

Industry Implementation of Automotive Electronic Stability Control (ESC) Systems

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ABSTRACT

The documented availability of electronic stability control (ESC) systems on passenger vehicles is useful in understanding the integration of ESC technology into the North American automobile market. Unfortunately, the sources that document ESC system availability are not always consistent with each other and many show discrepancies with information from the manufacturers. In this study, the history of the implementation of ESC systems in passenger vehicles is reported based on information combined from several different organizations including the National Highway Traffic Safety Administration (NHTSA), the Insurance Institute for Highway Safety (IIHS), Ward's Auto World, and Consumers Reports. Where discrepancies exist between these different sources of data, clarification was gained through further research of information available from the manufacturer, including corporate press releases, owner manuals, and vehicle brochures. ESC system implementation in vehicles as standard equipment is studied in terms of model year sales volumes, vehicle type, and vehicle manufacturer.

INTRODUCTION

Electronic stability control systems are typically combinations of complex electrical subsystems, mechanical subsystems, and hydraulic subsystems that are designed for a specific vehicle model and configuration. ESC systems monitor the driver's inputs and the vehicle's dynamic state and compare them to previously selected ranges that were determined during the design and development of that specific vehicle. If the combination of these inputs and responses is outside of those ranges, the system's electronic control unit triggers inputs to the vehicle such as wheel specific braking and engine intervention. The level of available intervention to the vehicle's dynamic state is governed and limited by the laws of physics.

The first production vehicle equipped with an ESC system was introduced to the European market by Mercedes-Benz in April 1995 (1). The name for Mercedes' ESC systems is Electronic Stability Program (ESP). Several months later that same year, Toyota introduced the Crown Majesta in Japan with an ESC system named Vehicle Stability Control (VSC) (2). It was the first all-wheel drive vehicle with an ESC system. BMW's first ESC system that activates during all driving situations, Dynamic Stability Control (DSC) III, was introduced during the 1997 model year (3, 4). BMW manufactured systems, DSC I and DSC II, for earlier vehicle models that activated during special braking situations only (5).

The availability of ESC systems on North American passenger vehicles for different models and model years is available through several different organizations including the NHTSA, IIHS, Ward's Auto World, Consumer's Reports, and Automotive News. In many areas, data from these organizations are consistent with each other, but also numerous discrepancies exist between them and with the data from the manufacturers. This study presents a comprehensive implementation history of ESC systems in North American passenger vehicles from the first production vehicle through the 2007 MY. Where inconsistencies were identified by two or more organizations, further research was conducted to determine the vehicles' true implementation history. A table of the implementation of ESC in North America from MY 1996 through MY 2007 for each manufacturer and vehicle model is presented in the Appendix.

In April 2007, NHTSA adopted a new Federal Motor Vehicle Safety Standard (FMVSS) No. 126 that requires manufacturers to install ESC systems on new light vehicles over a phase-in period that begins in 2008 (6). To better understand industry implementation of ESC systems, sales volumes for vehicles equipped with an ESC system as standard equipment are presented for 1996 MY through 2006 MY vehicles. Sales volumes for

vehicles that have an ESC system as optional equipment are not included because those option-specific sales volumes are not publically available. ESC system implementation in the high sales volume vehicles (the top ten vehicles sold for each year from 1996 through 2006) are investigated, and the introductory year that ESC was available in a vehicle class is also discussed. Selected manufacturer phase-in of ESC systems into their product lines is presented.

METHODOLOGY

The methodology for this study is divided into three sections. The first section describes the research performed in determining each vehicle’s ESC system availability. The second section focuses on the approach utilized in analyzing the sales volumes for vehicle models that have an ESC system as standard equipment. Next, the analysis that relates ESC system implementation to sales volumes and vehicle class is discussed.

IMPLEMENTATION HISTORY – The implementation history of ESC systems into North American passenger cars, utility vehicles, and pickups is studied. The general approach was to first create a table for every vehicle model manufactured for each model year, 1996 through 2007.

Using the table of vehicles manufactured, information related to the availability of an ESC system on each vehicle was populated using data available from the NHTSA, IIHS, Consumer’s Reports, Ward’s Auto World, and Automotive News. Availability was noted as standard, optional, not available, or if the vehicle configuration was not manufactured for a given model year.

For entries where availability was not consistent, further research was conducted to determine the actual availability of an ESC system on that specific vehicle. Resources include reviewing owner’s manuals, vehicle brochures, manufacturer press release information, and inspection of exemplar vehicles. The results are representative of the most current information publically available to the authors.

An excerpt of the data entry for the Mercedes SL-Class, MY 1996 through MY 1999, is shown in Table 1. The manufacturer, name used for manufacturer’s ESC system, vehicle model, and configuration are listed on the left. Each manufacturer is separated by a yellow highlighted row. In some instances, as in this example, the vehicle model is highlighted in blue with the different vehicle configurations that were available listed below the blue row. The availability of an ESC system on each vehicle configuration is listed on the right under the model year columns. “S” indicates the vehicle configuration was sold with its ESC system as standard equipment; “O” indicates the vehicle configuration was sold with an optional ESC system; “na” signifies that an ESC system was not available for that vehicle

configuration, and the shaded “X” notes that the specific vehicle configuration was not manufactured for the noted model year. If the availability is noted in blue font, for example “S”, then the ESC system availability was confirmed using an owner’s manual for that specific vehicle configuration and model year. If the availability has a “b” superscript, for example “O^b”, then the availability was confirmed using a vehicle brochure or corporate press release for that specific vehicle configuration and model year.

