Vehicle Safety Measures for Building a Society Free from Road Traffic Accidents

(REPORT)

The Road Transport Subcommittee of Land Transport
Committee of Transport Policy Council

June 12, 2006

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SUMMARY

SUMMARY

Report by the Road Transport Subcommittee of Land Transport Committee of Transport Policy Council

- Vehicle Safety Measures for Building a Society Free from Road Traffic Accidents –

1. Overview

Traffic Accident Situation Remaining Serious

O Road traffic accidents not only bring about social and economic losses but also deprive families of their bread earners and impose a sudden burden on families to take care of their injured or disabled members .(*1)

O In Japan, nearly 7,000 people lost their lives and over one million people were injured in road traffic accidents during 2005. ***(A pace of one fatality in every 76 minutes and one injured person in every 27 seconds)***

O Road traffic fatalities account for ***90% of the total number of accident fatalities in all traffic modes.***

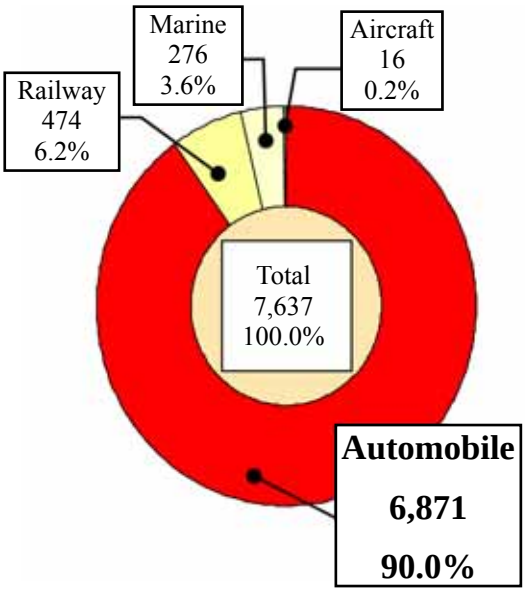
O With road traffic accident victims by far outnumbering the victims of disasters and crimes, ***achieving traffic safety is a vitally important step for building a safe and comfortable society.*** (*2)

(*1) Taken from the 2004 WHO Report.
(*2) Excerpt from the '8th Fundamental Traffic Safety Program'

O Prime Minister Koizumi in 2003 announced the Japanese Government's target to ***reduce the annual road traffic fatality toll by half to no more than 5,000 in 10 years.***

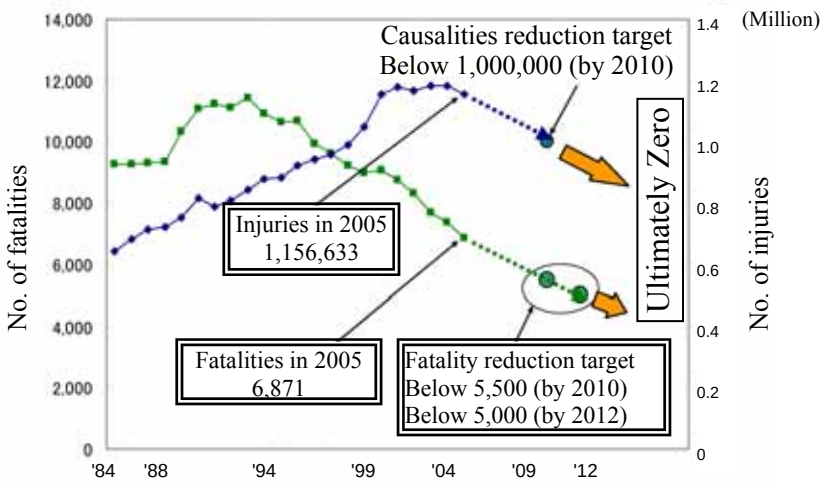
O In its '8th Fundamental Traffic Safety Program', the government identified ***"Building a society having no traffic accidents"*** as an ultimate goal.

Fatalities by Transportation Mode in Japan, 2005



Source: '8th Fundamental Traffic Safety Program'

Road Traffic Fatalities & Injuries



Source: National Police Agency

Note: "Fatality" means a death within 24 hours from the injury inflicted in an accident. According to police statistics for 2004, fatalities within 30 days from accident injury numbered 1.15 times the fatalities within 24 hours. "Causality" include Fatality and Injury.

2. Effects of Vehicle Safety Measures Up to Now

Steady Execution of Measures (Reaching the Progressive Targets for Fatality Reduction)

O The Transport Engineering Council in 1999 set down ***a target to achieve a 1,200 annual fatality reduction in 2010 from the 1999 baseline in terms of fatalities within 30 days from accident injury ("within-30-day fatalities").***

O To reach the target, the following measures were undertaken in view of what had actually taken place in road traffic accidents:

(1) Establish and enforce frontal collision, side collision and other safety regulations.

(2) Enhance the automobile assessment scheme for informing the consumers about the safety performance test results of various vehicle models, using such improved assessment techniques as the total collision safety evaluation(*).

(3) Develop and promote the use of ASVs (advanced safety vehicles), including the ASV technologies commercialized ahead of other countries).

(*) The assessment technique which combines the results of three tests (two types of frontal crash tests and one side crash test)

Fatality Reductions Exceeding the Target

Due mainly to marked improvements in occupant protection in collisions, the previous target to reduce within-30-day fatalities by 1,000 was accomplished in 2003, ***giving rise to the prospect of achieving the 2010 target in 2005 or 5 years in advance.***

Effects of Vehicle Safety Measures (within-30-day fatalities)

	2003	2005 (estimate)
Improved occupant protection in crashes		
Full-lap frontal crash	715	900
Side crash	288	350
Total	1,003	**1,250**

(*) Full-lap frontal crash: Testing the protection of occupants in the head-on collision of a test vehicle into a concrete barrier.

The 2010 target of 1,200 fatality reductions (set in 1999) was reached 5 years in advance

3. Setting of a New Target

As road traffic accidents remain a serious public issue, a new vehicle safety target needs to be set in view of the '8th Fundamental Traffic Safety Program' as follows:

1. Reduction of road traffic fatalities
   - O With the current fatality reduction target (recommended by the Transport Engineering Council in 1999) being reached 5 years in advance, the target will be strengthened by an additional 750-fatality reduction which is about a half of the reduction target set as part of the '8th Fundamental Traffic Safety Program ' in 1999.
   - O To continue fatality reductions into 2010 and beyond, efforts will be exerted to enhance active safety measures.
2. Reduction of road traffic injuries
   - O While no target has been set for the number of the injured, the government will aim to reduce road traffic injuries through the execution of active safety measures and passive safety measures.

New Fatality Reduction Target (within-30-day fatalities)

2010 ***Additional 750 reduction*** (*)

(***The initial 1,200 fatality reduction target is strengthened to a 2,000 fatality reduction*** as compared to the 1999 baseline.)

(*) Roughly half of the reduction target set in the '8th Fundamental Traffic Safety Program'.

Active safety measures will be stepped up to further reduce fatalities in 2010 and beyond.

(ASVs indispensable for reaching this target)

Fatality reductions by vehicle safety measures

	2003	2005 (estimate)	2010 (target)
Full-lap frontal crash	715	900	1,150
Side crash	288	350	600
Offset frontal crash(*) & pedestrian head protection	-	-	50
Future measures	-	-	200
Total	1,003	**1,250**	**2,000**

(*) Offset frontal crash: Testing the protection of occupants in the frontal collision of a test vehicle, only the driver's side of the vehicle comes into contact with an aluminum honeycomb barrier.

-750

New Injury Reduction Target

2010	***Reduction by 25,000*** (from 2005 baseline)
2015	***Reduction by 50,000*** (from 2005 baseline)

Injury reduction target by vehicle safety measure (projection)

	2010	2015
Rear-end collision measures	20,000	40,000
Pedestrian protection measures	3,000	5,000
Other measures	2,000	5,000
Total	25,000	50,000

4. Vehicle Safety Measures

Active safety measures and other vehicle safety measures will be initiated or strengthened without delay.

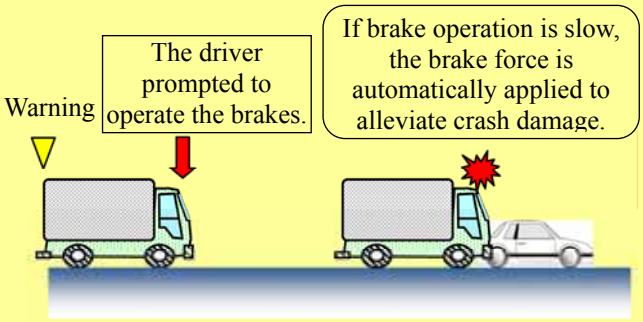
Major Active Safety Measures to be Promoted

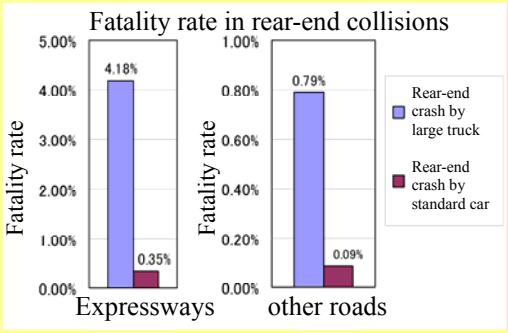
Promotion of damage mitigation brake for heavy duty vehicles

* Heavy duty vehicles tend to cause severe accident damage; for example, their rear-end collisions on highways are a serious public issue.
* Therefore, it is urgently necessary to promote the widespread use of damage mitigation brake for heavy duty vehicles.

