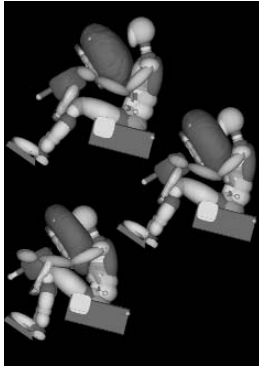


# TECHNICAL REVIEW

**2007 NO. 19**



**MITSUBISHI MOTORS**



- **Cover Photograph**

The cover photograph shows a simulation of the behavior of the driver side dummy of a vehicle equipped with a SRS knee airbag during a frontal impact. The driver side SRS knee airbag instantaneously deploys between the instrument panel and the driver's knees, directly restraining the driver's legs at the very beginning of the collision. Together with the upper-extremity restraint provided by the seatbelt and SRS front airbag, it enhances the efficiency of ride-down (absorption of the kinetic energy conferred on the driver by deformation of the vehicle body). As a result, the driver's kinetic energy is more effectively absorbed.

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# MITSUBISHI MOTORS TECHNICAL REVIEW

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Photo on first page

The "Car School – Sporty Driving Course" is a hands-on safe-driving lesson for customers who drive sporty vehicles. It was held for the first time on October 15, 2006 at Mitsubishi Motors Corporation's R&D Center – Okazaki. The curriculum included full-force braking from high speeds and vehicle control on a slippery surface.

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# **‘Pursuing the Origins of Car Engineering’ is Synonymous with ‘Striving to Satisfy Others’**

**Tetsuro AIKAWA**

Managing Director

Two years ago, we at Mitsubishi Motors Corporation (MMC) established the customer-communication phrase “Pursuing the Origins of Car Engineering” as a way to declare to society and ourselves that we are committed to providing “the utmost driving pleasure and safety” as stated in our corporate philosophy. Here, “the origins” refers to our customer-first approach, our corporate responsibility to society, the car engineering expertise that we have built over the years, and the Mitsubishi uniqueness that our customers expect. And “Pursuing the Origins” reflects our commitment to continuing to offer vehicles and services that meet customer expectations by focusing on what our customers really seek from our products while carrying forward the great resources we have created.

My personal interpretation of our customer-communication phrase is “a quest for the satisfaction of others” or “striving to satisfy everyone around you”, and I characterize the means to achieve this goal as “tireless pursuit of knowledge and technologies”.

I believe the origins of car engineering are all about focusing on how we at MMC can delight and satisfy those around us through the cars that we make. On an in-house level, each employee needs to consider how best to please his or her colleagues at all levels of the company. And on a wider level, each employee needs to consider how best to please customers, distributors, shareholders, and society as a whole.

To turn ideas into vehicles, all of us at MMC need to constantly try new approaches and technologies. New technologies are particularly important; even if we identify new customer needs, we can’t satisfy those needs without the necessary new technologies. In other words, new technologies are crucial for customer satisfaction.

Satisfying other people is far more pleasing than satisfying oneself. In this sense, too, then, satisfying everyone around oneself needs to be fundamental to the way everyone at MMC works. If we are ever in doubt as to which of two options is better, we must take the one that satisfies more people. And if we were ever to make a particular kind of car simply because it was the kind of car we wanted to make, we would probably be the only people satisfied by it. The only way to avoid this outcome is for each of us to be open-minded enough to listen to the opinions of others. The mistaken pursuit of self-satisfaction begins the moment any of us believes we are absolutely right. It is only when we focus on the basic goal of satisfying those around us that our work is worthwhile for our customers.

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Today's automotive technologies offer a host of user benefits. But automobiles are also major causes of traffic accidents and environmental problems. We cannot say that we offer vehicles that satisfy our customers unless we strive to tackle these issues with all our resources. Traffic-accident deaths in Japan are declining thanks to efforts by concerned parties, but there are still more than a million casualties every year. Everyone engaged in automotive development has an obligation to make vehicles that help reduce traffic accidents even further; every accident prevented is a step in the right direction.

This issue of MITSUBISHI MOTORS TECHNICAL REVIEW contains a special feature about MMC's safety initiatives and latest safety technologies.

On the environmental front, global warming is as pressing an issue as exhaust emissions. We at MMC will continue with our efforts to develop cleaner and more fuel-efficient powertrains while accelerating our development of the MiEV electric cars, which we see as the ultimate clean vehicles.

By striving to please our customers with unique vehicles that are built upon our safety technologies, our environmental technologies, and the all-wheel-control technologies that we have used in vehicles such as the LANCER EVOLUTION and PAJERO, we at MMC are truly focusing on the origins of car engineering.

