



Quality Criteria for the Safety Assessment of Cars Based on Real-World Crashes



Use of Vehicle Identification Number for Safety Research

Report of Sub-Task 1.1



CEA/EC SARAC II

QUALITY CRITERIA FOR THE SAFETY ASSESSMENT
OF CARS BASED ON REAL-WORLD CRASHES

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SARAC II

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Abstract

This discussion paper identifies a number of issues that need to be addressed if VIN is to be used to reliably identify safety features of vehicles in crash databases in Europe and possibly worldwide. In countries apart from the USA, the use of VIN appears to be quite random and at the discretion of the manufacturer and/or country in the way it gets used. Where regulated, it seems that only details related to the manufacture location and basic vehicle characteristics are specified. In these countries, the use of VIN for identifying safety features onboard a particular feature can only be identified with the assistance of the manufacturer involved. The USA and Canada do mandate the use of VIN and furthermore, requires manufacturers to provide these details to the National Highway Traffic Safety Administration (NHTSA) where it is freely available on a centralised database. While the details provided are only minimal for use in crash analysis, this system at least allows researchers to gain access to VIN independently from relying on the assistance of the manufacturer. A number of recommendations are included so that the use of VIN for safety research purposes can be achieved.

Keywords: VEHICLE IDENTIFICATION NUMBER, SAFETY, RESEARCH, CRASH ANALYSIS

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Executive Summary

The evaluation of car safety is difficult because not only are there a large variety of models of car in a particular marketplace, but also within each model there are a variety of classes and options available. Without controlling for the particular model type or the safety features it includes leaves open the possibility of misinterpretation of its safety performance. Mass crash databases commonly used today do not include this level of detail of their crashed vehicles. However, if these details could enable more sophisticated retrospective rating analyses to be undertaken. The Vehicle Identification Number (VIN) uniquely identifies vehicles manufactured worldwide and also includes some details on what various passive safety features are included in individual vehicles. It therefore may offer the possibility of identifying particular model type and whether a car possesses certain safety features. Supplementary details with VIN may also help to identify additional active safety features.

As part of the activities undertaken by the Comité Européen des Assurances, SAFETY Rating Advisory Committee (SARAC), a review was undertaken of VIN structures across various European, US and Asian countries to examine 1) formal specified systems of VIN worldwide, 2) how it is used by manufacturers across the various countries, 3) an analysis of safety feature identification patterns in VIN use, and 4) systems in place to assist researchers identify what safety features are available.

This analysis showed that VIN is not applied in a uniform manner across the different countries and different manufacturers. While there are consistent features specified by most governments such as country of manufacture, build date, Vehicle Descriptors, etc., other variables including safety feature details are ad hoc across the VIN structure. Hence, systematic use of VIN for inclusion in an analysis of safety features or for use in controlling for such features in a rating system is impossible without considerable effort and cooperation from all manufacturers.

Moreover, the analysis also identified a shortage in the collection of VIN information in many of the mass databases used for such analysis. In other words, even if VIN could be decoded successfully, it will not be useful for crash databases that do not list the VIN number.

This report highlights the inadequacies of VIN for use in safety analyses in countries apart from the USA where the collection and interpretation of VIN is mandated by NHTSA. Recommendations are made for further work to formalise this process in Europe and other countries for use in improved vehicle safety analyses.

1 Introduction

The evaluation of car safety is difficult because not only are there a large variety of models of cars in a particular marketplace, but also within each model type there is a variety of classes and options available. Not controlling for the particular model type or the safety features it includes leaves open the possibility of misinterpretation of the vehicle's safety performance. Mass crash databases rarely include this level of detail for crashed vehicles. Including such detail would enable more sophisticated retrospective rating analyses to be undertaken. Vehicle Identification Numbers (VIN) uniquely identify all vehicles manufactured worldwide and also often include the information regarding various safety features possessed by an individual vehicle. SARAC recognised that VIN therefore offers the possibility of identifying the particular model type and whether a car possesses certain safety features. However, as VIN is not applied in a uniform manner across different countries and different manufacturers, achieving the objective of using them to categorise cars according to safety will be a challenging task.

SARAC Subtask 1.1 was proposed to evaluate the potential for VIN to be used as an identifier of safety features of vehicles in crash databases. The scope of this subtask included four main aims: to examine the use of VIN in different countries for a range of manufacturers; determine why VIN is important for safety rating; investigate how it can be used to identify safety features of vehicles in crash databases; and the methods for its use, both with and without manufacturer involvement. This discussion paper addresses all these aims.