Features of Damage Mitigation Brake

Warnings are issued in a crash risk situation. In addition, if the driver's braking response is lagging, automatic braking is activated.





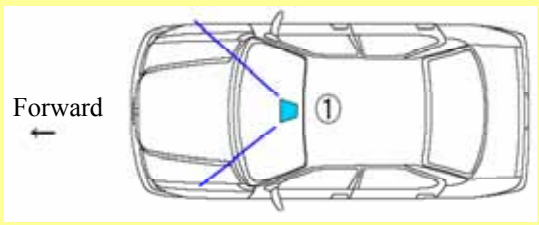
* Some studies predict that ***fatalities in rear-end collisions can be reduced by 90%*** if damage mitigation brakes are installed into heavy duty vehicles so as to lower the crash speed by an average 20 km/h.

Accident analysis by using a drive recorder

* Promote the widespread use of drive recorders to obtain detailed data on factors leading to an accident.
* Drive recorder data will enable quantitative assessment of safety technologies for the promotion of truly effective preventive safety technologies.

Features of Drive Recorders (DRs)

- Equipped with a forward field camera, the DR records the forward view, deceleration and other vehicle data when a certain degree of deceleration (braking) is applied.
- DR-recorded data enable in-depth accident analysis.
- These data can also be used for the safe-drive training of taxi drivers, truck drivers and other heavy duty vehicle operators.



Other Future Measures

In view of the future developments, such as the advancement of information technology and the decrease of younger population, the following measures need to be undertaken jointly by industry, university and government.

(Development of ASVs Using Communication Technology)
For ultimate prevention of accidents including accidents at intersections for which conventional technologies prove less effective:

- Drive-assist systems based on communication technologies will be developed.
- In keeping with the "New IT strategy" decided by the IT Strategy Headquarters in January 2006, the government will take part in the safe driving assist system project for the early commercialization of some of the safety driving assist system technologies.

(Promotion of Neck Injury Prevention Measures)
Neck injuries account for more than a hale of all road traffic injuries, and the percentage of neck injuries is increasing.

- For the reduction of neck injuries from rear-end collisions, efforts will be made to establish a Global Technical Regulation concerning the strength, position, etc. of head restraints and to supply the consumers with relevant information, such as neck protection assessment information on various vehicle models.

(Promoting the Correct Use of Safety Devices)

- In step with the widespread use of ASV technologies, user information will be increased on the correct use of these new technologies.
- The wearing of seatbelts in the rear seats will be encouraged, although seatbelt wearing in the rear seats has remained at a modest 8% wearing rate despite the excellent occupant protection by these seatbelts.
- The proper use of head restraints will be encouraged.
- Information will be spread on the importance of maintaining the tire pressure at recommended levels.

(Safety Measures for Pedestrians and Elders)
As pedestrians account for a large 30% of total road traffic fatalities:

- Efforts will be exerted to formulate and introduce a Global Technical Regulation based on the pedestrian protection performance regulation being drafted by the United Nations.

As the percentage of elders in total road traffic fatalities is predicted to further increase from the current and already significant 25%:

- The use of brake assist systems for aiding physically weak drivers will be promoted.
- Studies will be conducted to develop vehicles suited for the diverse physiques of drivers including elderly drivers.

(Other Safety Enhancing Measures)

- A compatibility regulation relating to the protection of occupants in a collision between vehicles of different sizes will be introduced.
- Accident analysis will be improved by utilizing event data recorders (EDR) which, upon airbag activation for example, record the vehicle behavior during an accident.

MAIN TEXT

FULL REPORT

Since the start of motorization in the mid-1950s, automobiles have become an indispensable means of transporting passengers and cargoes in parallel with living standard elevation and economic expansion. Especially the ownership of passenger cars increased at a rapid pace as the most convenient means of transit. Meanwhile, road accidents, environmental pollution and traffic congestion emerged as serious public problems.

In response, the Japanese government addressed the road traffic safety challenge from three perspectives -- "people" as the constituents of society, "roads" as traffic environment, and "vehicles" as the primary means of transport. With regard to "vehicles", the Transport Engineering Council in 1999 released a recommendation entitled 'Future Road Transport Policy in View of Safety and Environment' (hereafter "Recommendation"), and the government is currently executing various vehicle safety measures on the basis of this Recommendation.

To ensure greater vehicle safety, it is clearly necessary to build closer relations among "people", "roads" and "vehicles" through the development of safer vehicles and the proper use of safer vehicles by owners. This is particularly relevant because road traffic accidents claim nearly 7,000 lives in Japan yearly (as of 2005), while inflicting injuries upon more than one million people annually over the seven consecutive years. Road traffic accidents undoubtedly remain a formidable public challenge.

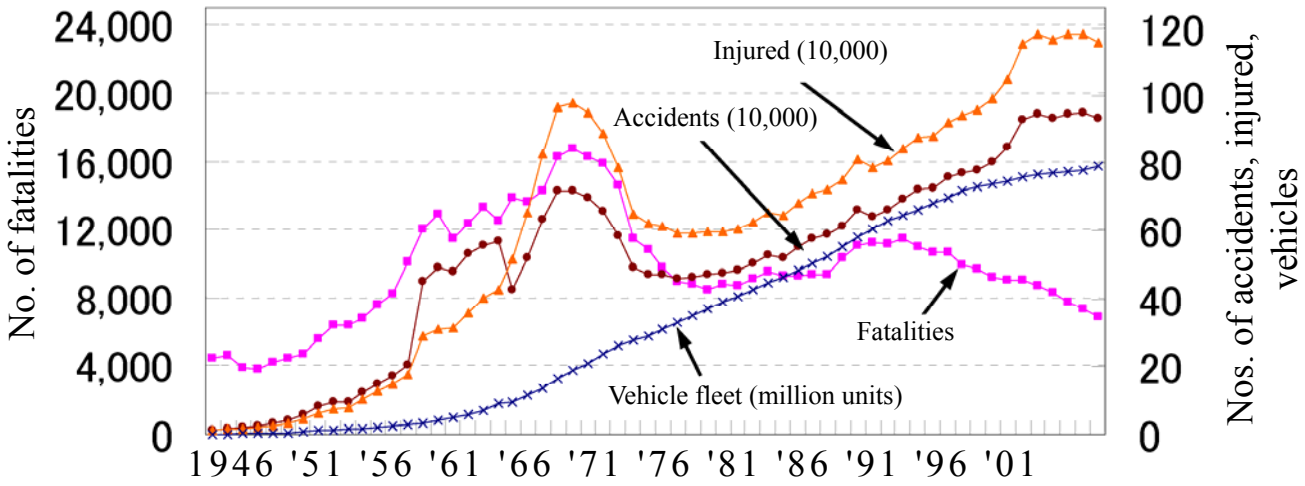
Worldwide, 1.2 million people lose their lives and 50 million more injured in road traffic accidents every year. Accordingly, the World Health Organization in its 2004 'World Report on Road Traffic Injury Prevention' identified road traffic injuries as "a major but neglected public health challenge". The WHO called for worldwide concerted efforts to bring into reality effective and sustainable prevention.

In the present Report of the Transport Policy Council, therefore, interim evaluations and modifications are attempted for the vehicle safety measures hitherto undertaken in accordance with the 1999 Recommendation. Furthermore, additional vehicle safety measures are proposed in order to accomplish the '8th Fundamental Traffic Safety Program'.

Chapter 1: Overview of Current Vehicle Safety Measures and Issues

Section 1: Road Traffic Accidents in Recent Years

In 2005 Japan's road traffic accident fatalities toll was registered at 6,871, falling below the 7,000 mark for the first time in 49 years. However, although recording a moderate decline from the preceding year, the number of road traffic accidents and the number of the injured both remained at high levels in 2005.

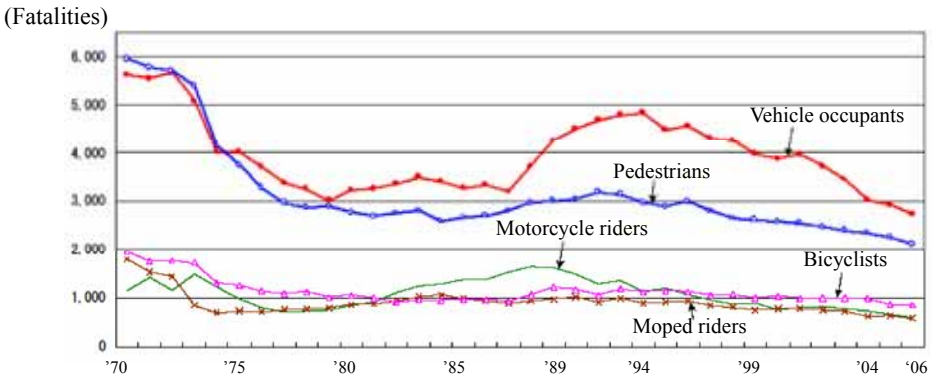


Source: 'Traffic Statistics' (ITARDA - Institute for Traffic Accident Research and Data Analysis)

