. C., 1973

Recreational vehicles, Accident studies, Data acquisition, Vehicle safety standards, Vehicle handling, Vehicle classification, Snowmobile accidents, Crashworthiness, Environmental factors, Occupant vehicle interface, Vehicle performance, Driver vehicle familiarity, Driver licensing, National Transp. Safety Board, Recreational vehicle safety, Recreational vehicle accidents

Duties of the National Transportation Safety Board are outlined and available data relating to the hazards attending the growth in the use of recreational vehicles are presented. The scarcity of data, largely because of the lack of suitable classifications and categories for the various recreational vehicles, denies statisti-

cal support except in a few instances. The potential hazards attending recreational vehicles and their use are described and illustrated by relating many of them to actual accidents. The collection and study of data necessary to verify the nature and extent of these problems; the development of new vehicle classifications; the extension of existing Federal Motor Vehicle Safety Standards to vehicles not now included; and the conduct of a pilot program aimed at making consumer information and safety guides for purchasers and users of recreational vehicles are recommended.

HS-013 682

THE NHTSA RECREATIONAL VEHICLE SURVEY

National Hwy. Traf. Safety Administration, Washington, D.C.
A. G. Detrick, R. L. Brooks 1973 23p 3refs Rept. No. Paper-73037
In HS-013 673, International Congress on Automotive Safety (2nd) Proceedings. Vol. 2, Recreational Vehicle Safety, Washington, D. C., 1973

Vehicle weight, Loading (mechanical), Suspension systems, Load bearing capacity, Surveys, Weight distribution, Measuring instruments, Data acquisition, Data reduction, Tire inflation pressure, Loads (forces), Owner manuals, Vehicle safety standards, Trailers, Campers (truck mounted), Pickup trucks, Field work, Motor homes

The objectives of the Recreational Vehicle Survey were to determine loading patterns, load capacities, and consumer knowledge in these areas. This information was acquired through survey of vehicles as used by the public. A total of 8,800 vehicles were weighed primarily in the national parks between June 1971 and March 1972. Some 530 different makes and types of vehicles were processed. The vehicle mix included pickup trucks, travel trailers, camper trailers, vehicles towing trailers, and motorhomes. In addition to the weight data from the national parks, data were obtained from vehicle builders consisting of suspension component ratings and weights of vehicles as sold with standard equipment and with all options installed. The results of the survey are being presented in reports now in preparation. These reports will identify those areas for which further attention is needed.

HS-013 683

WHEN DOES AN OVERLOAD PROBLEM BECOME A SAFETY-RELATED DEFECT WITHIN THE MEANING OF THE NATIONAL TRAFFIC AND MOTOR VEHICLE SAFETY ACT OF 1966

Recreational Vehicle Inst., Inc., Washington, D.C.
For primary bibliographic entry see Fld. 5.
HS-013 684

THE EVOLUTION OF THE MOTOR HOME CHASSIS

Chrysler Corp., Detroit, Mich.
R. R. Noble 1973 17p Rept. No. Paper-73039
In HS-013 673, International Congress on Automotive Safety (2nd) Proceedings. Vol. 2, Recreational Vehicle Safety, Washington, D. C., 1973

Chassis design, Vehicle weight, Control location, Brake systems, Power steering systems, Suspension systems, Engine size, Instruction manuals, Owner manuals, Guidelines, Motor homes

Field 5—VEHICLE SAFETY

HSL 74, No. 1r

Group 5T—Trucks And Trailers

The development of the motor home chassis from its beginnings as an adaptation of a commercial truck chassis to the present specialized chassis tailored to motor home applications is traced. The evolution of the motor home chassis has been based on the product philosophy of combining the need for the convenience features of a passenger car with the integrity and load carrying capability of a truck and anticipating the needs for increased load carrying capacity and improved safety performance. Improvements since production of the first generation motor home chassis in 1962 include increased gross vehicle weight (GVW) ratings, a variety of GVW levels available, improved driver controls, improved brake systems, improved power steering, systems, safer ride, greater vehicle roll stability, improved tires, and increased engine power. These improvements and a series of publications designed to assist motor home body builders and owners are briefly discussed.