Table 1. Excerpt of North American ESC System Implementation.

Manufacturer	Model Name	Availability (MY)			
		MY 1996	MY 1997	MY1998	MY 1999
Mercedes	Electronic Stability Program (ESP)				
	SL-Class	O ^b	O ^b	O ^b	S ^b
	SL320	na ^b	na ^b	X	X
	SL500 2dr Convertible	O ^b	O ^b	O ^b	S ^b
	SL55 AMG 2dr Convertible	X	X	X	X
	SL550 2dr Convertible	X	X	X	X
	SL600	S ^b	S ^b	S ^b	S ^b
	SL65 AMG	X	X	X	X

Within the highlighted blue section for the vehicle model, a summary of the availability of an ESC system is noted for the vehicle model. For a given year, if one configuration of a vehicle model has an ESC system standard and another configuration of the same model does not have an ESC system available, then that model is noted in the blue row as having an ESC system as optional equipment. For the SL-Class in MY 1996, ESP was optional equipment for SL-Class customers. For customers that chose to purchase the SL320, an ESP system was not available; an ESP system was available to customers as an option on the SL500; and an ESP system was standard equipment on the SL600.

Vehicle Class Introduction – The first year that an ESC system is introduced to a vehicle class is identified. The vehicle model is identified and its availability, optional or standard equipment, is noted. For this section, vehicles are separated into the following categories: sedan/coupe, compact sport utility vehicle (SUV), full-size SUV, minivan, full-size van, sport utility truck (SUT), compact pickup, and full-size pickup.

High Sales Volumes Implementation – Using the North American ESC System Implementation table in the Appendix and sales volumes available from *Ward’s Automotive Yearbooks* (7-18), the ten vehicles with the highest sales volumes sold in each year from 1996 through 2006 were identified and ranked. Of these high sales volume vehicles, it is noted whether an ESC system was standard equipment, optional equipment, or not available for that particular vehicle model.

YEARLY SALES VOLUMES – The sales volumes of the vehicles manufactured with an ESC system as standard equipment were gathered using the North American ESC System Implementation table and *Ward’s Automotive Yearbooks* from model year 1996 through 2006. In some instances, sales volumes were not available for vehicle model that did not have an ESC

system for all configurations; in other words, the vehicle model had an ESC system as optional equipment. These instances were noted and the total sales volumes for the vehicle model were reported as the upper limit. For the entire analysis using sales volumes, sales volumes of vehicles with an ESC system as standard equipment were used unless noted otherwise.

The data gathered from Ward's Automotive Yearbooks are considered approximate, to the extent that precise volumes are not always known and that a "model year" is considered by Ward's to be from October 1 through September 30; whereas, actual model year designations can vary outside that range. In some instances, ambiguity in sales volume data existed depending on vehicle configuration and the availability of ESC systems as standard equipment. Sales volumes of certain models were not tabulated separately, such as the 2001 Audi A4, which offered an ESC system as an option, and the Audi S4, which had an ESC system as standard equipment. For this example, the ratio of S4 to A4 sales from a later year, where individual data were available, was used to estimate the S4 sales volume for 2001.

As a second example, one vehicle model had an ESC system as standard equipment on four-wheel drive or V8 engine models and as an option on all other models. Sales volumes could be determined by drive configuration or engine selection, but not for combinations of engines and drive configuration; thus making it infeasible to determine if vehicles equipped with both four-wheel drive and V8 engines would be counted twice. In this instance, the numbers of vehicles with either the four-wheel drive option or the V8 engine option were summed. This result was then compared to the total number of units sold with an ESC system, either as standard equipment or as an option, and the lesser number was reported as the approximate sales volume for that model with an ESC system as standard equipment. Using this method, the reported sales volume would only overestimate the actual number of units sold with an ESC system as standard equipment.

Data were not available for relatively low volume, specialty vehicles and they were excluded from the sales volume analysis. These vehicles included models from Bentley, Ferrari, Lamborghini, Maserati, Maybach, as well as special packages such as the Mercedes SLR McLaren.

Once the sales volumes for the vehicles equipped with ESC systems were determined, the total number of vehicles manufactured with an ESC system as standard equipment was determined for each year. These volumes were compared with the total number of vehicles sold for that year. Retail price for vehicles equipped with an ESC system, from market introduction through 2001, are studied. Additionally, the implementation of an ESC system on the annual top 10 vehicles sold in North America was evaluated.

IMPLEMENTATION ANALYSIS – Implementation in terms of yearly sales volumes of vehicles with an ESC system equipped as standard equipment, yearly standard equipment implementation by vehicle class, and in some instances manufacturers were studied. Additionally, retail price of vehicles equipped with an ESC system from its market introduction through MY 2000 are discussed.