Fig. 1 Trends of Road Traffic Accidents in Japan

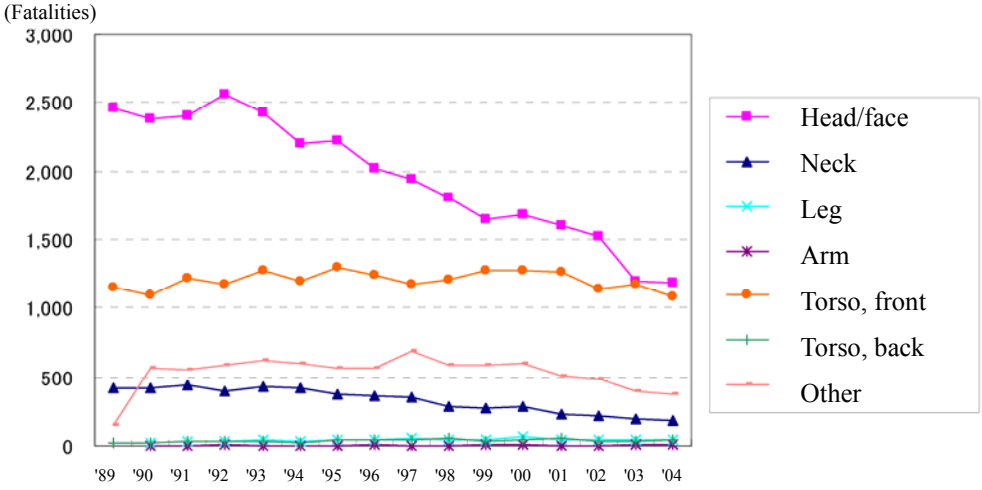
1. Number of Road Traffic Fatalities

- The 6,871 fatalities recorded in 2005 represented a 2,100 decline from the 9,006 fatalities in 1999, the year in which the Recommendation of Transport Engineering Council was released. Thus, road traffic fatalities are on downhill trends.
- The breakdown of fatalities in 2005 indicates that although the most numerous and accounting for about 40% of the total death toll, vehicle occupant fatalities showed a marked decline. The second most numerous group were pedestrian fatalities, accounting for about 30%, a larger percentage share than those recorded in Europe and North America.
- Overall, a marked decrease in fatalities has been registered over the recent years in all accident configurations. Especially focusing on vehicle-alone and head-on vehicle-to-vehicle collisions, which account for a combined share of roughly 75% of total fatalities, the number of fatalities declined about 30% between 2000 and 2004.
- Regarding fatal injury to vehicle occupants, fatalities due to head/face injury have sharply decreased, indicating the effectiveness of passive safety measures.



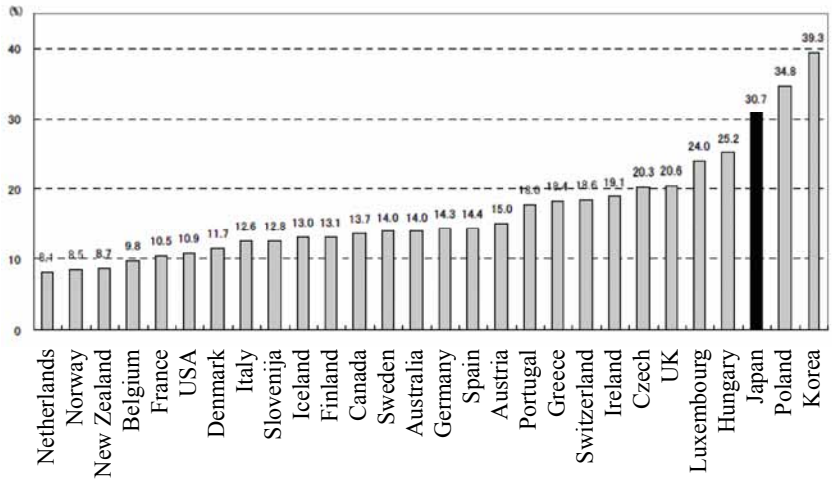
Source: 'Traffic Statistics' (ITARDA)

Fig. 2 Fatalities by Road User



Source: 'Traffic Statistics' (ITARDA)

Fig. 3 Vehicle Occupant Fatalities by Injured Body Part



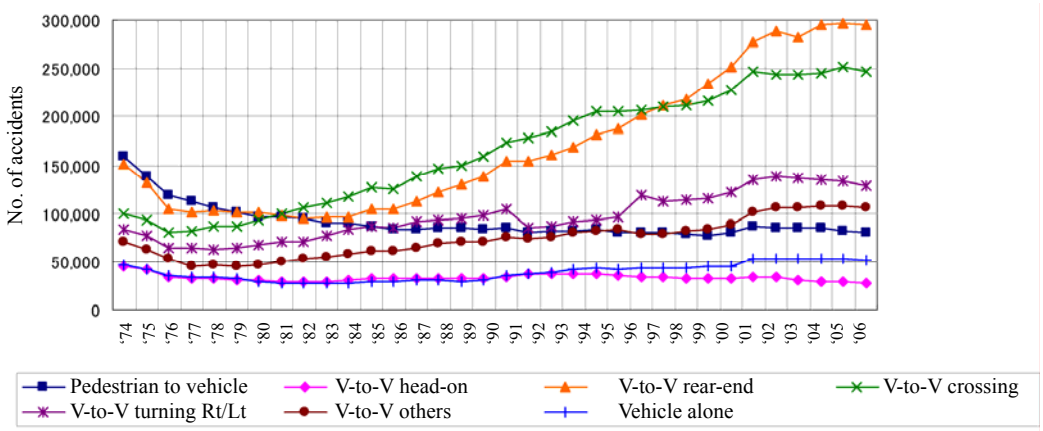
Note: 1. Composed from ITARDA and OECD data.
2. 2004 data, except otherwise indicated in parentheses.
3. Figures indicate within-30-day fatalities.

Source: '8th Basic Plan for Traffic Safety'

Fig. 4 Pedestrian Ratio to Total Fatalities

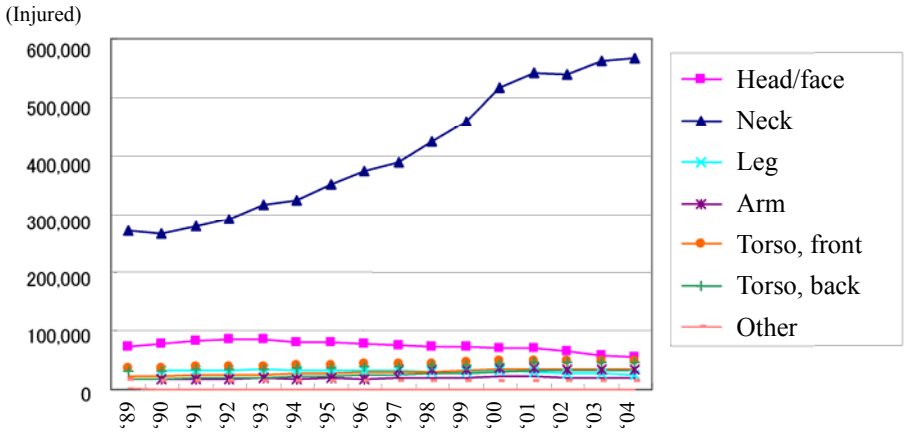
2. The Numbers of Road Traffic Accidents and Injuries

- With the number of road traffic accidents exceeding 900,000 for 6 consecutive years and the number of the injured topping 1 million for 7 consecutive years, the accident situation in Japan remains basically serious and alarming although a slight decline was recorded in those numbers during 2005.
- When comparing 2000 and 2004 data, injuries among vehicle occupants and pedestrians declined among all accident configurations except rear-end collisions and crossing collisions.
- Injuries increased in rear-end collisions and crossing collisions which had long been the two most prevalent accident types. With respect to injury severity, slight injuries and slight disabilities increased markedly.
- Regarding injured body parts, neck injuries recorded a steady increase over the past years and accounted for over half of injuries in 2004. Injuries to other body parts are either leveling off or on decreasing.



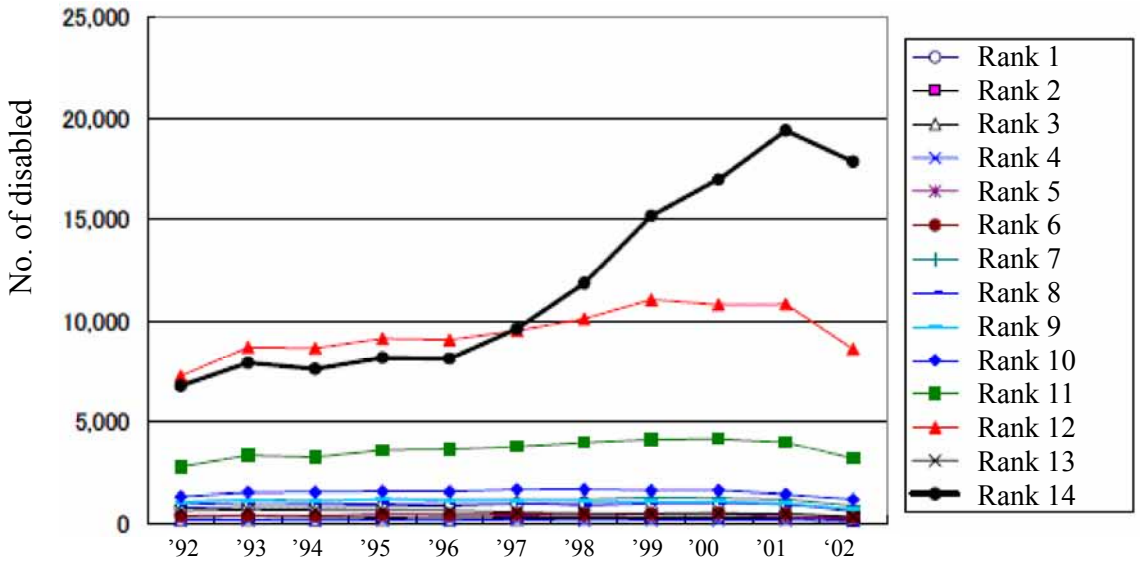
Source: Traffic Bureau, National Policy Agency