HS-013 685

RECREATIONAL VEHICLE SAFETY AT THE CAMPSITE

PRF Industries, Mount Clemens, Mich.

W. F. Korn 1973 17p Rept. No. Paper-73040

In HS-013 673, International Congress on Automotive Safety (2nd) Proceedings. Vol. 2, Recreational Vehicle Safety, Washington, D. C., 1973

Recreational vehicle safety, Safety standards, Heating, Electric systems, Safety standards, Mobile homes, Specifications, Design standards, Liquefied petroleum gases, Campers (truck mounted), Travel trailers, Motor homes

The plumbing, heating, and electrical installations in a recreational vehicle need the same type of safeguards as those employed in conventional housing, but the safety standards for recreational vehicles must take into consideration the basic differences in these tow types of housing, such as size, portability, type of construction, and means of connection to the public utilities; The development of the standard for recreational vehicles, American National Standard A119.2, is discussed; typical plumbing, heating, and electrical systems of recreational vehicles are briefly described; and the manner in which the standard provides for the safe installation of the utility systems, fixtures, and appliances in this unique environment is explained.

HS-013 686

RECREATIONAL VEHICLE SAFETY ON THE HIGHWAY

Liberty Mutual Insurance Co., Boston, Mass.

N. H. Pulling 1973 17p 17rcfs Rept. No. Paper-73041

In HS-013 673, International Congress on Automotive Safety (2nd) Proceedings. Vol. 2, Recreational Vehicle Safety, Washington, D. C., 1973

Recreational vehicle safety, Accident rates, Accident causes, Accident studies, Mobile homes, Campers (truck mounted), Driver experience, Failure caused accidents, Driver error caused accidents, Vehicle dynamics, Questionnaires, Crashworthiness, Hitches, Accident statistics, Vehicle stability, Recreational vehicle accidents, Motor homes

Recreational vehicle safety is evaluated in terms of the accident statistics in the literature. It is postulated that the principal causes of recreational vehicle accidents on the highway are driver inexperience and poor vehicle dynamics. They are interactive and variously manifested in different types of recreational vehicles. The vehicle problems reviewed include tires,

wheels, suspensions, brakes, trailer hitches, stability, and crashworthiness. Evidence is given for the importance of driver inexperience in accident causation with recreational vehicles, and the implications of this conclusion are discussed. Fourteen remedial suggestions to improve recreational vehicle safety are proposed.

HS-013 687

ADVANCED DEVELOPMENTS IN RV SAFETY MOTOR HOMES

Winnebago Industries, Inc., Forest City, Iowa

For primary bibliographic entry see Fld. 5D.

HS-013 688

A REVIEW OF THE G.M.C. MOTOR HOME SAFETY PROGRAM

General Motors Corp., Detroit, Mich.

For primary bibliographic entry see Fld. 5D.

HS-013 689

SAFETY FOR SELF CONTAINMENT SYSTEMS AND OFF THE ROAD EQUIPMENT FOR RECREATIONAL VEHICLES

Thetford Corp., Ann Arbor, Mich.

R. J. Sargent 1973 12p Rept. No. Paper-73049

In HS-013 673, International Congress on Automotive Safety (2nd) Proceedings. Vol. 2, Recreational Vehicle Safety, Washington, D. C., 1973

Recreational vehicle safety, Home appliances, Recreational vehicle accidents, Vehicle safety standards

A brief analysis of safety aspects for off-the-road equipment used in the recreational vehicle (RV) is presented. Off-the-road equipment includes heating, refrigeration, electrical, and sanitation systems, as well as materials and devices which are used to provide the life support aspects of the RV. The general areas of safety concern in the RV are fire and explosion, electrical shock, portable water contamination, inside air contamination, asphyxiation, physical injury, robbery and break-in, and penetration by animals/insects. Although these safety concerns are very similar to safety concerns in the home, home safety standards are not adequate for recreational vehicles. The space limitations, traveling limitations, use of energy limitations, use of water limitations, and price of inconvenience limitations of an RV must be considered in determining recreational vehicle safety standards. The development of the American Standards Institute Standard A 119.2 - 1971 for recreational vehicles is discussed.