Vehicle Type Implementation – The sales volumes of ESC systems equipped in different vehicle types were studied. The vehicles in this section were classified according to their designation in Ward's Automotive Yearbooks. For example, the Cadillac Escalade EXT is a sport utility truck. Ward's classifies this vehicle as a utility vehicle, not a pickup. The Escalade EXT sales volumes are included with the utility vehicles. The vehicle types studied are: passenger cars, utility vehicles, pickups, and vans. Sales volumes and percentage of total sales are reported for each vehicle type from MY 1996 through MY 2006.

Manufacturer Specific Implementation – Several different manufacturers are studied to better understand their implementation phase-in of ESC systems into their vehicles. This phase-in is analyzed based on sales volumes of vehicles equipped with stability control with the manufacturer's entire sales volumes each year.

RESULTS AND DISCUSSION

The results and discussion for this study is divided into three main sections. The first section discusses the North American ESC Implementation table, the first year an ESC system was implemented in a vehicle class, and ESC system implementation on high sales volume vehicles. The industry wide sales volumes of vehicles manufactured with an ESC system as standard equipment are discussed next. Finally, ESC system implementation per vehicle class, in terms of sales volumes and manufacturer specific implementation, is discussed.

IMPLEMENTATION HISTORY – The implementation of the ESC systems into North American automobiles was investigated. The results of this study are summarized in Table A-1 in the Appendix. This implementation data was used in the other analyses described in this study.

The first vehicles to market that had an ESC system available were manufactured by Mercedes-Benz in MY 1996. An ESP system was optional equipment on both the S-Class and the SL-Class. More specifically, Mercedes' ESP systems were standard on the V-12 versions of these vehicles, optional on the V-8 configurations, and not available on the six cylinder configurations. Additional to the S-Class and SL-Class, Mercedes offered an ESP system as optional equipment in 1998 on the C-Class, CL-Class, CLK-Class, and E-Class. An ESP system was not available on a Mercedes SLK until 2001.

Both BMW and Cadillac offered vehicles that had an ESC system available in MY 1997. BMW's first system became available on the BMW 750iL as standard equipment partway through the 1997 model year. In 1998, BMW equipped all 7-Series vehicles with an ESC system and an ESC system was available as optional equipment on the 540i. Cadillac sold three vehicle models in 1997 with an ESC system available: the DeVille, the Eldorado, and the Seville. In 1998, Toyota/Lexus introduced its first vehicles to the North American market; the Lexus GS and the Lexus LS were both equipped standard with an ESC system.

Vehicle Class Introduction – As mentioned in the previous section, the first passenger cars sold in the North American market were the S-Class and SL-Class Mercedes in MY 1996. Mercedes introduced their first compact SUV to North America in 1998, and in 1999 the M-Class was sold with an ESC system standard. The following year, Toyota/Lexus introduced the first full-size SUVs to be equipped with a standard ESC system: the Toyota Land Cruiser and the Lexus LX470. The first minivans equipped with an ESC system became available in MY 2001. The Ford Windstar and the Toyota Sienna offered an ESC system as optional equipment, and Volkswagen sold the Eurovan with an ESC system as standard equipment.

The first open bed vehicle to be equipped with and ESC system was the 2002 Cadillac Escalade EXT. In MY 2003, the Nissan Frontier was the first compact pickup to have an ESC system available; it was sold as an option. The Nissan Titan and Toyota Tundra were the first half-ton pickups sold with an ESC system available as an option in MY 2004. Also in MY 2004, General Motors sold the first full-size van, the Chevrolet Express Van, with an optional ESC system. The first three-quarter ton pickup that was equipped with an optional ESC system was introduced in 2007, the Dodge Ram Pickup. The vehicle class introduction of ESC systems on vehicles sold in North America is summarized in Table 2.

Table 2. ESC System Implementation – Introduction by Vehicle Class (North America).

MY	Class	Vehicle	S / O
1996	Sedan/Coupe	Mercedes S & SL-Class	O
1999	Compact SUV	Mercedes M-Class	S
2000	Full-Size SUV	Toyota Land Cruiser	S
		Lexus LX470	S
2001	Minivan	Ford Windstar	O
		Toyota Sienna	O
		Volkswagen Eurovan	S
2002	SUT	Cadillac Escalade EXT	S
2003	Compact Pickup	Nissan Frontier	O
2004	½ Ton Pickup	Nissan Titan	O
		Toyota Tundra	O
	Full-Size Van	Chevrolet Express Van	O
2007	¾+ Ton Pickup	Dodge Ram Pickup	O

High Sales Volume Implementation – New technologies are typically phased into lower volume vehicles so the technology can reach their greatest level of safety, reliability and effectiveness before they are introduced to high sales volume products. Early phases typically use small volume production lines that have limited manufacturing variations, with some of the hardware already installed on the vehicle, and they are introduced into smaller markets. The systems' effectiveness and reliability are then able to be studied using small sample sizes and limited demographics. The implementation of ESC systems into high volume vehicle was also studied. Using Ward's sales volume data, the top ten selling vehicles for each year ranging from 1996 through 2006 were identified. Then, using the North American ESC System Implementation table (Table A-1), the availability of an ESC system on a particular vehicle for a given year was noted. The implementation of ESC systems on the top ten vehicles sold is summarized in Table 3.