Fig. 5 Road Traffic Accidents by Configuration



Source: 'Traffic Statistics' (ITARDA)

Fig. 6 Injured Vehicle Occupants by Body Part



Source: 'Analytical Report on Body Injury Database, 2005', ITARDA

Fig. 7 Number of the Disabled by Severity Rank

Table 1 Definitions of Severity Ranks

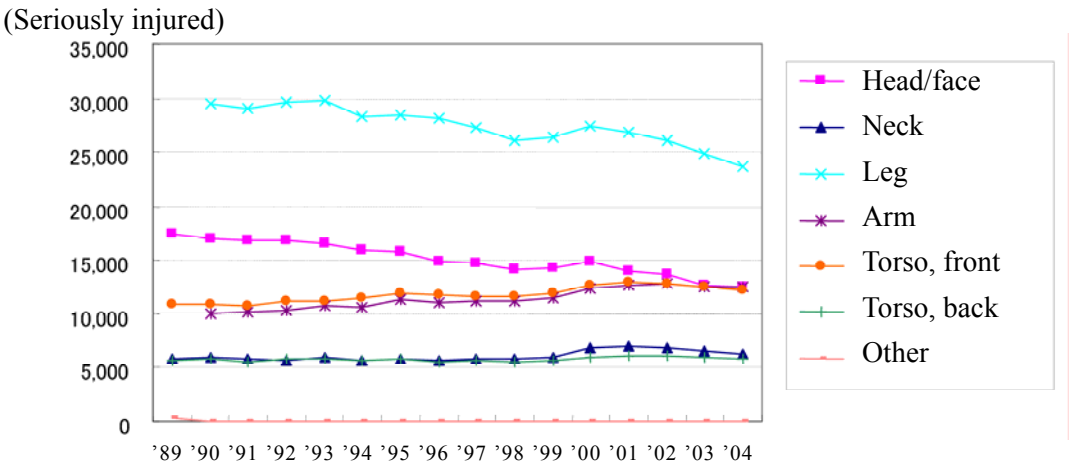
Rank	Severity	Description of disability
Rank 1	Serious	• Loss of sight of both eyes (disability rank 1) • Marked impairment of nervous system or mental function, requiring constant nursing care (disability rank 1 requiring nursing care)
		(Examples) Rank 2 Loss of sight of one eye; the other eye with an eyesight of no more than 0.02 (disability rank 2) Marked impairment of nervous system or mental function, requiring periodic nursing care (disability rank 2 requiring nursing care) Rank 3 Marked impairment of nervous system or mental function permanently disabling to work Rank 5 Marked impairment of nervous system or mental function forbidding all but extremely light work Rank 7 Impairment of nervous system or mental function forbidding all but light work Rank 9 Impairment of nervous system or mental function forbidding many types of work Rank 12 Remaining staunch nervous symptoms in a body part
Rank 14	Slight	• Remaining nervous symptoms in a body part

Source: Enforcement Order for the Automotive Accident Insurance Law

3. Other items

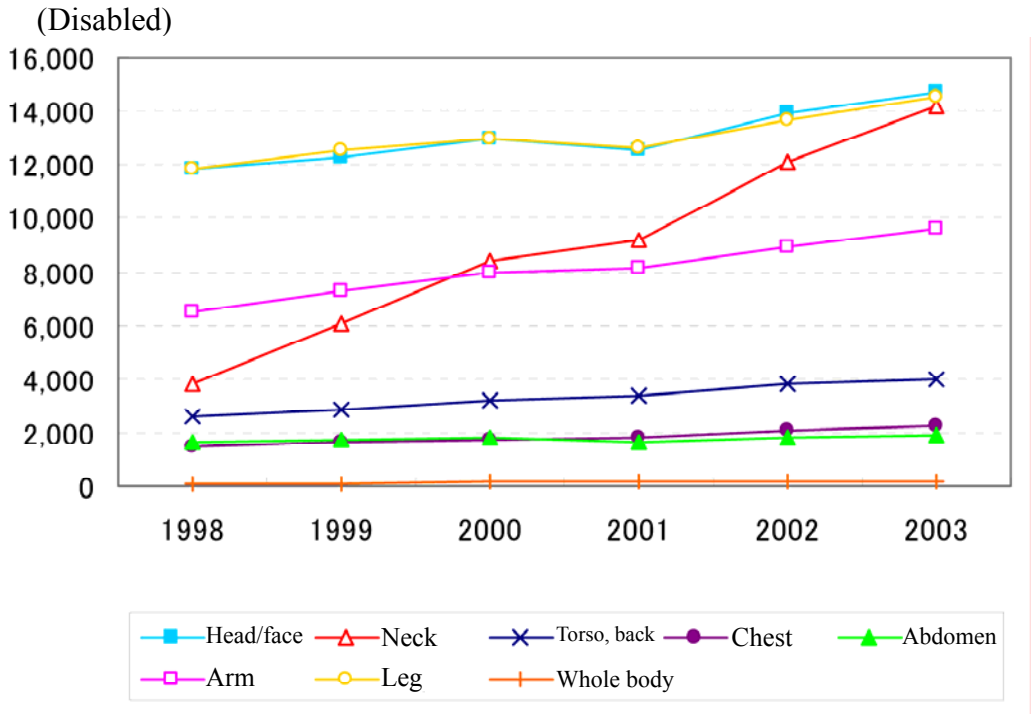
- As for age group breakdown, the elderly have been accounting for a significant percentage of road traffic fatalities. And with the ongoing aging of the Japanese population, the number of fatal accidents involving the elderly is considered to further increase in the years ahead.

- Although on the decrease since 2000, the number of the seriously injured still exceeds 70,000 per year. With respect to injured body parts, the legs account for 32.5% of total serious injuries, following by the head/face, arms, and chest/abdomen in this order.
- The number of the disabled has been going up, led strongly by disabilities caused by neck injury. In 2003, injuries to the neck, head/face and legs were the three most disability- causing injuries, each accounting for about 25% of total disability cases.
- Although the number of accidents involving heavy duty vehicles is not more prevalent than other vehicles, heavy duty vehicle accidents are characterized by the greater severity of damage done. Accidents involving heavy duty vehicles, such as multi-vehicle accidents on expressways, continued to be a public issue over the recent years.



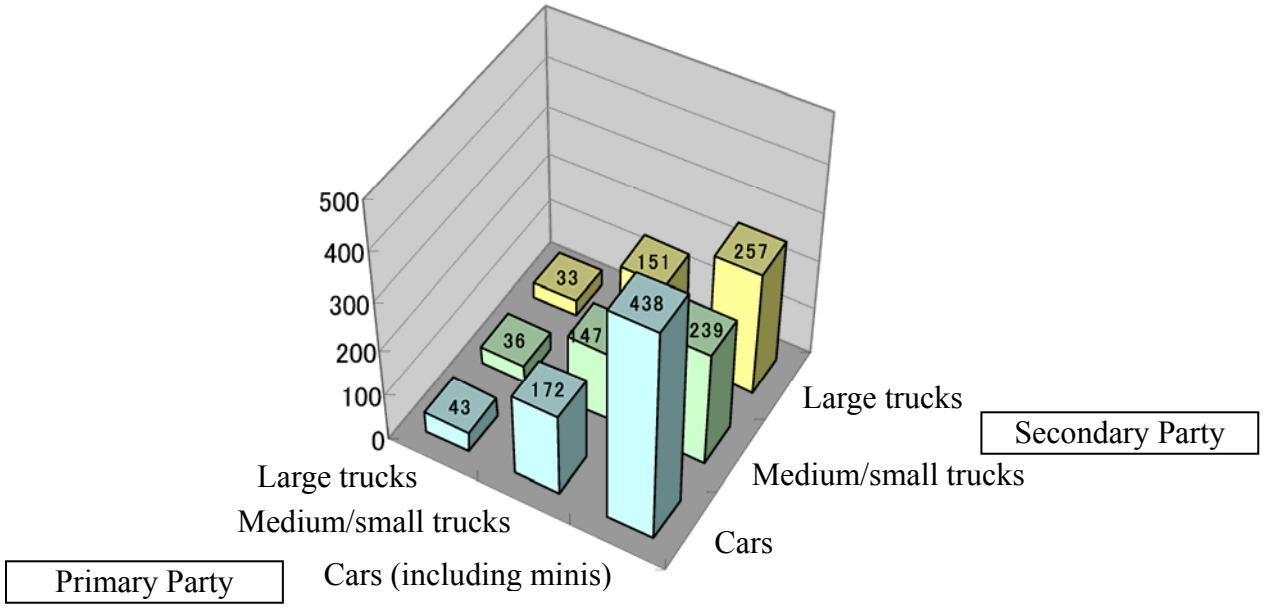
Note: "Seriously injured" means a person injured in a road traffic accident, needing at least 30 days for recovery.
Source: 'Traffic Statistics' (ITARDA)

