



SURFACE VEHICLE RECOMMENDED PRACTICE

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Recommended Practice for Optimizing Automobile
Damageability and Repairability

RATIONALE

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FOREWORD

The cost of vehicle ownership has developed into a major interest for vehicle manufacturers. During the 1970s, fuel economy was a primary concern in the vehicle buyer's purchasing decision and in vehicle design. Through the 1990s, the steadily rising cost of vehicle insurance in the U.S. surpassed fuel costs, to become the second highest element of the cost of ownership. Since at least 2006 in the U.S., insurance costs have been the third largest contributor to total cost of vehicle ownership (Figure 1). Insurance costs globally tend to be highest in the wealthiest countries. The top five countries with the highest insurance rates are the United States, Austria, Germany, the United Kingdom and Australia (4autoinsurancequote.com, 2015).

In addition to medical and litigation costs, two major elements of these rising customer insurance costs are collision repair and comprehensive costs, of which theft is the major contributor (Figure 2).

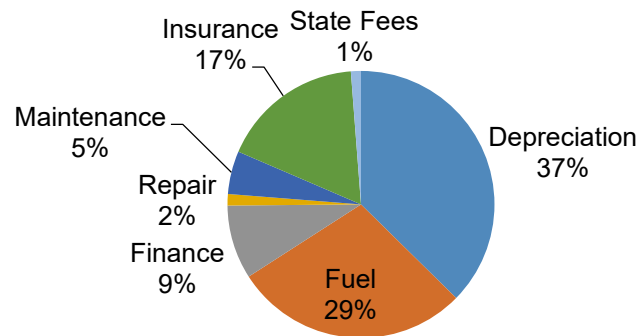
United States - 2014

Figure 1 - U.S. average cost of vehicle ownership

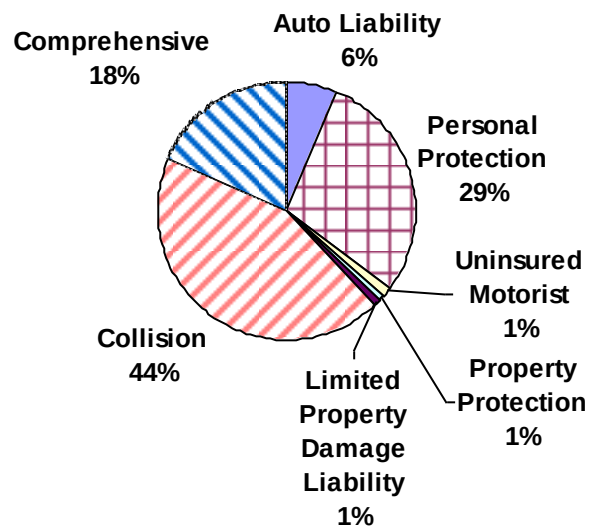


Figure 2 - Typical U.S. auto insurance cost elements - 2010

Automobile manufacturers, insurance companies, and the collision-repair industry continue to work together to contain repair costs. Advanced vehicle platforms should be reviewed by insurance industry repair experts as early in the programs as possible, to insure that recommended actions can be considered for implementation.

Extensive data bases, such as those compiled by the Highway Loss Data Institute (HLDI), provide vehicle damage statistics which can be used to identify design-related vehicle features having significant effects on collision-repair costs and to quantify the effects of design alternatives. Theft data statistics are available from National Insurance Crime Bureau (NICB) and HLDI.

This SAE Recommended Practice will assist in the evaluation of future technological changes in vehicle design and manufacturing improvements, which may affect damageability, serviceability, diagnostics and repairability. Such features as mechanical attachment and adhesive bonding of similar or dissimilar materials, the application of advanced high strength steels, aluminum and composites into body structures and chassis, including body shells consisting of combinations of these materials, modular construction, tailored blanks, laser welding, diagnosis, replacement, repair and calibration of collision avoidance/mitigation systems, etc., are becoming more important in future automotive designs. As an integral part of the design process, vehicle manufacturers should consider the effects of these new technologies and processes on damageability, repairability, and serviceability and develop the most efficient, cost effective and practical field repair procedures. Design for damageability, repairability, serviceability and diagnostics should facilitate practical, low cost, high quality collision repairs, but it must be balanced against all other vehicle factors (styling, packaging, manufacturing, safety, cost, fuel economy, etc.) to produce the best overall vehicle for customers.

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1. SCOPE

This SAE Recommended Practice applies to all portions of the vehicle, but design efforts should focus on components and systems with the highest contribution to the overall average repair cost (see 3.7). The costs to be minimized include not only insurance premiums, but also out-of-pocket costs incurred by the owner.

Damageability, repairability, serviceability and diagnostics are inter-related. Some repairability, serviceability and diagnostics operations may be required for collision or comprehensive loss-related causes only. Some operations may be for non-collision-related causes only (warranty, scheduled maintenance, non-scheduled maintenance, etc.). Some may be required for both causes. The scope of this document deals with only those operations that involve collision and comprehensive insurance loss repairs.