Table 3. Implementation of ESC Systems on High Sales Volume Vehicles.

Model	1996 Rank	1996 Equipped	1997 Rank	1997 Equipped	1998 Rank	1998 Equipped	1999 Rank	1999 Equipped	2000 Rank	2000 Equipped	2001 Rank	2001 Equipped	2002 Rank	2002 Equipped	2003 Rank	2003 Equipped	2004 Rank	2004 Equipped	2005 Rank	2005 Equipped	2006 Rank	2006 Equipped
Ford F-Series	1	na	1	na	1	na	1	na	1	na	1	na	1	na	1	na	1	na	1	na	1	na
Chevy C/K - Silverado	2	na	2	na	2	na	2	na	2	na	2	na	2	na	2	na	2	na	2	na	2	na
Toyota Camry	7	na	3	na	5	na	3	na	4	na	5	na	4	na	4	na	4	na	3	na	3	na
Ford Explorer	3	na	4	na	3	na	4	na	3	na	4	na	3	na	6	na	6	na	8	na	8	na
Honda Accord	6	na	6	na	4	na	6	na	5	na	3	na	5	na	5	na	5	na	5	na	6	na
Dodge Ram P/U	5	na	7	na	6	na	5	na	7	na	6	na	6	na	3	na	3	na	4	na	5	na
Honda Civic			8	na	8	na	9	na	9	na	8	na	8	na	9	na	8	na	7	na	7	na
Ford Taurus	4	na	5	na	7	na	8	na	6	na	6	na	7	na	8	na						
Ford Ranger	10	na	10	na	9	na	7	na	8	na	9	na										
Toyota Corolla													9	na	7	na	7	na	6	na	4	na
Dodge Caravan	8	na			10	na	10	na	10	na												
Ford Escort	9	na																				
Chevy Cavalier			9	na																		
Ford Focus											10	na	10	na								
Chevy Impala															10	na	10	na				
Chevy Trailblazer																	9	na	10	na		
Chevy Malibu																			9	na		
Chevy Cobalt																					9	na
Nissan Altima																					10	na

In reviewing Table 3, the Ford Focus was the first high volume vehicle that offered an ESC system. For the 2001 Ford Focus, a consumer could purchase the vehicle equipped with an ESC system as an option. The Ford Explorer was the first high volume vehicle to offer an ESC system as standard equipment in MY2005. In 2002, three of the top ten vehicles sold had an ESC system available as an option. In 2003 through 2006, two vehicle models each year had an ESC system available.

Both manufacturing limitations and design and engineering limitations make it impractical to simply introduce a complex technology such as ESC instantly in millions of vehicles. Typically, years are needed to design a new technology, to develop that technology, and to develop manufacturing capacity for mass production of that technology in a vehicle.

YEARLY SALES VOLUMES - In 1996, the Mercedes S600 and SL600 were the only vehicles sold in North America with an ESC system as standard equipment. According to the data available, a total of 1,000 units were sold, in both two-door and four-door variants.

with an average retail price of \$129,128. This volume represents approximately 0.01% of all passenger cars and light trucks sold in North America in 1996. For MY 1997, ESC systems were introduced as optional equipment on certain models by Cadillac and Mercedes, as well as BMW for a portion of the year, but the models with an ESC system as standard equipment remained the same, with sales volumes and average retail prices similar to 1996.

In MY 1998, over 100,000 vehicles were sold with an ESC system as standard equipment, representing 0.7% of all North American sales. Manufacturers offering vehicles with an ESC system as standard equipment included BMW, Cadillac, Lexus, and Mercedes. In 1999 the total number of vehicles sold with an ESC system standard exceeded 175,000, or 1.1% of all North American sales. The average retail price of these vehicles was \$69,531, nearly half the 1996 value. The average retail prices for vehicles sold with an ESC system as standard equipment from 1996 through 2000 are shown in Figure 1.

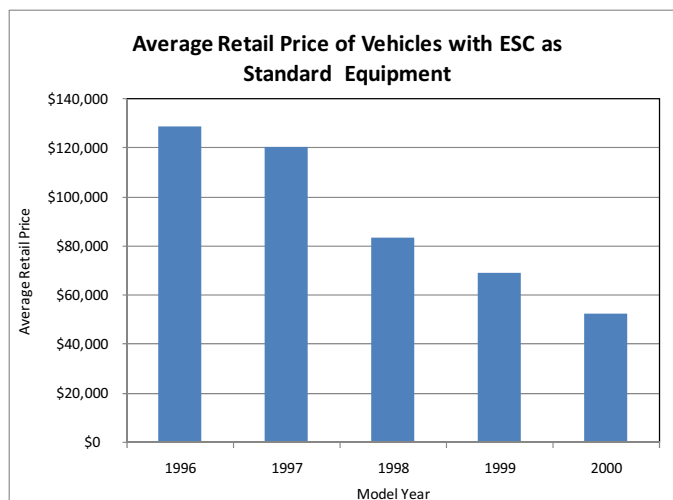


Figure 1. Average Retail Price of Vehicles Sold with an ESC System as Standard Equipment.