Fig. 8 Seriously Injured by Body Part



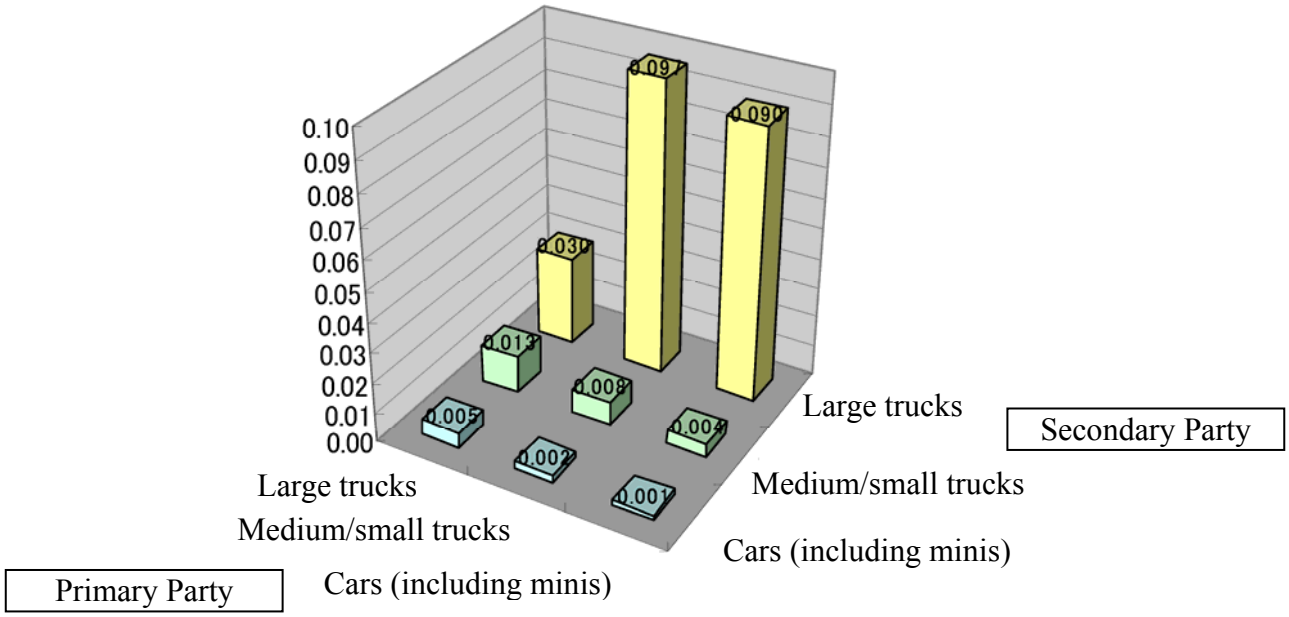
Source: The Marine & Fire Insurance Association of Japan

Fig. 9 Number of the Disabled by Body Part



* Vehicles with a trailer are classified as "large trucks".
* Composed from 2004 'Traffic Accident Statistics', National Policy Agency

Fig. 10 Fatal Accidents by Party Involved, 2004



* Vehicles with a trailer are classified as "large trucks".
* Composed from 2004 'Traffic Accident Statistics', National Policy Agency

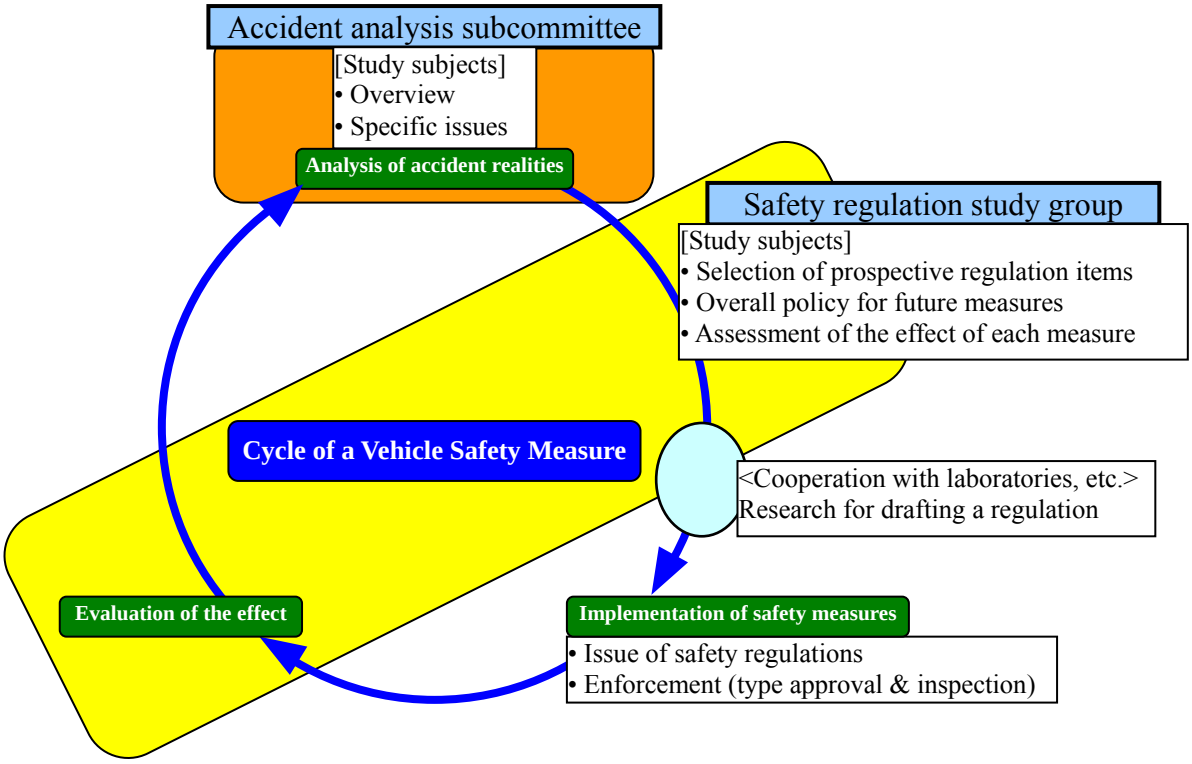
Fig. 11 Fatality Rate per Accident by Party Involved, 2004

Section 2: Achievement of the Target Provided in the 1999 Recommendation of the Transport Engineering Council

In its 1999 Recommendation the Transport Engineering Council proposed as a national target a 1,200 reduction in the annual number of road traffic fatalities (within-30-day) in the coming 10 years or by the target year 2010. To this end, the Council stated, vehicle safety measures should be taken according to the cycle of "setting a target" → "implementing safety measures" → "evaluating the effect".

To promote vehicle safety measures in response to the Recommendation, the Ministry of Land, Infrastructure and Transport carried out technology development projects, enhanced various safety regulations, and improved safety assessment tests. These were done by initiating the safety regulation study group and the accident analysis subcommittee and also by collaborating with the ASV promotion study group and the assessment study group as well.

Based on the Recommendation, vehicle safety measures have been executed in each safety sector according to the cycle of analyzing accident realities → implementing safety measures → evaluating the effect. The two bodies that have undertaken this cycle of actions are the safety regulation study group and the accident analysis subcommittee.

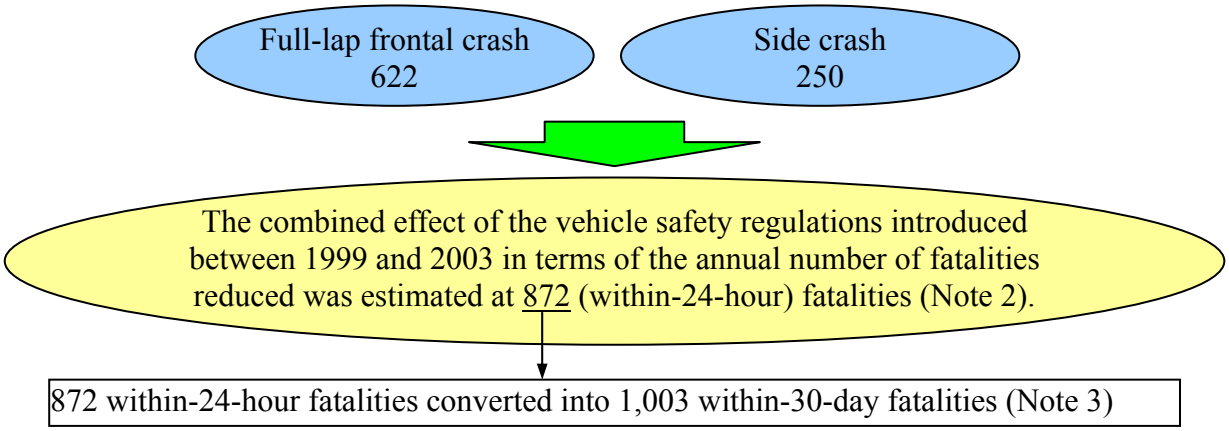


* As an exception to the above working, the technical and social effects of speed limiters forheavy duty vehicles are being assessed by the speed limitation device assessment study group.

Fig. 12 Framework for Safety Measure Cycle Implementation

Evaluation was performed on vehicle safety measures in effect between 1999 and 2003. The evaluation result was that these measures had an effect of reducing the annual number of fatalities by about 1,000. This reduction already exceeded the Recommendation's interim target of a 600 fatality reduction by 2005 and gave rise to a good prospect of reaching the Recommendation's final target of a 1,200 fatality reduction by 2010 years ahead of the schedule.