1.1 Purpose

The purpose of this document is to assist automobile manufacturers in optimizing their products' damageability, repairability, serviceability, and theft deterrence. This document should be considered concurrently with other parameters such as function, safety, cost, weight, manufacturability, recyclability, quality, styling, performance, marketability, etc. The main objective is to contain or reduce overall collision-repair costs without compromising occupant safety, crashworthiness, and other design parameters.

2. REFERENCES

2.1 Applicable Documents

The following publications form a part of this specification to the extent specified herein. Unless otherwise indicated, the latest issue of SAE publications shall apply.

2.1.1 SAE Publications

Available from SAE International, 400 Commonwealth Drive, Warrendale, PA 15096-0001, Tel: 877-606-7323 (inside USA and Canada) or +1 724-776-4970 (outside USA), www.sae.org.

SAE J817-1	Engineering Design Serviceability Guidelines - Construction and Industrial Machinery - Serviceability Definitions - Off-Road Work Machines
SAE J817-2	Engineering Design Serviceability Guidelines - Construction and Industrial Machinery - Maintainability Index - Off-Road Work Machines
SAE J1142	Towability Design Criteria and Equipment Use - Passenger Cars, Vans, and Light-Duty Trucks
SAE J1143	Towed Vehicle/Tow Equipment Attachment Test Procedure - Passenger Cars, Vans, and Light-Duty Trucks
SAE J1144	Towed Vehicle Drivetrain Test Procedure - Passenger Cars, Vans, and Light-Duty Trucks
SAE J1344	Marking of Plastic Parts
SAE J1828	Uniform Reference and Dimensional Guidelines for Collision Repair
SAE J2069	Recovery Attachment Points for Passenger Cars, Vans, and Light Trucks
SAE J2184	Vehicle Lift Points for Service Garage Lifting
SAE J2235	Paint and Trim Code Location
SAE J2376	New-Vehicle Collision Repair Information

2.2 Related Publications

The following publications are provided for information purposes only and are not a required part of this SAE Technical Report.

2.2.1 SAE Publications

Available from SAE International, 400 Commonwealth Drive, Warrendale, PA 15096-0001, Tel: 877-606-7323 (inside USA and Canada) or +1 724-776-4970 (outside USA), www.sae.org.

SAE J1556	Stationary Safety Glazing Replacement
SAE J1573	OEM Plastic Parts Repair

“Vehicle Design Features for Optimum Low Speed Impact Performance,” available at www.rcar.org/papers. Guidelines published in this document are similar to, but unique from those included in SAE J1555. Both documents should be utilized in designing for damageability and repairability.

The procedure for conducting a low speed 15 km/h offset insurance crash test to determine the damageability and repairability features of motor vehicles. Available from www.rcar.org/papers.

“The British Insurance Industry’s Criteria for Vehicle Security—Security System Evaluation, Passenger Cars,” “New Vehicle Security Assessment, Passenger Cars, LCV and HGV” Criteria for After ‘Theft Recovery Systems”, available from the Motor Insurance Repair Research Centre (THATCHAM), Colthrop Lane, Thatcham, Berkshire, England RG19 4 NR.

Canadian National Standard on Theft Deterrence Systems, CAN/UCC S-338.

2.2.2 Data Sources

Both the insurance and collision-repair industries can provide valuable insight into the most important damageability factors. Vast data bases are available in some countries, which provide detailed data on both collision and comprehensive losses. This data is the basis for the Design for Damageability/Insurability-(DFI) process.

2.2.2.1 Highway Loss Data Institute (HLDI)

U.S. collision and theft data are available by individual make and model, including relative claim frequency, relative average loss payment per claim, and relative average loss payment per insured vehicle year. Special reports on specific collision and theft topics are also available.

2.2.2.2 Insurance Services Office (ISO, U.S.)

Both collision and comprehensive (theft and glass) data are available, including overall claim frequency, average repair cost, and loss per year (claim frequency x average repair cost).

2.2.2.3 Individual Insurers

Insurance ratings, low-speed crash test data, security rating assessments, etc.

2.2.2.4 Repair Industry Associations

U.S.: Automotive Service Association (ASA), Equipment and Tool Institute (ETI), Inter-Industry Conference on Auto Collision Repair (I-CAR), etc.

2.2.2.5 Insurance Institute for Highway Safety (IIHS) (U.S.)

Test results from 5 and 10 km/h bumper impact tests.

2.2.2.6 Vehicle Information Centre of Canada (VICC)

Similar collision and theft claims data to that provided by HLDI. VICC also publishes ratings of individual vehicle models, based on expected actual loss costs. These ratings are used by Canadian insurers to set premiums.

2.2.2.7 NRMA (formerly National Roads and Motorist Association, Australia)

Test results from low speed offset crash tests and evaluation of vehicle anti-theft security.

3. DEFINITIONS

3.1 AVERAGE LOSS PAYMENT PER CLAIM (AVERAGE VEHICLE REPAIR COST)

The total of all loss payments (collision or comprehensive) made for claims for a group of vehicles, divided by the number of claims paid (as defined by HLDI).

3.2 AVERAGE LOSS PAYMENT PER INSURED VEHICLE YEAR

(Many insurers often refer to it as pure premium.) The product of claim frequency and average loss payment per claim (as defined by HLDI).