HS-013 690

SAFETY: TOMORROW'S RECREATIONAL VEHICLE GROWTH DEPENDS ON TODAY'S VISIBILITY

Eaz-Lift Spring Corp., Sun Valley, Calif.

J. Few 1973 16p Rept. No. Paper-73052

In HS-013 673, International Congress on Automotive Safety (2nd) Proceedings. Vol. 2, Recreational Vehicle Safety, Washington, D. C., 1973

Travel trailers, Consumer protection, Federal role, Consumer education, Driver licensing, Government industry cooperation, State laws, New York (State), Towing, Hitches, Accident prevention

The development and enforcement of safe towing principles has had questionable effect on the rising number of travel trailer accidents. A projected growth of the market is thus cause for alarm. A proposal to enhance driver education in respect to recreational vehicle driving procedures and equipment identification is outlined. A methodology for practical and effective legislation to pervade all fifty states and an argument for special licensing that will help to finance and enforce the program are presented. It is proposed that the responsibility for this travel trailer safety program be shared by Federal and state governments, industry, and recreation vehicle enthusiasts.
HS-013 691

SIMULATION OF A TANDEM AXLE TRACTOR-TRAILER WITH EXPERIMENTAL VALIDATION

Lord Corp., Erie, Pa.; Mack Trucks, Inc., Allentown, Pa.
R. A. Harwood, M. J. Crosby, R. F. Zalokar 1973 8p Rept. No. SAE-730651
Presented at Combined Commercial Vehicle Engineering and Operations and Powerplant Meetings, Chicago, 18-22 June 1973. SAE

Tractor trailers, Dual axles, Computerized simulation, Vehicle riding qualities, Mathematical models, Suspension system spring rates

A digital computer simulation of an on-highway tandem axle tractor-trailer has been developed. The mathematical model is presented in state variable form and includes non-linearities, such as suspension friction and shock absorber characteristics. The primary purpose of the simulation is the evaluation of suspension characteristics and their effect on truck ride. Comparisons showing good correlation between simulation and experimental results are presented for transient runs of the tractor-trailer over disturbances such as 2 X 4's and ramps.
HS-013 692

STABILAIRE TRUCK DRIVE AXLE SUSPENSION: SERIES 400

Western Unit Corp.
H. C. Harbers, Jr. 1973 11p Rept. No. SAE-730652
Presented at Combined Commercial Vehicle Engineering and Operations and Powerplant Meetings, Chicago, 18-22 Jun 1973. SAE

Air suspension systems, Drive axles, Truck design, Suspension system design, Suspension system spring rates, Springs, Control arms, Service life, Resonant frequency, Fail safe systems, Torsion, Axle loads, Truck stability, Mathematical analysis

The development of a heavy-duty light-weight truck drive axle air suspension for use on single and tandem axles is described. The suspension system design parameters discussed included control arm design, long service life, compatibility with other vehicle components, resonant frequency, weight, fail safe capability, and design simplicity. A mathematical analysis was made of three basic design concepts incorporated into the Series 400 suspension: sway control, axle compatibility in torsion, and trailing arm configuration.
HS-013 693

TRACTOR-SEMITRAILER HANDLING: A DYNAMIC TRACTOR SUSPENSION MODEL

Cornell Univ., Buffalo, N. Y.