2 Official Classification of VIN

There are at least four competing standards used to calculate VIN worldwide. The VIN system used in Canada and the USA is specified by FMVSS 115, Part 565, while ISO Standard 3779 is used in Europe and most other parts of the world. The third standard is SAE J853, which is similar to the ISO standard, as is ADR 43 used in Australia. Of the four standards, the FMVSS is the most stringent and applies to all cars made or sold in North America. Each standard requires that the VIN be 17 characters in length and specifies how the VIN should be fixed to the vehicle. The standards differ with respect to the information contained in the VIN and the order of this information. FMVSS 115 is the only one that specifies that manufacturers reserve a character position in the VIN for the coding of information concerning restraint features fitted to the vehicle. The ISO and SAE Standards (which are in common use in parts of the world not including North America) do not make the recording of safety information compulsory. All standards mandate that the VIN begins with a three-character code that uniquely identifies the manufacturer of the vehicle. What follows is a brief summary of the different standards for VIN in use around the world.

2.1 FMVSS 115 and Part 565 (and CMVSS 115 for Canada)

This Standard applies to all cars made or sold in the USA and Canada. An exception exists for cars made by non-corporations or by manufacturers that export fewer than 500 cars into the USA or Canada annually. In these cases, the relevant governing body in Canada or the USA must approve the VIN assigned by the manufacturer. The VINs of any two vehicles manufactured within a 30-year period must not be identical. Each VIN consists of four sections.

1. The first section is commonly called the World Manufacturer Identifier (WMI), and consists of the first three characters of the VIN. It identifies the manufacturer, make and type of the vehicle (note that a manufacturer can produce several “makes” of cars). Manufacturers must submit their request for the assignment of a WMI to the Society of Automotive Engineers (SAE).
2. The second section occupies positions 4 through 8 and is often referred to as the Vehicle Descriptor Section (VDS). It is used to identify the attributes of the vehicle. The attributes that must be identified in this section vary according to the type of vehicle. For passenger cars, the line, series, body type, engine type and restraint type must be identified. The order in which these attributes are coded within the VDS is not specified but the manufacturer must make details concerning how their VDS is coded readily available. What other attributes are recorded is to the discretion of the manufacturer.

3. The third section is a single digit (the 9th) and is commonly called the “check digit”. Its purpose is to enable anyone transcribing a VIN to check its accuracy by applying a simple mathematical algorithm to the VIN and ensuring that the result is equal to the value of the check digit.
4. The fourth and final section is commonly called the Vehicle Identification Section (VIS) and occupies positions 10 through 17 of the VIN. The first character in this section represents the model year and the second the plant of manufacture. The third through eighth character of this section is a sequential number assigned by the manufacturer to uniquely identify the vehicle.

Shown below are two examples of how the VIN of two manufacturers making cars for US and Canadian markets structure their VIN. Both BMW and VOLVO follow the FMVSS Part 565 guidelines for all cars that they produce in the USA or manufacture for US markets.

2.1.1 BMW

- Position 1-3 = World Manufacturer Identifier
- Position 4-7 = Vehicle Description Section will specify the Series, body type and engine features such as capacity and the number of cylinders
- Position 8 = Restraint system – will give the most basic information about safety belts (i.e. “manual safety belts” and whether driver and FLP SRS airbags are fitted). Note that for non-North American markets, this position in the VIN is sometimes reserved for a variable that specifies the vehicle’s weight classification.
- Position 9 = Check digit
- Position 10 = Model year
- Position 11 = Plant of manufacture
- Position 12-17 = Serial Number – may restart at the beginning of the production year (September) for each model

2.1.2 VOLVO

- Volvo have a comprehensive VIN system
- The following system applies to post 1980 rear wheel drive cars
 - Positions 1-3 = WMI (YV1 for Volvo)
 - Position 4 = Model
 - A = 240, J = 940, K=960, D=700
 - Position 5 = Safety Equipment
 - 1991 and before: A = Airbag and 3 point seatbelts, X = Mechanical belts

- 1992 and after: S=4-door vehicle with airbag, T=4-door vehicle with mechanical seatbelts, W=5-door vehicle with airbag
- Position 6-7 = Engine Type
- Position 8
 - (1991 and before) = body type: 4 = Sedan, 5 = wagon
 - (1992 and after) = Emissions Control: 0 = Basic Emissions Control (Catalyst), 1 = Catalyst with EGR, 3 = Alt. Fuel/ignition system
- Position 9 = Check digit (Transmission Code in non-North American cars)
- Position 10 = Model year
- Position 11 = Manufacturing plant
- Position 12-17 = Unique Chassis Number

2.2 SAE J272 Standard

The VIN for this standard consists of three sections.

1. The first is the World Manufacturer Identifier (WMI) and it consists of 3 characters that uniquely identify the manufacturer of the vehicle. The WMI is assigned in accordance with SAE Recommended Practice J1044a.
2. The next section is the Vehicle Descriptor Section (VDS), which consists of 6 characters. The coding of this section is to be determined by the manufacturer but it is intended that it be used to identify attributes of the vehicle.
3. The third section is the Vehicle Indicator Section (VIS) and consists of 8 characters, the last four of which are numeric. It is recommended that the first character refer to the year of manufacture and the second the plant, with the remaining characters uniquely identifying the vehicle.

The SAE standard is used by the FMVSS Part 565 and the ISO 3779 standards to code the WMI and the year of manufacture. Therefore, at least these two pieces of information are consistently coded when they do appear in the VIN (see the following section on ISO 3779).