# Continuously Providing Safety through the “Utmost Security” Efforts

Hiroyuki ASADA\* Tetsushi MIMURO\*\*  
Toshiaki FUJINO\*\*

## Abstract

Mitsubishi Motors Corporation (MMC) is making efforts in various aspects of safety to continue providing our customers and society with “utmost security”, the company philosophy. Outlined here are recent automobile safety technologies in the fields of active safety and passive safety, as well as important social issues and activities for promoting safe driving habits.

**Key words:** Traffic Accident, Active Safety, Passive Safety, Education

## 1. Introduction

According to data from the World Health Organization (WHO), almost 1.2 million people die annually (over 3,000 people die each day) in road traffic accidents around the world, and another 20 – 50 million people suffer from injuries. This accounts for 2.2 % of deaths in the world and the estimated cost of traffic accidents on the roads is 518 billion US dollars. With automobile usage continuing to rise, especially in developing countries, road traffic accident deaths are forecast to rise to 2.3 million by 2020, placing it as the third most likely cause of death and injury, above both war and HIV<sup>(1)</sup>. (Table 1)

As realized from the above data, the road traffic accident is the most life threatening manmade disaster, not including disease. In its publication entitled “A 5-year WHO Strategy for Road Traffic Injury Prevention”, the WHO states “Countries need greater commitment to prevention. Provided there is adequate political will, millions of lives could be saved in the coming years”.

## 2. Activities by leading countries and the present status of road traffic accidents

In order to reduce traffic accidents, understanding their main contributing factors, which are interactions between road users, vehicles and the road environment, is necessary and taking a unified approach from all aspects including joint actions of all involved, starting with the government and on through the industry, medical professionals and citizens. Aiming at this goal, the governments of developed countries are now taking the lead in making a strong drive to implement political measures for the reduction of road traffic accidents. In the 50 signatory countries of the Organization for Economic Cooperation and Development (OECD) and European Conference of Ministers of Transport (ECMT), there has been a significant improvement in the conditions of road accidents since 1990. In the period from 1990 to 2004, despite a 30 % increase in the number of

**Table 1** Change in rank order for the world’s 10 leading causes of death between 1998 and 2020

1998	2020
1. Lower respiratory infections	1. Ischaemic heart disease
2. HIV/AIDS	2. Unipolar major depression
3. Perinatal conditions	3. Road traffic accidents
4. Diarrheal diseases	4. Cerebrovascular disease
5. Unipolar major depression	5. Chronic obstructive pulmonary disease
6. Ischaemic heart disease	6. Lower respiratory infections
7. Cerebrovascular disease	7. Tuberculosis
8. Malaria	8. War
9. Road traffic injuries	9. Diarrheal disease
10. Chronic obstructive pulmonary disease	10. HIV/AIDS

registered vehicles in these countries, there has been a 26 % decrease in fatalities and an 8 % decrease in injuries across all the 50 member countries<sup>(2)</sup> (Figs. 1 and 2). However, differences in culture, traffic conditions, and circumstances of the road have given rise to particularities in the accidents occurring across the countries (Fig. 3) despite similarities between them. For the areas of similarities, the United Nations ECE/WP.29 has adopted the global technical regulation (gtr) on vehicle safety, and the individual countries are resolving those areas that are particular to each country through individually planned measures.

### (1) European efforts

In 2002, the ECMT unanimously adopted the program to cut the fatalities caused by traffic accidents to 50 % of the level of 2000 by 2012 (Fig. 1). In response to this, the EU disclosed in 2003 a concrete action program entitled “European Road Safety Action Programme”, which aimed to cut the number of fatalities to 50 % of the 2000 level by the year 2010<sup>(6)</sup>. The program includes the following action items: road safety education and campaigns; implementation of political measures aimed at road users such as license sys-

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\*\* Advanced Vehicle Engineering Dept., Development Engineering Office



tems; implementation of political measures aimed at vehicles such as vehicle inspection systems and active and passive safety technologies; and implementation of political measures concerning road environment maintenance and accident analysis. These action items were updated by the 2006 mid-term follow up review. Especially noteworthy is the initiative called "eSafety" to promote the active safety using advanced communications and electronics technologies. This initiative aims at, amongst other things, increased installation of electronic stability control (ESC) systems as well as promotions for research and introduction of automated electronic accident emergency notification systems (eCall), intelligent speed adaptation (ISA) systems which give a warning when a vehicle exceeds the pre-established speed limit, collision warning/alleviating systems utilizing a 24 GHz short range radar, event data recorder (EDR, see Section 5.3), and a new and improved artificial satellite (Galileo) for fixing vehicles positions accurately.

Also, the EU is leading in making a new pedestrian protection gtr in cooperation with Japan as the second stage action following the directive that came into effect in 2003.