In 2002, the number of vehicles sold in North America with ESC as standard equipment approached one million units, or 5.8% of all North American sales. By MY 2006, over 4.5 million vehicles were sold with standard ESC, representing 28.5% of all vehicles sold in North America. Figure 2 and Figure 3 show the number and percentage of vehicles sold with standard ESC for model years 1996 through 2006, respectively.

IMPLEMENTATION ANALYSIS – The implementation of ESC systems into North American automobiles is analyzed for different vehicle types and manufacturers in terms of vehicles equipped with an ESC system and sales volumes. These analyses considered vehicles that were sold with an ESC system as standard equipment.

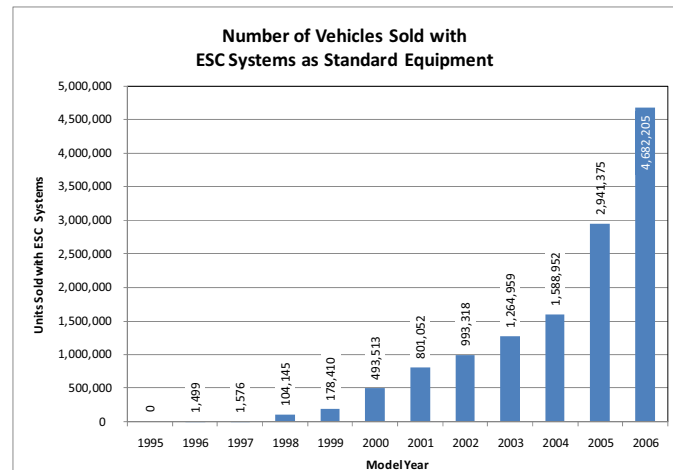


Figure 2. Number of Vehicle Sold with an ESC System as Standard Equipment.

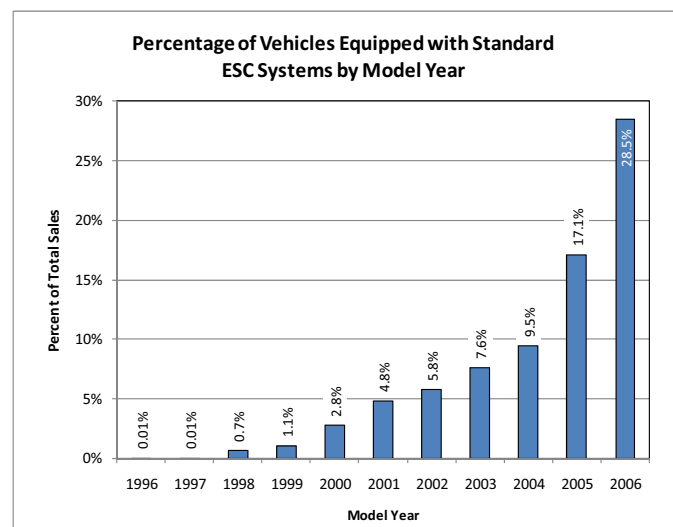


Figure 3. Percentage of Vehicles Sold with an ESC System as Standard Equipment.

Vehicle Type Implementation – Vehicles were classified into four different types: passenger cars, utility vehicles, pickups, and vans. The sales volumes of these vehicle types were tabulated and are shown graphically in Figure 4. Review of these data shows that the total number of passenger cars sold with an ESC system as standard equipment exceeded that of any other type from MY 1996 through MY 2004. However, in MY 2005 the sales volumes of utility vehicles equipped with an ESC system standard outpaced those passenger car sales. By 2006, utility vehicle volumes were nearly double that of passenger car volumes with standard equipment ESC systems. Nearly three million utility vehicles were sold with an ESC system as standard equipment in MY 2006.

These data are presented as percentages in Figure 5, with all light trucks combined. In 2006, 19.4% of all passenger cars and 36.6% of all light trucks sold in North America had an ESC system as standard equipment.

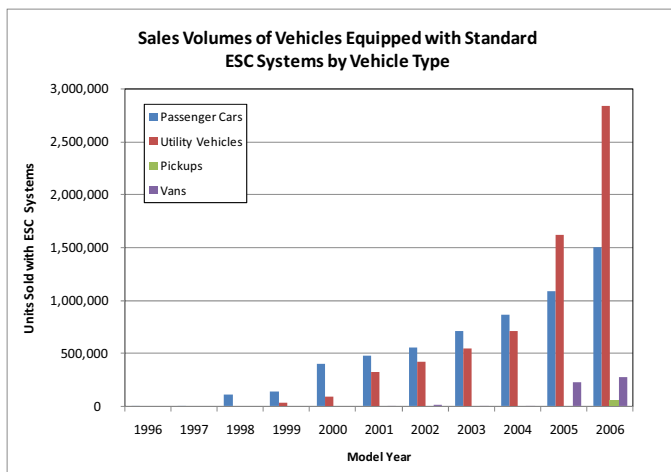


Figure 4. Sales Volumes of Vehicles Equipped with Standard ESC Systems by Vehicle Type.