2.3 ISO 3779 Standard

The VIN for this standard also consists of three sections.

1. The first section is the World Manufacturer Identifier (WMI), which constitutes the first three characters of the VIN.
2. The Vehicle Descriptor Section (VDS) is made up of six characters that occupy positions 4-9, and may be used by the manufacturer to identify attributes of the vehicle.

3. The third section is the Vehicle Indicator Section (VIS), which occupies the last eight characters and is used to identify a specific vehicle. The manufacturer can use this section to designate the year of manufacture and the plant of manufacture, and should use the first and second positions of this section to do so, although the standard does not make this compulsory.

Most non-North American countries follow the ISO Standard. Gaining information on non-European countries, has proved difficult. However preliminary research indicates that VINs are not regulated by Japanese authorities. Although a translation of ISO 3779 is available as a Japanese International Standard (JIS 4901-1982), this standard is not actually used in Japan. Japanese vehicle manufacturers imprint unique body numbers on each of the vehicles they produce. However, these body numbers do not necessarily describe vehicle specifications. In order to derive information on vehicle specifications from Japanese body numbers one would have to match body numbers with manufacturers' records. With respect to vehicles imported into Japan, the Japanese government does not regulate VINs assigned in the country of manufacture.

2.4 Australian Design Rule ADR 43

Shown below is the structure of the VIN used by Holden Ltd that assigns VIN according to the Australian Design Rule 43. This standard complies with ISO 3779.

2.4.1 HOLDEN

- The following system applies to post 1980 rear wheel drive cars
 - Positions 1-3 = WMI = 6H8
 - Positions 4-5 = Vehicle Type
 - S= Barina
 - T= Astra
 - J= Vectra
 - V= Commodore
 - W= Statesman
 - Y= Calibra
 - Position 6 = Luxury Level (e.g. Executive, Berlina, Calais, etc)
 - Positions 7-8 = Body Style (e.g. Sedan)
 - Position 9 = Engine Size
 - Position 10 = Model Year
 - Position 11 = Plant of Manufacture
 - Positions 12-17 = Sequential Number

2.5 A Global Standard?

The table shown in the Appendix to this paper compares the various types of VIN structures specified by each standard as well as the variations in use by particular vehicle manufacturers. Members of the SARAC committee and other investigations led to the information contained in this document. It is provided solely for the information of SARAC members for further discussion and no claims are made about its completeness at this time.

Introducing a global standard for VIN may seem like a daunting task, but an increased willingness to internationally harmonise standards means that the prospects are improving. The United Nations Economic Commission for Europe (ECE) established the Global Agreement in 1988. This agreement establishes a process for promoting the development of global technical regulations ensuring high levels of safety, environmental protection, energy efficiency and anti-theft performance of Wheeled Vehicles, Equipment and Parts, which can be fitted and/or be used on Wheeled Vehicles. At the time of writing 24 countries have become Contracting Party including the United States of America, Japan, the European Community, the Russian Federation, China, South-Africa, New Zealand, Canada, France, Germany, the UK and Korea. The Global Agreement could be used to establish mandatory VIN components including safety features.

3 How VIN is used

As each vehicle's VIN is unique, it can be used as a vehicle identifier to match records in different databases. However, unless the safety features being assessed are coded into the VIN, its use for comparing safety performance of vehicles within and across different countries will be a challenging task.

VIN is commonly used today to help prevent vehicle theft and to identify cars that have been involved in crashes and deemed unfit for further use. To aid these two objectives, various components of vehicles are permanently marked with the vehicle's unique VIN. This not only reduces the economic incentives for vehicle theft, but also increases the likelihood that a crime will be detected. Police also use VIN to track down the owners of stolen vehicles. In the USA, consumers can use publicly available VIN decoders to gain access to the history of used cars. Manufacturers and Government agencies use VIN as a way of determining what vehicles will be affected by product recalls.

The US Insurance Institute for Highway Safety (IIHS) uses VIN to capture details of vehicles involved in road crashes. They use a VIN decoder program called VINDICATOR. However, the information concerning features (including safety features) of the vehicles involved in a crash is dependent on the accuracy of the recorded VIN. The IIHS recognise that the accuracy of the VIN varies widely depending on the source of information. From their experience, the most accurate source of VIN is motor vehicle insurance companies, which have VIN error rates of less than one percent. At the other end of the scale is the US Department of Transportation Fatality Analysis Reporting System (FARS), which the IIHS estimates has an error rate of between 10 and 15 per cent.