- The safety regulations introduced since the release of the Recommendation in June 1999 and whose related technologies had been used in a considerable number of vehicles were evaluated for their fatality reducing effects.
- Specifically the safety regulations related to 1) full-lap frontal collisions, 2) side collisions, 3) rear-marking plates for heavy duty vehicles, 4) ABS, and 5) rear underrun protectors for heavy duty vehicles were evaluated. The evaluation results are as follows in terms of the annual number of fatalities prevented by these regulations (Note 1):



* Consequently the interim target of a 600/year fatality reduction by 2005 can be deemed to have been achieved, while the final target of a 1,200/year fatality reduction is well within reach.

Note 1: It was not possible to assess the effects of rear-marking plates for heavy duty vehicles, ABS, and rear underrun protectors for large vehicles.
Note 2: The assessment results may include the effects of factors other than the safety regulations, for example a slowdown in collision speed.
Note 3: According to police statistics, the ratio of the number of within-24-hour fatalities to the number of within-30-day fatalities was 1 to 1.15 in 2004.

Fig. 13 Evaluation of Effects of Safety Regulations

Section 3: The Current Status and Issues of Vehicle Safety Measures

1. The Current Status of Vehicle Safety Measures

(1) The promotion of technology development projects (advanced safety vehicles : ASVs)

- To significantly improve the safety of vehicles, the ASV projection has been undertaken by the concerted effort of industry, university and government for developing new drive assist technologies incorporating information processing techniques.
- While the Recommendation called for early realization of new drive assist technologies, technologies such as crash damage mitigating brakes and adaptive cruise control systems have been commercialized over the past years.
- These were the Japanese technologies introduced into the market for the first time in the world, as their development is still underway in North America and Europe.
- Since these technologies concern the assisting of brake, acceleration and other drive operations in response to the information obtained by onboard sensors, they are called autonomous detection drive assist technologies.
- The important task at the present stage is to spread the actual use of these drive assist technologies in a greater number of vehicles, especially among heavy duty vehicles.
- Furthermore, experiments are underway to develop another type of drive assist technologies making use of communication technology between vehicles, between vehicle and motorcycle, between vehicle and pedestrian for future safety measures.

Table 2　Commercialized Technologies from ASV Project

No.	ASV technology	Status		
		1996	2001	2004
1	High-speed adaptive cruise control (ACC)	☆	☆☆☆	☆☆☆
2	Low-speed adaptive cruise control	☆	☆☆	☆☆☆
3	Lane keep	☆	☆☆☆	☆☆☆
4	Damage mitigation brake	☆	☆	☆☆☆
5	Drowsiness warning	☆	☆☆☆	☆☆☆
6	Rear & side obstacle warning	☆	☆☆☆	☆☆☆
7	Curve warning	☆	☆	☆☆☆
8	Night vision	☆	☆	☆☆☆
9	Parking assist	☆	☆	☆☆☆

☆: In-company test, ☆☆: Road running test, ☆☆☆: Commercial use

* Damage mitigation brake……Using radars or other onboard sensors, this system rapidly anticipates front crash risks and controls the brakes to mitigate crash damage.

(2) Technological guidelines

- If a compulsory safety regulation is introduced quickly after the development of an ASV or another new safety technology, this may limit the diversification and design freedom of the new technology, thereby blocking a further advancement of the technology. Accordingly, it is a common practice to apply an optional guideline until the new technology reaches its maturity so as to facilitate its progressive introduction into the market.
- For example, technological guidelines have been formulated and applied to night vision and crash damage mitigation technologies, proving helpful in increasing the actual use of the new technologies in vehicles.

(3) Safety regulations

- Safety regulations, providing necessary requirements for ensuring the safety of vehicles and automotive components, are a fundamental element of vehicle safety measures. For this reason, a systematic process of accident analysis, regulation formulation, effect evaluation and regulation modification must be performed with continuity and transparency.
- To ensure such a process, the task of formulating safety regulations was entrusted to the private experts comprising the safety regulation study group and the accident analysis subcommittee. To give transparency to the process of regulation formulation, discussion results of the two groups are disclosed to the public while public comments are invited on such occasions as automobile safety symposiums.

Table 3 The Current Status of Safety Regulations

Issue	Summary
Aug. 31, 2001	• Introduction of the speed limitation device regulation for large trucks (mandatory equip)
July 15, 2002	• Introduction of the high-mount stop lamp regulation for passenger cars (mandatory equip) • Expansion of the applicable scope of the underrun protector regulation for trucks (change from not less than GVW 7 tons to over GVW 3.5 tons)
Oct. 25, 2002	• Introduction of the adaptive front-lighting system (AFS) regulation
July 7, 2003	• Introduction of a forward visual field regulation for cars and small trucks • Introduction of an immediate front and side visual field regulation for cars and small/medium trucks
Apr. 20, 2003	• Introduction of a pedestrian head protection regulation for cars and certain small trucks
Dec. 2, 2004	• Prohibition of the attachment of decorative sheets to the windshield
Mar. 10, 2005	• Enhancement of the seatbelt reminder regulation for cars (mandatory equip)
Mar. 31, 2005	• Introduction of the fuel cell vehicle regulation
Dec. 21, 2005	• Introduction of an offset frontal collision regulation for cars and small trucks
Mar. 31, 2006	• Introduction of the fixable child restraint (ISOFIX) regulation • Introduction t of the rear center 3-point seatbelt regulation for cars

Introduction of Safety Regulations according to Accident Data

- With their compulsory power, safety regulations impose additional costs on vehicle users and vehicle manufacturers. Consequently it is necessary to prioritize and select pertinent safety regulation areas through accident analysis and predictive evaluation. For the formulation of safety regulations, it is imperative to draw upon the analysis of accident data and, after its introduction, evaluate the effect of the new regulation in force.
- Based on statistical (macro) data on-site investigation (micro) data, the accident analysis subcommittee analyzes both the overview and specific subjects of road traffic accidents. The subcommittee also studies ways of further improving accident investigation and analysis.
- To more accurately analyze the vehicle conditions and injury mechanisms involved in accidents, accident reproduction experiments are conducted on the basis of micro investigation results. Additionally an injury database is being constructed to address the disability reduction issue of growing importance.
- The results of analyses are not only utilized for the formulation of safety regulations but publicly informed for the advancement of various vehicle safety efforts by research institutes and vehicle manufacturers.

Table 4 Summary of Accident Analysis Types

Macro Statistical Analysis

(Summary)

In addition to the 'driver's license data', the National Police Agency compiles the 'traffic accident data' from police officers' reports using a common form on all road traffic accidents in Japan. ITARDA performs macro analysis on these police data plus the 'vehicle data' and 'road census data' taken by the Ministry of Land, Infrastructure and Transport.

(Example of application)

- Macro analysis results were used in deciding the types of vehicles applicable to mandatory rear reflex reflectors.

Micro Analysis (approx. 300 cases/year since 1993)

(Summary)

With the cooperation of the police, ambulance, hospitals and other similar organizations, ITARDA staff members conduct field investigations on drivers, road/traffic conditions, vehicles, injuries concerning the accidents that have occurred within the district where ITARDA is located. These field data are used as micro data for traffic accident analysis.

(Example of application)

- Micro data were used for formulating frontal collision and side collision test methods.

Specific Micro Analysis (since 1998)

(Summary)

For certain issues of public interest, such as airbags and child restraints, intensive field investigations into accidents (vehicles, injuries, etc.) are conducted in selected areas for a limited period of time, because the existing micro data do not cover a sufficient number of relevant accidents.

Table 5 Specific Subjects of Accident Analysis Subcommittee

	Subjects of specific micro analysis
FY 2001	1) Truck accident realities, 2) Damage to small- physique occupants in accidents, 3) Accidents relating to poor tire maintenance
FY 2002	1) Truck accident realities, 2) Damage to small- physique occupants in accidents, 3) Rear-end collisions
FY 2003	1) Damage to small-physique occupants in accidents, 2) Rear-end collisions, 3) Effects of seatbelt wearing and non-wearing on occupants, 4) Accidents involving elderly, 5) Compatibility
FY 2004	1) Accidents involving elderly, 2) Compatibility, 3) Accidents involving large trucks
FY 2005	1) Rear-end collisions, 2) Crossing accidents (preventive safety), 3) Crossing accidents (damage mitigation)

International Perspective

- In formulating safety regulations, it is necessary to take into consideration the ongoing efforts of offer countries to harmonize their regulations and enhance collaborative relationships among countries in order to answer the growing demand for safety regulations reflecting sophisticated technologies.
- There are two international agreements for the promotion of regulation harmonization and reciprocal type approval -- the 'United Nations Agreement on Reciprocal Recognition of Approvals for Vehicles, Etc. ("1958 Agreement")' and the 'United Nations Agreement on Global Technical Regulations for Vehicles, Etc. ("1998 Agreement")' -- to both of which Japan has been a contracting party. Under the 1958 Agreement, Japan has adopted harmonized regulation items for expanded mutual approval with other contracting party countries. Moreover, since 2000 Japan has been actively involved with the establishment of Global Technical Regulations under the 1998 Agreement. The international harmonization of regulations and the reciprocal recognition of approvals have remarkably progressed over the recent years owing to these Agreements.
- For the formulation of Global Technical Regulations, it is important to quantitatively predict the effect of each proposed regulation on the basis of impartial data. Participants in the drafting of Global Technical Regulations, therefore, must collect accident data in their respective countries.
- With regard to international research activities, Japan is an active participants in the ESV (Enhanced Safety of Vehicles) Conference and the IHRA (International Harmonization Research Activities) Project along with the EU, USA, Australia and other major motorized countries and regions. In addition, Japan is exchanging research information bilaterally with Europe and the USA among other partners.
- In these international activities, Japan has played the leading role in the IHRA and Global Technical Regulation working groups for the drafting of a harmonized pedestrian head protection regulation and pedestrian leg protection regulation. Through active contribution to international research and harmonization activities, Japan has expedited its adoption of harmonized safety regulations.