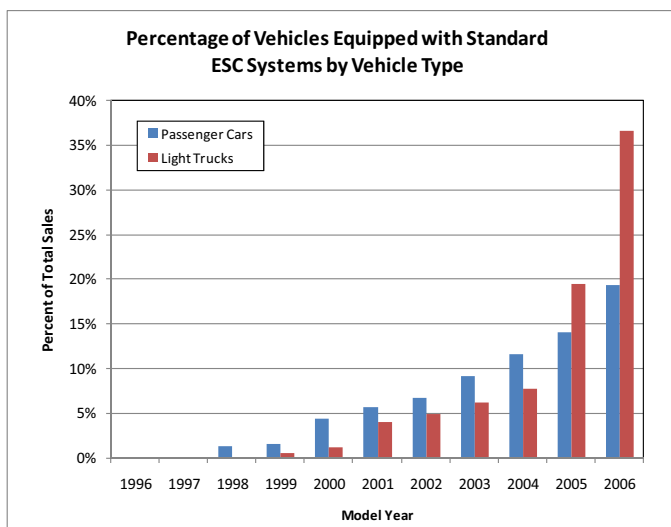


Figure 5. Percentage of Vehicles Equipped with Standard ESC Systems by Vehicle Type.

Manufacturer Specific Implementation – ESC system implementation as standard equipment varies from manufacturer to manufacturer. Many factors affect the phase-in of a new technology including engineering resources, manufacturing capacities, vehicle sales volumes, reliability/field performance, serviceability, and consumer acceptance. Data were compiled for three different manufacturers to understand their technology phase-in. Data for Mercedes, BMW, and Toyota/Lexus were compiled; this data includes the total number of vehicles sold in the North American market and the number of those vehicles sold with an ESC system as standard equipment. The total number of vehicles sold and the percentage of vehicles sold for Mercedes, BMW, and Toyota/Lexus with an ESC system as standard equipment are shown in Figure 6 and Figure 7, respectively.

Mercedes' implementation included less than 2000 vehicles for each of the first three years an ESC system was offered, 1996 through 1998. Those units amounted to less than 2% of the total number of vehicles sold by Mercedes. By model year 2000, Mercedes equipped all models with an ESC system as standard equipment

except the SLK. An ESC system was not available on the SLK until 2001. The highest number of Mercedes units sold in a single model year with an ESC system was the total sales volume for 2006, or 244,826 units.

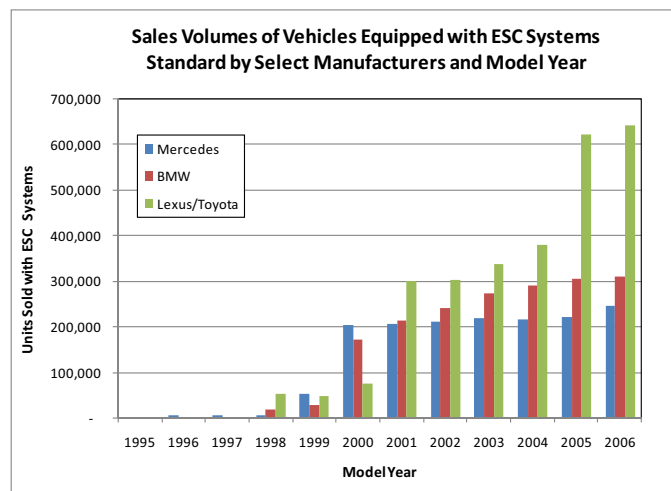


Figure 6. Sales Volumes of Vehicles Equipped with ESC Systems Standard by Select Manufacturers and Model Year.

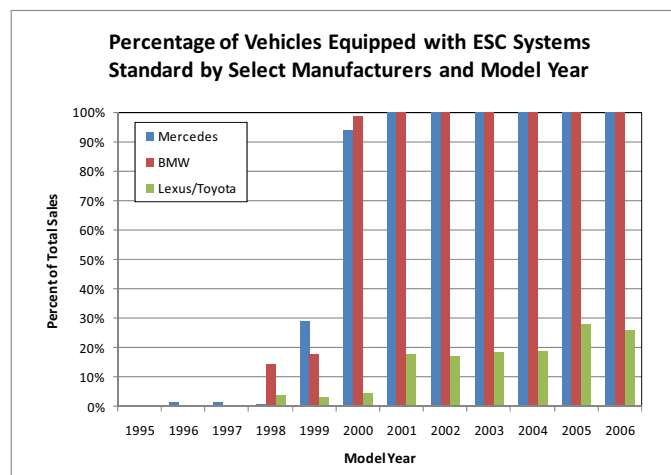


Figure 7. Percentage of Vehicles Equipped with ESC Systems Standard by Select Manufacturers and Model Year.

Implementation by BMW similarly began with relatively low volumes in 1998 and was increased to 100% by model year 2001. According to its own documentation, BMW first introduced DSC III on the 7-Series partway through the 1997 model year.

Toyota's North American implementation of ESC systems as standard equipment began with its Lexus brand in 1998 and included over 50,000 units, more than any other manufacturer for that model year. In model year 2006, the number of Toyota vehicles with an ESC system as standard equipment was over 640,000 units, more than double the number of units sold by Mercedes or BMW. It accounted for 26% of its total sales volumes. Despite the fact that both Mercedes and BMW sold all of their vehicles in North America equipped with an ESC system beginning in 2001, Mercedes and BMW do not have comparatively high volume sales, nor did they, at

that time, sell larger vehicles such as minivans, full-size SUVs, SUTs, pickups, or full-size vans.