One of the reasons for inaccurate reporting of VIN is the way it is captured in a crash. It is often recorded by an attending police officer who copies the VIN in poor lighting conditions or may have to record this code hastily at the crash scene. Also, the VIN is commonly recorded by hand, and consequently is prone to being misread or not recorded accurately. Standards that regulate the use of VIN in various markets have sought to eliminate misreading problems by limiting the characters in the VIN to the numerals 1, 2, 3, 4, 5, 6, 7, 8, 9 and 0 and the Roman letters of the English alphabet. They also exclude the letters I, O, and Q, as they can easily be confused with the numerals 1 and 0. Obviously, any system that decodes VIN to analyse the safety of vehicles would either need to make sure that the source of its data is of the highest quality or it would need to have in place a reliable quality-checking routine. Such routines are commercially available for vehicles manufactured or sold in the USA. Such programs probably use the check digit, which is mandatory in the VIN of cars manufactured or sold in the USA.

3.1 Use of VIN for Vehicle Safety

VIN promises potential for improved vehicle safety rating by providing the mechanism for identifying safety features fitted to crashed vehicles and the particular vehicle model variant. Such added detail will enable more accurate analyses to be undertaken by controlling for the myriad of compounding factors likely to affect the outcome. The usefulness of VIN globally is dependent on the level of information manufacturers incorporate into the VIN and its general accessibility to those undertaking these analyses. The USA and Canada have mandated that manufacturers selling vehicles in their countries must follow the FMVSS 115 standard and provide this information to the National Highway Traffic Safety Administration (NHTSA). Moreover, NHTSA are instructed to make this information public and therefore publishes it on their website. Unfortunately, authorities in the rest of the world do not adhere to similar policies.

The problem of accessing information on VIN from manufacturers of vehicles not destined for the US market was highlighted recently when MUARC undertook a study of the effectiveness of vehicle safety features. It took considerable time and effort to gain the necessary information from vehicle manufacturers and agents in Australia, where such information is not publicly available.

Even though the FMVSS 115 standard requires that manufacturers selling vehicles to the North American market must include information specific to safety restraints in the VDS part of the VIN, this does not guarantee that VIN coded in accordance with this Standard can be used to identify specific safety features. For example, Braver and Kyrychenko (2004) recently investigated the effectiveness of side airbags in reducing fatalities in driver-side collisions. The Fatality Analysis Reporting System (FARS) and the General Estimates System (GES) databases were used to establish risk of death. From each database, the VIN of vehicles involved in the crashes could be obtained. However, many of the VIN did not include information on the presence of side airbags in the VDS, as information specific to side airbags is not required by the Standard. Brian O'Neill from the Insurance Institute for Highway Safety (IIHS) reports that the information specific to side airbags was derived for Braver and Kyrychenko's (2004) study by sending the VIN of vehicles for which side airbag status could not be determined to the respective manufacturers. The manufacturers matched each vehicle's VIN number with another unique identification number called the Vehicle Order Number (VON). The manufacturers used the VON to uniquely identify records in a database that detailed the standard equipment for a particular vehicle as well as a list of any optional extras added to the vehicle. The manufacturers then provided the required side airbag information to enable Braver and Kyrychenko (2004) to complete their analysis.

Manufacturers in North America keep records of standard equipment and optional extras for each car that they manufacture in order to comply with the American Automobile Labelling

Act (AALA), which was enacted in 1958 and requires all new cars to display a sticker on their windshields listing (among other things) the vehicle's standard equipment, added equipment, VIN and the manufacturer's suggested retail price. Presently only two organizations have access to VON information, they include the National Insurance Crime Bureau and ProQuest Automotive (who maintain detailed parts catalogue databases to assist in the distribution of parts to car dealers). While VON could be used to provide more detailed information on the safety equipment of cars manufactured in North America, no equivalent procedure for identifying specific standard equipment or added equipment has been identified for non-North American markets. Furthermore, in order to use VON effectively for North American markets, it would be necessary for manufacturers to provide access to their internal databases.

While the information contained in VIN has the potential to improve the assessment of vehicle safety (either directly or indirectly via VON), there is also interest in its use for other applications such as its use as a base address for telematic networks.

3.2 Vehicle Telematics

In the past decade, the telematics industry has increased in size and scope so that technology developed in this field is used to perform tasks ranging from updating accounts on toll roads to tracking vehicle progress for onboard navigational systems. Many industry experts believe that the next step in vehicle telematics will be to record consumer behaviour by using the VIN as a unique address in databases. Such databases could keep information on where and how people are driving, what toll roads they are using and what features they are adding to their cars. This information could be used as a powerful safety and marketing resource. Databases have already been established for this purpose, but currently only use VIN to identify individual cars. Decoding of vehicle characteristics only occurs on the most basic level (i.e. make and model) but there is a push to use the information contained in VIN more strategically. Within the industry, some are proposing that the number of characters of the VIN should be increased to allow even more information about the vehicle to be stored.

The reason VIN is popular for telematics purposes is that each car's VIN is unique and that it can be decoded to give basic information concerning the car. Furthermore, it is a permanent identifier and can not legally be altered by sale or repair. Most cars also have their VIN in bar code form, which means it has the potential to be used by remote sensor systems as a tracking identifier. VIN can also be imprinted onto a car in more permanent ways other than just imprinting it on a compliance plate or on engine components during manufacture. The National Motor Vehicle Theft Reduction Council (NMVTRC) in Australia is conducting trials into the feasibility of identifying cars by spraying their bodies and components with up to

10,000 microdots, each of which carries the vehicle's VIN. Preliminary results suggest that such novel ways of coding VIN will be very successful.