R. J. Vincent, A. I. Krauter 1973 16p 15refs Rept. No. SAE-730653
Presented at Combined Commercial Vehicle Engineering and Operations and Powerplant Meetings, Chicago, 18-22 June 1973. SAE

Tractor semitrailers, Truck handling, Suspension system design, Drive axles, Dual axles, Computerized simulation, Degrees of freedom, Vehicle dynamics, Braking, Fifth wheel couples, Roll, Pitch, Yaw, Antiskid brakes, Vehicle mass, Body center of mass, Articulated vehicle modeling, Suspension system spring rates, Torque rods, Articulated vehicle performance, Vehicle control, Wet road conditions, Cornering, Tire road contact forces, Air brakes, Air pressure, Mathematical analysis

Tandem-drive axles and tractor suspension dynamics were added to a digital computer model of a tractor semitrailer. The extended model provides 22 degrees of freedom for the vehicle. Two degrees of freedom are included for the motion of each tractor axle. Vertical tire flexibility and tandem-axle suspension jacking and roll steer are also included. Nonlinear equations for translation, yaw, pitch, and roll of the tractor and the semitrailer (except as these motions are constrained by the fifth wheel), wheel rotation dynamics, and antiskid brake control of the previous vehicle model are retained in the extended model. The model also includes a simulated driver which specifies the steering angle and the air pressure applied to the brakes. The models are compared by performing tests involving simultaneous cornering and braking. The extended model is used to investigate the effects of nonhorizontal torque rods at the tandem axles on vehicle behavior.
HS-013 694

TRUCK VIBRATION DIAGNOSTICS USING A NEW ELECTRONIC TECHNIQUE

Northrop Corp., Los Angeles, Calif.
L. V. Rennick 1973 8p Rept. No. SAE-730656
Presented at Combined Commercial Vehicle Engineering and Operations and Powerplant Meetings, Chicago, 18-22 Jun 1973. SAE

Vibration analysis, Vibration measurement, Rotation, Truck tests, Vibration tests, Sensors, Test equipment, Differentials, Wheel balancing, Drivelines, Joints, Accelerometers

A technique has been developed for diagnosing the vibration source in a vehicle as it is driven on the road. The basic problem is to determine whether the vibration is related to excessive engine or transmission vibration, driveshaft imbalance, driveline misalignment, U-joints, differential, or wheel assembly imbalance; and, in the latter case, to isolate the faulty wheel. The technique developed is to integrate samples of the vibration signal taken synchronously with the various rotating parts. The feasibility of the technique was demonstrated on two heavy trucks and several passenger vehicles.
HS-013 695

MAINTENANCE INDICATOR SYSTEM FOR MILITARY TRUCKS

Teledyne Continental Motors, Warren, Mich.; Army Tank-Automotive Command, Detroit, Mich.
W. Obits, D. Ancona 1973 8p 3refs Rept. No. SAE-730657
Presented at Combined Commercial Vehicle Engineering and Operations and Powerplant Meetings, Chicago, 18-22 Jun 1973. SAE

Group 5T—Trucks And Trailers

Truck maintenance, Military vehicles, Automated inspection, Diagnostic equipment, Display systems, Sensors, Durability, Indicator lights, Brake inspection, Fuel system inspection, Engine inspection, Filters, Oil filters, Fluid levels, Oil pressure, Temperature, Air induction, Service needs

The Maintenance Indicator System (MIS) is an automatic system that monitors the condition and performance of vehicle and engine accessories and subsystems. Although designed for military 2-1/2 and 5 ton trucks, this system can be adapted to most military and commercial vehicles. MIS consists of an instrument panel-mounted display panel located in full view of the operator and connected through a wiring harness to sensors permanently mounted on or within systems and accessories of the engine and vehicle. The sensors activate a light on the panel when service is required or a malfunction has occurred. Maintenance functions indicated by MIS include: fuel supply pressure to engine, engine primary fuel filter condition, radiator coolant level, engine coolant temperature, oil level, oil pressure, oil filter condition, alternator/generator output, battery voltage, air/hydraulic brake system condition, transmission and transfer case operating temperature, and air cleaner condition.
HS-013 696

DIESEL SMOKE ANALYSIS ON CHASSIS DYNAMOMETER

White Motor Corp., Cleveland, Ohio; Clayton Mfg. Co., El Monte, Calif.
For primary bibliographic entry see Fld. 5F.
HS-013 698