CONCLUSIONS

Electronic stability control system implementation into the automotive industry was investigated and a table was created to document the availability of an ESC system for a given vehicle model and model year. Using the table, the first vehicles manufactured with an ESC system available in the different vehicle classes were identified. The implementation of ESC systems in high sales volume vehicles was also investigated. It was shown that ESC system implementation was consistent with a phase-in of ESC technology into lower sales volume vehicles prior to higher volume vehicles. Yearly sales volumes were studied and by 2006, approximately 28.5% of the vehicles sold in North America were equipped with an ESC system standard. Sales volumes reported are an overestimate of vehicles equipped with an ESC system as standard equipment. They do not reflect the number of vehicle sold with an ESC system as optional equipment. When vehicle types were considered, passenger cars were equipped with ESC systems earlier than light trucks. However, sales volumes of light trucks with standard ESC systems ultimately outpaced those of passenger cars. Select manufacturers were studied to learn more about the phase-in of the technology. The phase-in of ESC system technology by lower volume manufacturers (i.e. luxury brands) took five to six years before having 100% ESC system implementation into their vehicle lines. The phase-in for higher volume manufacturers that have a more diverse fleet of vehicles is longer.

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CONTACT

The information in the implementation history table is based on the available information. If inconsistencies are identified in the table with actual industry implementation, please contact the primary author, Nicholas J. Durisek, ndurisek@DynamicAG.com, and provide the updated information with supporting documentation so an amended table can be published.

APPENDIX

Table A-1. North American ESC System Implementation (1 of 18, continued)