3.3 VIN Decoders

Because of the wide variations in the way VIN is used by different manufactures and between different countries, the degree of usefulness of current VIN decoders is limited. There are many decoders available (often on the internet) and they generally fall into 3 categories.

First, there are decoders that are designed and used by car enthusiasts, generally limited to the particular model of car of interest to an enthusiast group. They do provided significant detail depending on the way the manufacturer of the model uses the VIN.

Second, some manufacturers and parts suppliers provide VON for the use of car owners or mechanics to aid them in the purchase of parts for their vehicles. These decoders are less commonly available than those used by enthusiasts, although they do provide information on a variety of the models produced by the manufacture. Most of the information provided includes the year and place of manufacture, the engine size as well as some details concerning the standard features to the particular model and series specified by the VIN.

The third type of decoder is one provided by government agencies and is the least common. To date, we are only aware of the system operating in the USA where VIN information gathered by NHTSA is made available publicly for vehicles sold in this country. The Insurance Institute for Highway Safety (IIHS) developed a computer software package called VINDICATOR for decoding this information. This decoder analyses the VIN for 15 domestic (i.e. made in the USA) and 45 foreign makes of passenger cars and ten makes of vans, light trucks and multipurpose vehicles manufactured between 1981 and 2003. The VINDICATOR can also recognise but not analyse the VIN of trucks and motorcycles. The user can select the level of information that the decoder provides. The most basic information given is the make, series, model and model year of vehicle. Information on the vehicle type, the body type, the restraint system and the presence of airbag systems is also given at this most basic level. More detailed information concerning the weight, wheelbase, engine specifications and horsepower is also available.

Finally, the US Environmental Protection Agency (EPA) is in the process of establishing a database concerning emissions and engine dynamometer testing that uses VIN to establish what test parameters should be employed for individual vehicles. The EPA formerly used a system where vehicle details such as model year, manufacturer, model name, body style, number of cylinders and engine displacement had to be entered into a "Lookup Table" to give the required parameter. However, the EPA recognized that it would be more efficient simply to use the VIN of the vehicle to calculate the required parameter. They commissioned

a report (see Austin, et al, 1997) examining the potential of using VIN in this manner and concluded that it was feasible to use VIN to provide vehicle details for the purpose of emissions testing.

Kommen
properly

The report found that commercially available VIN decoders could be adapted to supplement the already available information specific to vehicle emissions. However it should be emphasised that the EPA were only concerned with vehicles manufactured or sold in the USA, where the structure of VIN is standardised and databases concerning vehicle emissions exist. If the EPA's design for incorporating VIN into their testing procedures was to be applied to the field of safety, it would be required that a data source which listed the safety features of vehicles was available. Such a data source probably exists for most vehicles in the US market and could possibly be accessed using each vehicle's VON, but a data source for vehicles manufactured or sold in the rest of the world has not been located. Furthermore, whereas the EPA envisaged that only one or two commercially available VIN decoders would require adaptation to complete their task, to complete a similar task for European vehicles (not to mention vehicles manufactured in Asia or South America) the adaptation of a multitude of decoders would be necessary. Whether decoders actually exist for certain makes of cars is still unknown.

The EPA recognised that decoders are not 100% accurate and that the decoders that they adapted would not cover the population of all cars on American roads. In small numbers of cases, the EPA planned to consult the manufacturer for detailed information regarding the VIN. However this would be a substantial task when projected globally to the safety context. The EPA also recognised alternative ways of decoding the Vehicle Identification Number of vehicles for which there are no decoders available. For instance, the Association of International Automobile Manufacturers, Inc. (AIAM) publishes a handbook of the structure of the VIN used by its members (see AIAM, 2000). However such handbooks only list the VIN structure of affiliated manufacturers and are specific to certain markets (for example the AIAM handbook only applies to passenger vehicles sold in the USA).

The EPA also recognised that no decoder existed that fulfilled all of their needs by providing all the vehicle details required to calculate the emission parameters. Furthermore, many of the decoders that did calculate fields of interest to the EPA did not calculate the features of individual vehicles but only estimated characteristics based on model and make information. For example, the EPA were interested in using the VIN to calculate the vehicle's weight. This characteristic of the car is not explicitly recorded in the VIN, but decoders do exist that give estimates of the weight of the vehicle. One example is a decoder called VINA (designed by R. L. Polk). The estimate is calculated using information from the VDS (see page 2) part of the VIN. Therefore two vehicles with the same VDS (but different VIS) will have the same weight value, while in reality this may not be the case. This would not be a problem for analysing restraint systems in the USA as the VINA software uses the mandatory restraint

variable of the VIN to give information on restraint systems. However, using analogous methods of feature estimation in markets where there is no restraint variable requirement for the VIN could compound inaccuracies in safety ratings.