(2) US efforts

The US Transportation Secretary has taken on the challenge of "decreasing the mortality rate on US roads to 1.0 person (per one hundred million vehicle miles) by 2008" (Fig. 1), and in January 2005 the National Highway Traffic Safety Administration (NHTSA) re-released the five-year (2005 – 2009) plan for automobile road safety rules<sup>(7)</sup>. This plan puts forward eight priorities, the main five of which are as listed below:

- ① Decreasing risks to passenger cars due to the increase in sport utility vehicle (SUV) and small truck ownership, and lessening damage from sideways collision with such things as

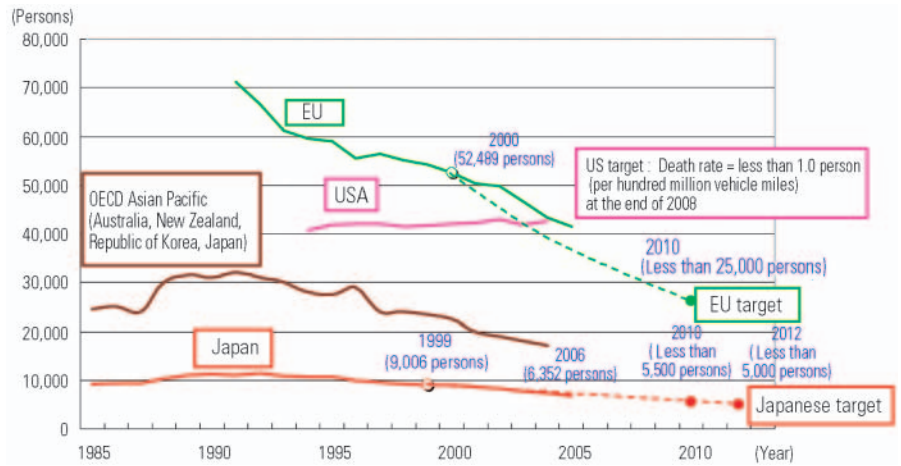


Fig. 1 Change in fatalities and their reduction targets in the three world regions<sup>(2)(3)(4)(5)</sup>

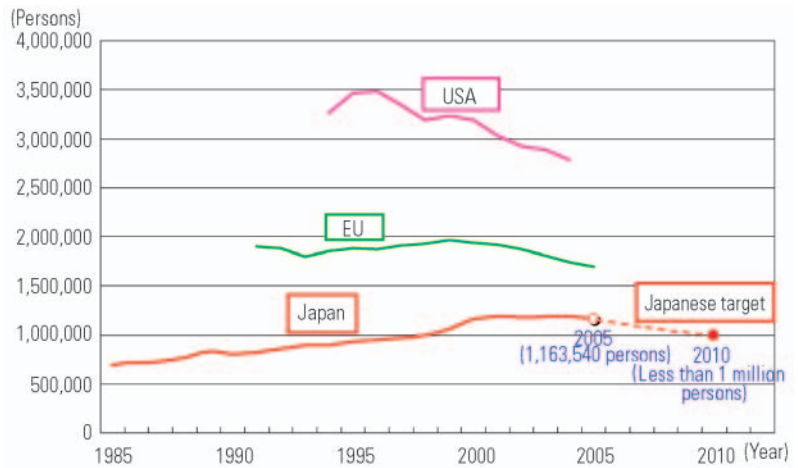


Fig. 2 Change in fatalities and injury accidents and their reduction targets in the three world regions<sup>(2)(3)(4)(5)</sup>

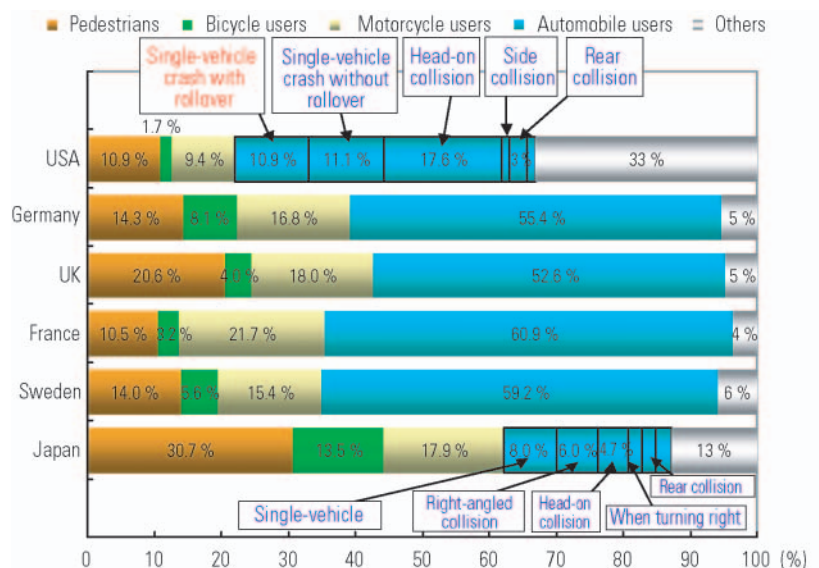


Fig. 3 Fatality by accident type in the six countries (2004)<sup>(5)</sup>

trees and utility poles.