Reciprocal Recognition of Approvals for Vehicles

Under the reciprocal recognition of approvals scheme, a vehicle approval issued by a country is accepted by other countries, instead of each country having to examine the same model of vehicle. Thus, work redundancies are eliminated for reductions in approval time and expense.

The United Nations establishes harmonized automotive technical regulations (UN/ECE Regulations) and is promoting the reciprocal recognition of approvals scheme under the 1958 Agreement. Specifically, a vehicle model approved to UN/ECE Regulations by a country is accepted also by other countries adopting the same UN/ECE Regulations, without repeating the approval test and documentation procedure.

UN Agreements on Automotive Regulations

International activities relating to the harmonization of regulations and the reciprocal recognition of approval are undertaken by the World Forum for the Harmonization of Vehicle Regulations (WP29) within the United Nations organization.

UN Agreement on Reciprocal Recognition of Approvals for Vehicles, Etc. (1958 Agreement)

- Including European nations, Australia and the Republic of Korea, a total of 45 countries and one region have acceded to this agreement.
- The 1958 Agreement is aimed at the harmonization of safety and environmental regulations for automobiles and at the reciprocal recognition of approvals based on harmonized regulations.
- Japan acceded to the 1958 Agreement in 1998 as the first contracting party outside of Europe.

(Japan's adoption of UN/ECE Regulations)

In 1998 - Adopted 5 UN/ECE Regulations including car brakes and brake lamps.
1999-2001 - Adopted another 12, including side collision and direction indicators.
2002-2005 - Adopted another 13, including lamp installation, tires, theft prevention devices (one regulation resulting simply in the harmonization of texts).
At present - Working to adopt another 4, including seatbelts and child restraints.

UN Agreement on Global Technical Regulations for Vehicles, Etc. (1998 Agreement)

- This agreement was created at the initiative of Japan, the US and Europe. Currently a total of 26 countries (including China, the Republic of Korea and Canada) and one Region of Economic Integrated Organization, the European Community, are contracting parties.
- The 1998 Agreement is aimed at the international harmonization of automotive technical regulations. (It does not provide a reciprocal recognition of approval scheme.)
- Japan acceded to the agreement in 1999.

(Global Technical Regulations (gtr) under 1998 Agreement)

- A resolution has been adopted on 2 gtr items (door latches, motorcycle emission test cycle) and on vehicle categories.
- Discussion is underway on another 13 proposed gtr items including pedestrian protection and car brakes. Additionally, information is being exchanged on another 5 items including ITS and side collision dummies.
- Japan is serving as the chair-country of the 1998 Agreement administration committee, the chair-country of three gtr working groups (including pedestrian protection and ITS), and the technical sponsor of such working groups as hydrogen-fueled vehicles, fuel cell vehicles, and car brakes.

Fig. 14 International Framework for Automotive Regulations & Type Approval

(4) Assessment tests on vehicle safety

- To encourage the development and widespread use of safer vehicles by providing safety information to consumers, an automobile assessment scheme has been in effect to publicly disclose the safety test results of vehicle models in the market and provide explanations of the functions and availability of safety devices. Efforts are made to make assessment information as fair, neutral and transparent as possible.
- Since the Recommendation, the variety of automobile assessment tests has expanded, now including the pedestrian protection test and the child restraint test. Regarding collision test results, the test results of full-lap frontal crash, offset frontal crash and side crash have been integrated to facilitate the comparison of safe vehicle models in relation to collision configurations.
- The establishment of safety regulations and the initiation of crash safety assessment have prompted many models to score high ratings, so that the occupant injury values have come down to below the regulatory limit value by wide margins. Aided by the analysis of accident data, a satisfactory correlation between assessment results and fatality/serious injury rates has been confirmed. The automobile assessment scheme, therefore, proves effective and reliable in supplying useful vehicle safety information to consumers and in reducing accident fatalities and injuries through the mitigation of crash damage.
- Similarly, automobile assessment is implemented in other motorized countries as one of their important vehicle safety measures. Japan participates in the NCAP and other world conferences to bolster international cooperation in assessment activity.

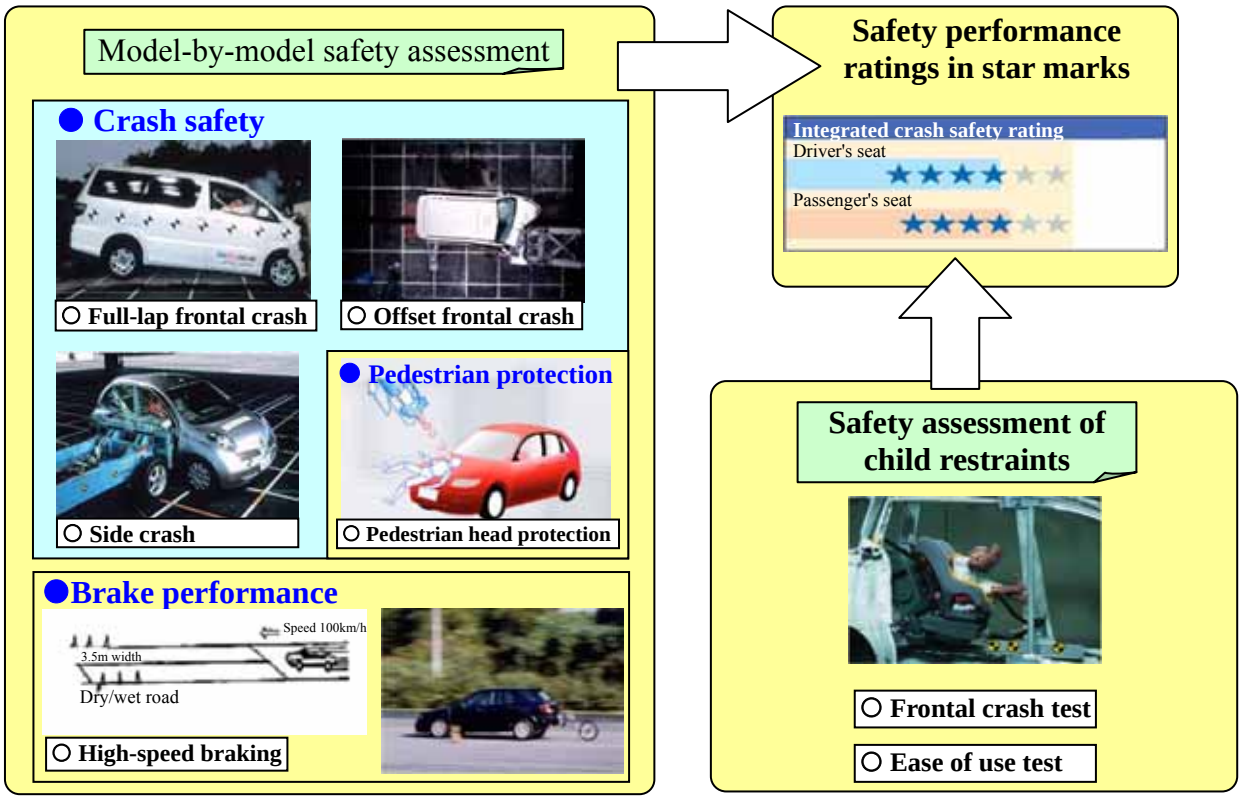


Fig. 15 Profile of Japan's Automobile Assessment

Between the occupant safety assessment period of 2000 and 2005, vehicle models winning the highest 6-star rating sharply increased.