4 Vehicle Order Number

While the Vehicle Identification Number (VIN) can be decoded to provide some limited information about vehicle safety features, however, more detailed information on optional equipment specification requires access to databases held by the manufacturers. It is possible, with manufacturer cooperation, to get from VINs the corresponding Vehicle Order Numbers (VONs) that allow the re-creation of the information on the window stickers that are on all new passenger vehicles in showrooms (see Figures 1 and 2 below). Thus, optional safety equipment can be identified this way.



CHEVROLET

2005 MALIBU LS SEDAN

Standard Equipment

Items Featured Below are included at NO EXTRA CHARGE in the Standard Vehicle Price Shown at Right

**** MECHANICAL ****

- 3.5L V6 ENGINE
- 4-SPEED AUTO TRANSMISSION
- ** SAFETY & SECURITY ****
- DRIVER & PASS FRONT AIR BAGS
- 4-WHEEL ANTI-LOCK BRAKES W/ TRACTION CONTROL
- PCH-THRT DETENT IMMOBIL DAYTIME RUNNING LAMPS
- AUTOMATIC HEADLAMP CONTROL
- RR CHILD SEAT LATCH SYSTEM
- BATTERY RUNDOWN PROTECTION
- EMERGENCY TRUNK RELEASE HNDL
- ** EXTERIOR ****
- 16" 10" ALLOY WHEELS
- POWER OUTSIDE MIRRORS
- INTERMITTENT WIPERS
- 2 SIDED GALVANIZED STEEL ON EXTERIOR PANELS EXCEPT ROOF
- ** INTERIOR ****
- AIR CONDITIONING

Options & Pricing

STANDARD VEHICLE PRICE MANUFACTURER'S SUGGESTED RETAIL PRICE

Options installed by the Manufacturer (may replace standard equipment shown at left) \$21,265.00

MALIBU PREFERRED EQUIP GRP 1SB 1,095.00

- FRONT SIDE IMPACT AIR BAGS & HEAD-CURTAIN SIDE AIR BAGS
- DRIVER SEAT 6-WAY POWER
- FLOOR MATS
- REMOTE VEHICLE STARTER SYSTEM

FRONT LICENSE PLATE BRACKET .00

EXT-LIGHT DRIFTWOOD METALLIC INC.

INT-NEUTRAL CUSTOM CLOTH INC.

TOTAL OPTIONS \$1,095.00

Visit us at www.chevy.com

Compare this vehicle to others in the FREE FUEL ECONOMY GUIDE available at the dealer.

CITY MPG

22



HIGHWAY MPG

32

ACTUAL MILEAGE
 WILL VARY WITH DRIVING
 CONDITIONS. ALWAYS WEAR
 YOUR SEATBELT. NEVER
 REPORTED TO EPA EXCEPT THAT THE
 MAXIMUM CITY AND HIGHWAY
 ESTIMATES WILL VARY BETWEEN
 15 AND 30 MPG IN THE CITY
 AND BETWEEN
 27 AND 37 MPH ON THE
 HIGHWAY.

2005 MALIBU
 2.8 LITER V6 ENGINE
 FUEL INJECTION/AUTOMATIC
 & SPD ELECTRONIC THROTTLE
 CATALYST, FEEDBACK FUEL SYSTEM

ESTIMATED ANNUAL FUEL COST: \$1,540

FOR COMPARISON SHOPPING,
 ALL VEHICLES CLASSIFIED AS
 MED-SEDS

HAVE BEEN DERIVED
 MILEAGE ROUNDED
 RANGING FROM
 12 TO 30 MPG CITY
 AND
 14 TO 51 MPG
 HIGHWAY.

388

DEALER TO WHOM DELIVERED

JIM PRICE CHEVROLET
 PO BOX 7468
 CHARLOTTEVILLE, VA 22908-7468

ORDER NO 100751 SALES DOC 6
 SALES MODEL CODE 12719
 DEALER NO 1407
 FINAL ASSEMBLY KANSAS CITY, KS U.S.A.
 VIN 1G1ZT54825F230079

This sheet has been adopted pursuant to Federal law. Do not remove prior to delivery to the customer. Excludes dealer-installed accessories and manufacturer-installed equipment. Dealer may receive dealer-installed accessories at a discount from the dealer. MSRP does not include tax.