- ② Preventing rollover accidents, the fatalities from which account for 30 % of all deaths, and preventing the ejection of passengers as well as protecting those not ejected during a rollover.
- ③ Accident avoidance and warning functions for passenger cars, improvement of visibility, tire safety, and limiting the decline of drivers' awareness.
- ④ Protection for children in vehicles.
- ⑤ Data collection as a measure to avoid collisions and standard equipment of EDR for later analysis of accident causes.

Also, the USA has taken the initiative in finalizing the world's first global technical regulation (gtr) regarding door latches, and is engaging itself in developing other global technical regulations for headrests and fuel cell powered vehicles.

### (3) Japanese efforts

In 2003, former Prime Minister Junichiro Koizumi declared "Japan aims towards having 'the world's safest' roads (...) with the number of deaths from road accidents halved in 10 years from now". In 2006, the number of deaths was 6,352, the first time in 51 years that this figure has been in the low 6,000s and injuries also decreased showing a trend towards improvement. However, the number of deaths and injuries still showed a high standard (**Figs. 1 and 2**). In March 2003, the Japanese government produced the Eighth Fundamental Traffic Safety Program, in which it set up a program aiming at the following numerical objectives from the viewpoint of a transition into aging of the population with a low birth rate, securing pedestrian safety, raising awareness of traffic safety among citizens, and more utilization of information technologies<sup>(8)</sup>:

- By 2012, to reduce annual road traffic fatalities to less than 5,000 and make Japan's roads the safest in the world.
- By 2010, to reduce annual road traffic fatalities to less than 5,500.
- By 2010, to reduce annual road traffic casualties (fatalities and injuries) to less than 1 million.

In response to setting up of this program, the Automobile Traffic Subcommittee Meeting, Advisory Panel of Road Traffic Policy of the Ministry of Land Infrastructure and Transport of Japan published a report in June 2006, in which the meeting states that it is looking to "have a marked increase in the effectiveness of the active safety measures from 2010 and have a continued decrease in the annual death rate by 2015". In order to come up to this expectation, the following points were decided as vehicle safety plans to be implemented in the coming years:

- ① Dissemination and promotion for increased application of active safety technologies
  - Dissemination of collision mitigation brake systems and promotion for their increased application to large-sized vehicles
  - Full use of drive recorders for analysis of accidents and for effective evaluation of safety technologies (Section 6.2)

- ② Promotion of the development of advanced safety vehicles (ASV) using communications technologies (Section 4.4).
- ③ Promotion of measures against neck injuries (Section 5.1).
- ④ Promotion of the correct use of safety devices
  - ASV technologies (Section 4.4), rear seatbelts, headrests and tire pressure.
- ⑤ Measures for protecting pedestrians and elderly people (Sections 5.1 and 5.2)
  - Promoting development and introduction of global technical regulations (gtr) for pedestrian safety
  - Increased application of brake assist systems and its promotion
  - Promoting development of vehicles that can accommodate the varied physiques and builds of people including elderly drivers.
- ⑥ Introduction of compatibility standards and reinforcing accident analysis means through the use of EDR (Sections 5.1 and 5.3).

The Ministry of Land, Infrastructure and Transport will examine the best methods to implement the above points of the plan (while maintaining an organic unity between the safety standard, ASV promotional plans and car assessment). To the above list, the "measures against drunk driving" was added following the frequency with which tragic accidents have occurred since August 2006 due to drivers under the alcoholic influence.

### (4) Efforts by other countries

As much as 90 % of road traffic accidents that occur around the world are in developing countries. In these countries, the loss and consequential cost to the society constitutes one of the contributing factors to stunting progress. In order to improve the road traffic safety on a world level, the leaders of the eight vehicle manufacturers (including MMC) held a summit meeting as part of cooperation to safety from the private sector at the Geneva Motor Show in February 2006, and agreed that by July 2008 (or by the next vehicle redesign stage) seatbelts are to be installed on all seats in all vehicles sold the world over<sup>(9)</sup>. It is expected that this will substantially improve road traffic safety, particularly in the developing countries where the motorization goes on growing rapidly.

## 3. MMC efforts for road traffic safety

"We are committed to providing the utmost driving pleasure and safety for our valued customers and our community". With this corporate philosophy in mind, MMC is aiming towards a society with minimum traffic accidents. To this end, MMC is developing new technologies in order to provide customers with the safest vehicles and is performing a variety of promotional activities to increase awareness in the safe use of vehicles. It is said that traffic accidents are caused by the 'human', 'traffic environment' and 'vehicle' factors, and out of these, the 'human' factor is mostly contributory to accidents, followed by the 'traffic environment' (**Fig.**