Manufacturer	Model Name	Availability (MY)											
		MY 1996	MY 1997	MY1998	MY 1999	MY 2000	MY 2001	MY 2002	MY 2003	MY 2004	MY 2005	MY 2006	MY 2007
Acura	Vehicle Stability Assist (VSA)												
	CL 2.2I/2.3I/3.0I	na	na	na	na	X	X	X	X	X	X	X	X
	CL 3.2L	X	X	X	X	X	O	O	O ^b	X	X	X	X
	Integra - 2 dr	na	na	na	na	na	na	X	X	X	X	X	X
	Integra - 4 dr	na	na	na	na	na	na	X	X	X	X	X	X
	MDX 4dr 4WD	X	X	X	X	X	na	na	S	S	S	S	S ^b
	NSX	na	na	na	na	na	na	na	na	na	na	na	X
	RL 3.5L 4dr	na	na	na	na	S	S	S	S ^b	S	X	X	X
	RL 3.5L 4dr 4WD	X	X	X	X	X	X	X	X	X	S	S	S ^b
	RDX	X	X	X	X	X	X	X	X	X	X	X	S ^b
	RSX 2dr	X	X	X	X	X	X	na	na	na	na	na	X
	SLX 4dr 4x4	na	na	na	na	X	X	X	X	X	X	X	X
	TL 2.5L 4dr	na	na	na	X	X	X	X	X	X	X	X	X
	TL 3.2L 4dr	na	na	na	na	na	na	O	O ^b	S	S	S	S ^b
	TL 3.5L 4dr	X	X	X	X	X	X	X	X	X	X	X	S ^b
	TSX 4dr	X	X	X	X	X	X	X	X	S	S	S	S ^b
AM General													
	H1 2dr 4WD	na	na	na	na	na	na	na	na	X	X	X	X
	H1 4dr 4WD	na	na	na	na	na	na	na	na	na	na ^b	na ^b	X
	H2 4dr 4WD	X	X	X	X	X	X	X	na ^b	na	na ^b	na ^b	na
	H2 SUT 4dr 4WD	X	X	X	X	X	X	X	X	na	na	na ^b	na
	H3 4dr 4WD	X	X	X	X	X	X	X	X	X	X	O	S ^b
Aston Martin													
	DB7 Coupe	X	na	na	na	na	na	na	na	X	X	X	X
	DB7 Volante Convertible	X	na	na	na	na	na	na	na	X	X	X	X
	DB9 - 2 dr	X	X	X	X	X	X	X	X	X	na	S	S
	DB9 - Volante Convertible	X	X	X	X	X	X	X	X	X	na	S	S
	Vanquish 2dr	X	X	X	X	X	X	na	na	na	na	na	X
	Vantage V8 2dr	X	X	X	X	X	X	X	X	X	X	S	S
	Vantage V8 Convertible	X	X	X	X	X	X	X	X	X	X	X	S
Audi	Electronic Stabilization Program (ESP)												
3		X	X	X	X	X	X	X	X	X	X	S ^b	S
	A3 Station Wagon	X	X	X	X	X	X	X	X	X	X	S ^b	S
	A3 Quattro Station Wagon	X	X	X	X	X	X	X	X	X	X	S ^b	S
4		na	na ^b	na	na	na ^b	O	O ^b	S	S	S	S ^b	S
	A4 4dr	na	na ^b	na	na	na	O ^b	S ^b	S	S	S	S ^b	S
	A4 Cabriolet Convertible	X	X	X	X	X	X	X	S	S	S	S ^b	S
	A4 Cabriolet Quattro Convert.	X	X	X	X	X	X	X	S	S	S	S ^b	S
	A4 Quattro 4dr 4WD	na	na ^b	na	na	na	O ^b	S ^b	S	S	S	S ^b	S
	A4 Avant Quattro Station Wagon	X	X	na	na	na	O ^b	S	S	S	S	S ^b	S
	A4 Avant Station Wagon	X	X	na	X	X	X	X	X	X	X	X	X
	S4 Quattro	X	X	X	X	na ^b	S	S ^b	S	X	S	S ^b	S
	S4 Avant Quattro Station Wagon	X	X	X	X	X	S ^b	S	X	S	S	S ^b	X
	S4 Cabriolet Quattro Convert	X	X	X	X	X	X	X	X	S	S ^b	S ^b	S
	S4 Quattro Station Wagon	X	X	X	X	X	X	X	X	X	S ^b	S ^b	S
	RS4 Quattro 4dr 4WD	X	X	X	X	X	X	X	X	X	X	X	S
6		na	na ^b	na	na	na	O	O ^b	S ^b	S	S	S ^b	S
	A6 4dr	na	na ^b	na	na	na	O	O ^b	S ^b	S	S	S ^b	S
	A6 Quattro 4dr 4WD	na	na ^b	na	na	na	O ^b	S ^b	S	S	S	S ^b	S
	A6 Station Wagon	na	na ^b	X	X	X	X	X	X	X	X	X	X
	A6 Quattro Station Wagon	na	na ^b	na	X	X	X	X	X	X	X	X	X
	A6 Avant Quattro Station Wagon	X	X	X	na	na	O ^b	S	S	S	X	S	X
	S6 Quattro 4dr 4WD	X	X	X	X	X	X	X	X	X	X	X	S
	S6 Avant Quattro Station Wagon	X	X	X	X	X	X	S ^b	S	X	X	X	X
	RS6 Quattro	X	X	X	X	X	X	X	S	X	X	X	X
8		X	na ^b	na	na ^b	O	S ^b	S ^b	S	S	S ^b	S	S
	A8	X	na ^b	na	na ^b	X	X	X	X	X	X	X	X
	A8 Quattro	X	na ^b	na	na ^b	O	S ^b	S ^b	S	X	S ^b	S	S
	A8L Quattro 4dr	X	X	X	X	X	S ^b	S ^b	S	S	S ^b	S	S
	S8 Quattro	X	X	X	X	X	S ^b	S ^b	S	X	X	X	S
Q		X	X	X	X	X	X	X	X	X	X	X	S
	Q7 4dr 4WD	X	X	X	X	X	X	X	X	X	X	X	S
TT		X	X	X	X	na ^b	S ^b	na ^b	S ^b	S ^b	S	S ^b	X
	TT Coupe	X	X	X	X	na ^b	S ^b	na ^b	S ^b	S ^b	S	S ^b	X
	TT Quattro 4WD Coupe	X	X	X	X	na	na ^b	S ^b	S ^b	S	S	S ^b	X
	TT Roadster Convertible	X	X	X	X	X	na ^b	S ^b	S ^b	S	S	S ^b	X
	TT Roadster Quattro Convert.	X	X	X	X	X	na ^b	S ^b	S ^b	S	S	S ^b	X
All-Road		X	X	X	X	X	S ^b	S ^b	S	S	S ^b	X	X
	All-road Quattro SW	X	X	X	X	X	S ^b	S ^b	S	S	S ^b	X	X
Cabriolet		na	na ^b	na	X	X	X	X	X	X	X	X	X
	Cabriolet Convertible	na	na ^b	na	X	X	X	X	X	X	X	X	X
Bentley													
	Arnage 4dr	X	X	X	S	S	S	S	na	na	na	X	X
	Arnage 4dr LWB	X	X	X	X	X	X	na	na	na	na	X	X
	Azure Convertible	na	na	na	na	na	na	na	na	X	X	S	X
	Brooklands 4dr	na	na	na	X	X	X	X	X	X	X	X	X
	Brooklands R 4dr LWB	na	na	na	X	X	X	X	X	X	X	X	X
	Brooklands R Limo 4dr	X	X	na	X	X	X	X	X	X	X	X	X
	Continental GT 2dr	X	X	X	X	X	X	X	X	S	S	S	X
	Continental GTC Convertible	X	X	X	X	X	X	X	X	X	X	X	S
	Continental Flying Spur 4dr 4WD	X	X	X	X	X	X	X	X	X	X	S	S
	Continental R 2dr	na	na	na	na	na	na	na	na	X	X	X	X
	Continental SC 2dr	X	X	na	na	na	X	X	X	X	X	X	X
	Continental T 2dr	X	na	na	na	na	na	na	na	X	X	X	X
	Turbo R/RT 4dr	na	na	na	X	X	X	X	X	X	X	X	X
	Turbo R/RT 4dr LWB	na	na	na	na	X	X	X	X	X	X	X	X
BMW	Dynamic Stability Control III												
3 Series		na	na	na ^b	na ^b	S	S	S	S ^b	S	S	S	S ^b
	3 Series : 318i 2 dr	na	na	X	X	X	X	X	X	X	X	X	X