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 Last Change: 10/1/2004

PB
TAG0280793

Fig: 1 Sample VON layout for the Chevrolet 2005 Malibu Sedan

TOYOTA
moving forward

DESCRIPTION: SIENNA LE FWD 8 PASSENGER

YEAR/MODEL: 2005/05AC

COLOR: PEARL#B12

VIN: 5TDZA23C35S328765 (P1E)112

PORT/PLANT: Princeton, IN/TMAM

MECHANICAL & PERFORMANCE

- 3.3L DOHC V6 w/VVT-i
- 5-Speed Automatic Transmission w/ECT-4
- Power Rack & Pinion Steering
- Power Front Disc & Rear Drum Brakes
- 4-Wheel Disc Electronic Brake Force Dist
- 4.0 Brake Assist
- 16" Steel Wheels w/195/60R16 Tires
- Full Wheel Covers/Temporary Spare Tire
- 3000 lbs. Tow Prep Package Includes: Heavy Duty Radiator Fan, 150 Amp Alt & Power Steering Oil Cooler

SAFETY

- Advanced Airbags w/Occupant Sensor
- 3 Point Seatbelts in All Locations
- Side Impact Door Beams
- Child Protection Sliding Rear Locks
- Child Seat Top Tether & Lower Anchors
- The Power Warning Indicator

EXTERIOR

- Full Color-Keyed Exterior
- Black Heated Power Mirrors

STANDARD EQUIPMENT

- Roof Rack
- Privacy Glass

COMFORT & CONVENIENCE

- LE Cloth Int 6-Way Adj Dr Seat w/16" Lumbar & 4-Way Adj Head Rest, Pwr Seat
- 2nd Row 20/20" Modular w/TV & Center Middle Seat
- 50/50 Split & 3rd Row Seat
- Front/Rear AC & Heater
- Deluxe AM/FM/CD w/6 Speakers
- Driver & Window w/Auto Up/Down
- Power Windows in 1st & 2nd Rows
- Power Rear Quarter Windows
- 10 Cup & Bottle Holders
- Folding Top Table
- Illuminated Vanity Mirrors
- Outside Control
- Tilt/Tension-Rear Wheel w/Audio Coat
- Full Tank of Gas**

MANUFACTURER'S SUGGESTED RETAIL PRICE \$25,080.00

OPTIONAL EQUIPMENT

- FE 50 State Emissions
- EW LE Package #E Includes:
 - 210 Computer/Throttle Power-Rin Passenger
 - Shifting and Rear Seat Audio Control
 - Shield Airbags for All 3 Rows, D & F
 - Five Side Impact Airbags 16" Alloy Wheels
 - w/215/55R16 all season Tires, Vehicle Stability Control w/traction Control, Rear Disc Brakes, Daytime Running Lights, Windshield Wiper Deicer Grid
- CF Carpet Four Mats/Door Sill Protector 194.00
- CR Cargo Net 83.00
- WN Wireless Headphones (Pair) 82.00

Compare this vehicle to others in the FREE FUEL ECONOMY GUIDE, available at the dealer.

CITY MPG 19 **Fuel Economy Information** **HIGHWAY MPG 26**

Actual Mileage will vary with driving, driving conditions, accessories and vehicle's condition. Actual results may differ. EPA estimates that the majority of vehicles with these estimates will achieve between:

2005 SIENNA LE FWD 8-PASS. DISP. 3.3LITER DISP. DOHC V6-1 ENGINE 5-SPEED ECT-4 AUTOMATIC TRANSMISSION

Estimated Annual Fuel Cost: \$1,255

For Comparison Purposes, all vehicles classified as 5-SEAT PURPOSE have been tested mileage mileage ranging from:

11 to 26 mpg city and 14 to 31 mpg highway.

DELIVERY, PROCESSING AND HANDLING FEE 565.00

TOTAL \$28,867.00

Dealer Name: Address: 45012
City: State: ZIP: 45012
Country: OHIO
CARGO/LOADING CAPACITY: 1500 LBS

Fig: 2 Sample VON layout for the Toyota Sienna 101 Sedan

The Insurance Institute for Highway Safety used VINs from crash reports to access information about optional side airbags in vehicles involved in side impact crashes for the study on the efficacy of such airbags (Braver and Kyrchenko, 2004). The process, which involved getting information from multiple manufacturers, was somewhat time consuming but it illustrates how additional information can be obtained starting with VINs.

Other than vehicle manufacturers, two organizations in the United States have continuing access to VON information: the National Insurance Crime Bureau (NICB) and ProQuest Automotive. NICB gets a variety of information that relates VINs to detailed information on vehicle specifications from most manufacturers. From “major” manufacturers they get three pieces of information: VIN specifications, VONs, and shipping records. The combination of the three pieces allows identification of the year, make, and model of the vehicle as well as the colour and other optional features. This kind of detailed information facilitates the recovery of stolen vehicles reported by insurers using VINs to identify specific stolen vehicles.

NICB is restricted from sharing this information with anyone except law enforcement personnel, who use it for investigative purposes. According to NICB the quality and quantity of the data vary from manufacturer to manufacturer. The data from some manufacturers provides greater detail than others. Some manufacturers have contracted out the storage

function for these kinds of data, and in these cases it costs the manufacturers each time they access their own data or send it to NICB.

ProQuest Automotive is the new name for the former Bell and Howell Automotive Information Division. ProQuest maintains a very detailed parts catalog database. The manufacturers use ProQuest to distribute parts level details to their dealers. The terms of the ProQuest contracts with the manufacturers limit the users of the database to dealers who can provide valid dealer franchise numbers as a condition of access. After gaining access, the dealer can enter a VIN and get a menu of parts for that particular vehicle that includes information on color, options, trim, and other equipment.