STABILITY AND HANDLING CRITERIA OF ARTICULATED VEHICLES. PT. 1, TECHNICAL REPORT (FINAL)

IIT Res. Inst., Chicago, Ill.
For primary bibliographic entry see Fld. 5R.
HS-800 915

5V. Wheel Systems**MOTORCYCLE TIRE DEVELOPMENT**

Goodyear Tire and Rubber Co., Akron, Ohio
For primary bibliographic entry see Fld. 5C.
HS-013 656

POSSIBILITIES OF IMPROVING SAFETY FOR MOTORCYCLE TIRES

Bridgestone Tire Co. Ltd., Tokyo (Japan)
For primary bibliographic entry see Fld. 5C.
HS-013 657

WET TRACTION TEST PROGRAM. FINAL REPORT

Michigan Univ., Ann Arbor. Hwy. Safety Res. Inst.
R. E. Wild 1973 55p 1ref Rept. No. HSRI-PF-73-3
Contract DOT-HS-031-2-283
NTIS

Tire traction, Wet road conditions, Tire tests, Tire pavement interface, Statistical analysis, Skid resistance tests, Coefficient of friction, Tire force measurement, Tire diameters, Tire sizes, Tire grading, Asphalt pavements, Concrete pavements

Eighty-six tires were measured for longitudinal and lateral traction capability on jennite, asphalt, and concrete wetted surfaces. The resulting data were subjected to a simple but thorough statistical analysis. Findings of general interest emerged showing the fallibility of the skid number for characterizing a tire pavement combination, the independent nature of lateral traction with respect to longitudinal traction, and indications of the effects on traction of tire diameter and load rating. Traction uniformity on concrete between identical tires was found to be excellent, while the traction differences on concrete between tires of the same size but of different manufacture were found to be statistically significant.
HS-800 917

CONTRACTS AWARDED

NHTSA CONTRACT AWARDS

DOT-HS-048-1-064 Mod. 16

ALCOHOL SAFETY ACTION PROJECTS

The Commission on Alcohol Problems
State of Minnesota
St. Paul, Minnesota 55101

28 Nov 73 to 30 May 75

\$59,000.00

This modification provides for revisions to the original plans as outlined in the detailed plan change sheets.

DOT-HS-214-2-367 Mod. 2

OCCUPANT EJECTION STUDY

Agbabian Associates
8939 Sepulveda Boulevard
Los Angeles, California 90045

5 May 72 to 31 Oct 73

\$10,000.00

the contract to provide for formulating a final report
This modification extends the period of performance of
of the findings and data on the completed testing.

DOT-HS-224-2-384

PRE-ARREST BREATH TEST PROGRAM

State of North Dakota
North Dakota Highway Department
Capitol Grounds
Bismarck, North Dakota 58501

No change

\$28,152.00

This modification provides for testing the reliability of pre-arrest breath test devices. The purpose of the test is to determine the effect of the instrument on the individual patrol officer's DWI productivity; the effect of the use of the instrument on BAC levels of those arrested compared to previous levels of arrested offenders; and the effects of variable conditions on the accuracy and stability of the instruments. In addition to these objectives, the State of North Dakota will use the instruments to facilitate the accomplishment of certain specific State objectives.

DOT-HS-240-2-431 Mod. 1

TRAINING WORKSHOPS

ABT Associates, Inc.
55 Wheeler Street
Cambridge, Massachusetts 02138

29 Nov 73 to 30 Apr 74

\$53,481.00

This modification provides for the development of an outline of workshop activities, the development of manuals for trainers and participants, the conduct of a meeting for trainers, and the conduct of a pilot-tested workshop, followed by nine actual workshops.

DOT-HS-256-3-542

EFFECTS OF BROKEN ENGINE MOUNT ON VEHICLE CONTROL

Tracor Jitco, Inc.
1300 East Gude Drive
Rockville, Maryland 20851

26 Nov 73 to 4 Dec 73

\$1,967.00

This modification provides for obtaining three vehicles, making certain modifications on the front engine mounts required to perform the tests, and performing stall, straight-ahead, full left and right turn, and reverse tests. The vehicle types, modifications, and test details are specified by NHTSA. Testing is coordinated with the test monitor, and photographs made during the test program.