5 Conclusion

This discussion paper identifies a number of issues that need to be addressed if VIN is to be used to reliably identify safety features of vehicles in crash databases in Europe and possibly worldwide. In countries apart from the USA, the use of VIN appears to be quite random and at the discretion of the manufacturer and/or country in the way it gets used. Where regulated, it seems that only details related to the manufacture location and basic vehicle characteristics are specified. In these countries, the use of VIN for identifying safety features onboard a particular feature can only be identified with the assistance of the manufacturer involved.

The USA and Canada mandates the use of VIN and furthermore, requires manufacturers to provide these details to the National Highway Traffic Safety Administration (NHTSA) where it is freely available on a centralised database. While the details provided are only minimal for use in crash analysis, this system at least allows researchers to gain access to VIN independently from relying on the assistance of the manufacturer. The addition of the Vehicle Order Number or VON, does provide additional details, although its widespread use and central availability is not yet mandatory.

5.1 Recommendations

Harmonization across different markets of how manufacturers apply VIN is essential if it is to be useful for identifying safety features on-board particular vehicles. EC DG TREN should therefore set up a committee to develop a uniform approach to a European (or even global) standard for VIN, considering also national laws on data protection. Issues that need to be addressed by the committee should include:

1. an analysis of which safety systems (eg; front and side airbags, pre-tensioners, advanced safety systems, etc) should be coded into VIN to provide maximum benefit to Europe;
2. examining ways in which mass crash databases currently in existence in different countries in Europe can be encouraged to include the VIN to the list of variables they currently collect; and
3. the need for a central body, to provide public access to information describing how VIN codes are assigned, needs to be determined.

Implementation of this recommendation will enable VIN to be used as an effective tool for consistently identifying the presence of safety features of vehicles in crash databases in Europe and around the world.

6 References and Web Resources

Austin T. C., Di Genova F., Joy R. W., Williams L. L. and Hughes R. L., *VIN-Based Lookup Table*, US EPA Draft Report SR97-10-01, 1997 (available at <http://www.sierraresearch.com/reports/sr971001.pdf>).

AIAM, *2000 Passenger Vehicle Identification*, 2000 available at: <http://www.aiam.org/vin/2000VINBOOK.pdf>.

Brave, E. R. and Kyrychenko, S. Y. (2004). *Efficacy of Side-Airbags in Reducing Driver Deaths in Driver-Side Collisions*, American Journal of Epidemiology, 159:556-64

CMVSS 115, available at: http://www.vehicleidentificationnumber.com/canadian_vin.html

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Audi/Volkswagen VIN for North America available at: <http://www.angelfire.com/ca/TORONTO/VIN/VINcode.html>

Honda VIN for Europe available at: <http://www.hondaclub.it/vin.htm>

Ford VIN for Europe available at: <http://www.fordeurope.net/>

Information on VIN microdot technology in Australia available at: http://www.carsafe.com.au/t_05_a5.html#1

Information on Australian VIN available at: <http://www.vicroads.vic.gov.au/vrne/vrninte.nsf/0/4D1CFD1F798BAE20CA256CBE0015F6E2?OpenDocument&Area=%5Bonline+Information+%26+Services%5D>

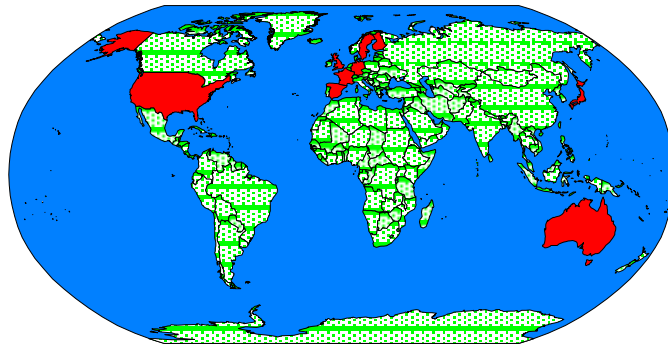
and

<http://www.vicroads.vic.gov.au/vrne/vrninte.nsf/LinkView/76ADE830905A48A0CA256B760008AE55A0E6B550C59A6444204A171BCD2A5F8F>

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Comité Européen des Assurances (CEA)
Prof. Dr. Klaus Langwieder



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Ford Motor Company
Volkswagen AG
Verband der Automobil Industrie (VDA)

Japan

National Organisation for Automotive Safety
and Victims Aid (NASVA)
Institute for Traffic Accident Research and Data Analysis
(ITARDA)

Japanese Automobile Research Institute (JARI)

Spain

Centro Zaragoza, Instituto de Investigación Sobre
Reparación de Vehículos

Sweden

Swedish Road Administration (SRA)
Folksam Insurance Group

United Kingdom

Department for Transport
Loughborough University (VSRC)

USA

Insurance Institute for Highway Safety (IIHS)