DOT-HS-310-3-595 Mod. 2

ACCIDENT INVESTIGATION

Trustees of Boston University
881 Commonwealth Avenue
Boston, Massachusetts 00215

No change

\$10,200.00

This modification provides for the investigation of all crashes in a specific area which involve passive restraint and/or crash recorder equipped vehicles forming a part of the NHTSA fleet, plus any similarly equipped vehicles designated. The modification also provides for the investigation of all school bus accidents in the specified area which involve three or more fatally injured passengers, or other school bus accidents designated.

DOT-HS-370-3-780

PERFORMANCE EVALUATION OF CHILD TEST DUMMIES

Transportation Research Center of Ohio
East Liberty, Ohio 43319

29 June 73 to 29 Oct 73

\$30,908

Test data will be obtained on the dynamic performance and repeatability of two 3-year-old and two 6-year-old child test dummies under identical impact environments of two current child restraint systems. Anthropometric measurements, sled testing, instrumentation, and data acquisition requirements are specified by NHTSA.

DOT-HS-4-00799

UNIFORM TIRE QUALITY GRADING—TREADWEAR

Virginia International Testing Lab., Inc.
1548 Springhill Road
P.O. Box 701
McLean, Virginia 22101

3 Nov 73 to 3 Jan 74

\$4,800.00

A variety of tread depth measurements will be made at 500 and 1000 mile intervals to determine if road tests are producing rates of wear on control tires which are consistent with Uniform Tire Quality Grading requirements.

DOT-4-00805

SAFETY BELT INTERLOCK SYSTEM: USAGE SURVEY

Opinion Research Corporation
North Harrison Street
Princeton, New Jersey 08504

5 Nov 73 to 5 Mar 75

\$273,865.00

A study will be made to determine the extent to which 1974 safety belt systems increase usage, and to determine the various methods of defeating the different systems, as well as the incidence of these methods. The study will assess public acceptance of the safety belt systems and the nature of negative reaction. An additional objective of the study will be to determine the reliability of the various systems used in 1974 vehicles. Two classes of samples of 1974 model cars will be surveyed: rental cars, and cars from the general population of vehicles.

DOT-HS-4-00809

MULTIDISCIPLINARY HIGHWAY COLLISION INVESTIGATION TRAINING COURSE

University of Southern California
University Park
Los Angeles, California 90007

26 Oct 73 to 31 Jan 74

\$20,000.00

A course will be conducted in Multidisciplinary Highway Collision Investigation. All resources for conducting the course, including instructors, invitation and arrangements for participants, facilities, classroom space, transportation during the course, training materials, and crash observation for participants will be furnished.

DOT-HS-4-00811

UNIFORM TIRE QUALITY GRADING—TREADWARE

Compliance Testing, Inc.
1150 N. Freedom Street
Post Office Box 351
Ravenna, Ohio 44266

6 Nov 73 to 6 Feb 74

\$13,280.00

As a part of the overall inquiry into the establishment of treadwear grading procedures, test runs will be made to confirm the proposed Uniform Tire Quality Grading procedure, to confirm the suitability of using a single size control tire, and to determine whether similar treadwear ratings are obtained when a specific size tire is tested at different inflation pressures using respective T & R loads.

DOT-HS-4-00812

STANDARDS ENFORCEMENT TEST PROGRAMS

Control Systems Research, Incorporated
1515 Wilson Boulevard
Arlington, Virginia 22209

26 Nov 73 to 31 Jul 74

\$26,009.12

A process will be developed for selecting vehicles for Standards Enforcement Test Programs. The process will include the development of a compliance test data base; the development of a mechanized vehicle test selection matrix report; the design and development of a vehicle master file; the development of a purchase matrix report generator; the provision of a system demonstration which will include documentation for system description and operation; and the provision of certain specified updating operations.

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