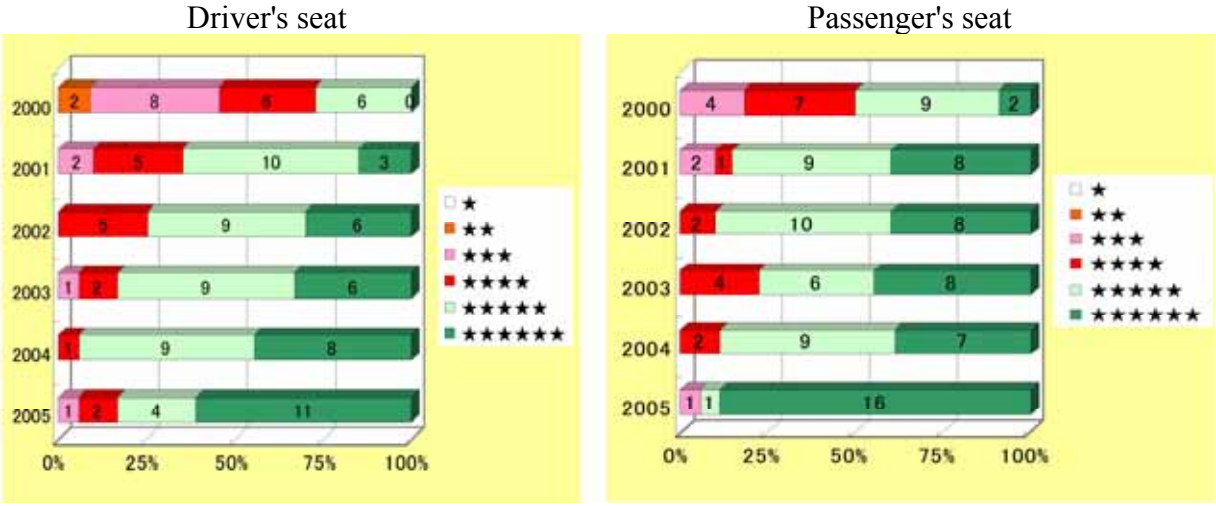


Fig. 16 Number of Models & Assessment Ratings

Table 6 Assessment Institutes & Tests Worldwide

Nation/region	Institute	Assessment test
Japan	Ministry of Land, Infrastructure & Transport (MLIT) National Agency for Automotive Safety and Victims' Aid (NASVA)	1) Integrated crash safety assessment • Full-lap frontal crash • Offset frontal crash • Side crash 2) Pedestrian head protection 3) Brake performance 4) Explanations on safety devices and their availability
USA	National Highway Traffic Safety Administration (NHTSA)	1) Full-lap frontal crash 2) Side crash 3) Roll-over (static, dynamic) 4) Child restraint (ease of use)
	Insurance Institute for Highway Safety (IIHS)	1) Offset frontal crash 2) Headrest performance 3) Bumper performance (prior assessment of low-speed crash repair expenses) 4) SUV side crash into barrier
Australia, New Zealand	Federal/State governments (A-NCAP)	1) Offset frontal crash 2) Side crash (including crash with pole) 3) Pedestrian protection (head, legs)
Europe	EU Commission, UK Ministry of Transport, German Ministry of Transport, etc. (Euro-NCAP)	1) Offset frontal crash 2) Side crash (including crash with pole) 3) Pedestrian protection (head, legs)
Korea	Ministry of Construction and Transport	1) Full-lap frontal crash 2) Side crash 3) Brake performance

(5) Promotion and correct use of safer vehicles and safety devices

- To encourage the widespread and correct use of safety devices, information is supplied to consumers concerning what devices are equipped in which vehicle models and how these safety devices function.
- Additionally, tests have been performed and test results released concerning the occupant protection effect of rear seatbelts and the accident prevention effect of skid prevention devices. The released information includes the injury risks to front and rear seat occupants in case the rear seat occupant does not wear a seatbelt.

2. Current Issues of Vehicle Safety Measures

(1) Measures to date

- The vehicle safety measures implemented in response to the Recommendation have proved generally effective, highlighted by an decrease in the number of fatalities. It is therefore appropriate to continue the safety measures in their execution cycle including research and development, safety regulation formulation and safety assessment testing. At the same time it is necessary to take account of accident data, ensure transparency in the implementation of safety measures, and work closely with other countries.

(2) Accident data and issues for future motorized society

- While road traffic fatalities must be further reduced, the sharp neck injury increases in rear-end and crossing accidents should be stopped. In planning safety measures for the years ahead, it will be imperative to pay attention to the number of the road traffic injuries in addition to the number of fatalities.
- Moreover, given such influencing factors as the large percentage of pedestrians among fatalities, the ongoing population aging and the birth rate downtrend, pedestrian protection need to be enhanced with the following two points taken into consideration:
  I Protection of elderly whose percentage share in pedestrian accidents are expanding.
  II Building of a safe social environment which will facilitate the raising of children by families.
- In addition, accelerated efforts will be necessary to reduce heavy duty vehicle accidents, a rising public issue.
- Motorized countries in North America and Europe continue to give a high priority to the reduction of road traffic accidents, undertaking vehicle safety measures in a systematic manner. From the international perspective, also, it is necessary to give large importance to vehicle safety measures in the hierarchy of overall traffic safety program.

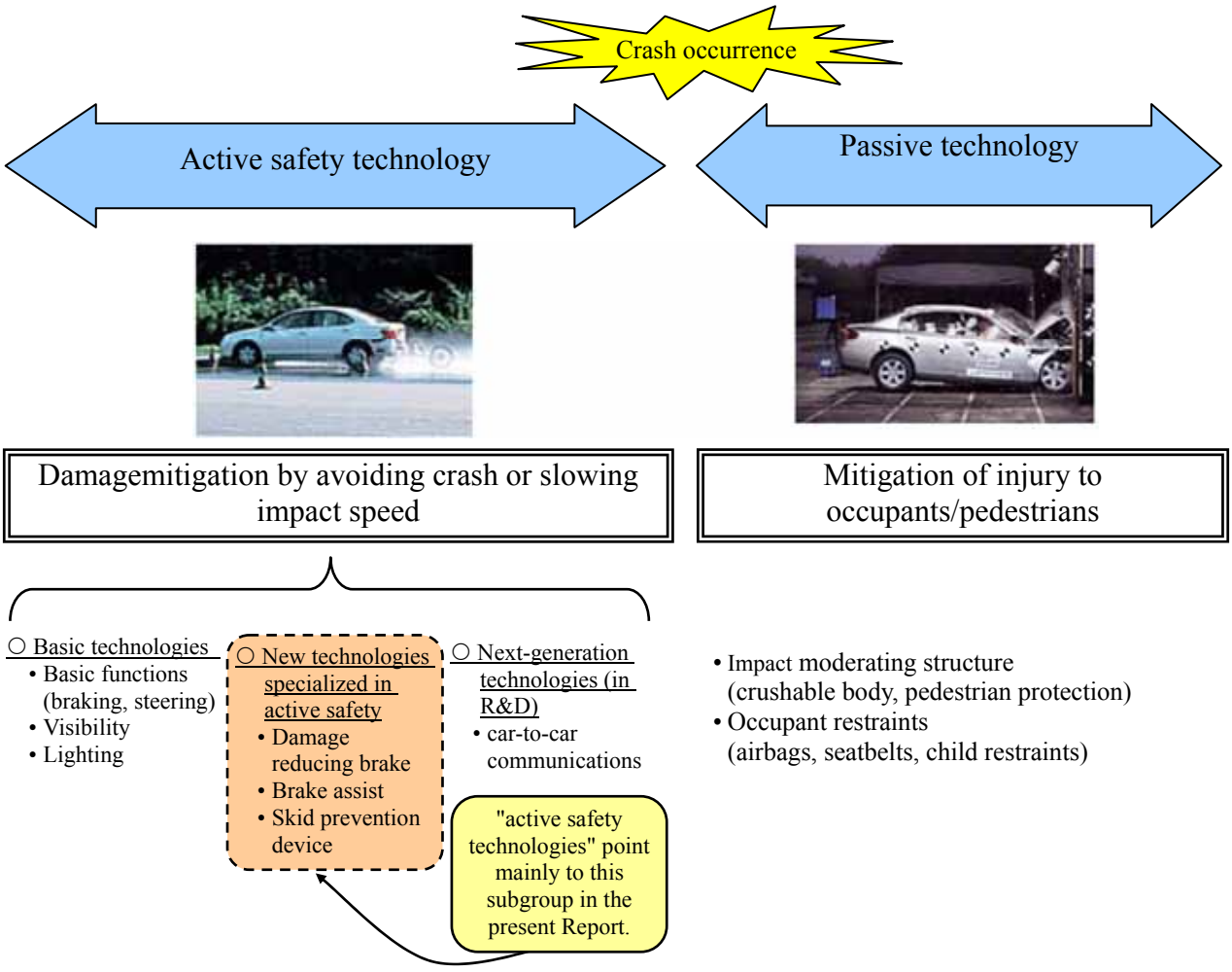
(3) Prevention of accidents (active safety)

- In view of the above (1) and (2) and considering the fact that the current technologies for mitigating crash damage have spread and are nearing maturity, their remaining potentials for the reduction of fatalities and injuries will be diminishing. Consequently the next step will be to introduce more accident prevention (active safety) technologies and push forward with the development of new safety technologies in general.
- Some of the active safety technologies developed as part of the ASV project have been commercialized for the first time in the world. These and other ASV technologies are considered to have significant safety enhancing potential, and their widespread use should be encouraged.

[Reference] Vehicle Safety Technologies -- Terminology

- Vehicle safety technologies can be divided into the following two groups:
  1) Those that are activated before accident in order to avoid a crash or to reduce the impact speed.
  2) Those that are activated upon accident to mitigate injury by moderating the impact, restraining the occupants, etc.
- As group 1) technologies, intended chiefly for accident prevention, are called **"active safety"** technologies with the former term used in the present Report.
- Group 2) is called "crash safety" technologies. To avoid the misconception that crashes can be safe, they are called **"passive safety technologies"** in the present Report.
- Not all safety devices necessarily belong to either of the two groups. The damage mitigation brakes, for example, detect an imminent crash in advance and activate themselves while retracting the seatbelt, thus demonstrating the functions of groups 1) and 2) simultaneously. (In the present Report these brakes are classified as a active safety technology.)
- Although active safety technologies can cover such basic vehicle functions as braking, steering and visibility, the present Report focuses mainly on those active safety technologies that were developed in the recent past.

Conceptual Grouping of Vehicle Safety Technologies



(4) Continuous promotion of active safety measure

- With active safety technologies being introduced into the market, measures need to be taken to facilitate the widespread use of these technologies by considering the following points:
- While the evaluation of safety technologies through accident analysis has been essential part of the road traffic safety measures, it has not been possible to conduct reliable evaluation based on accident data for some of the active safety technologies in practical use.
- One cause of the evaluation failure was the fact that, unlike the effectiveness of passive safety technologies which is evaluated on the basis of accident data, the evaluation of active safety technologies require detailed data on accident-contributing factors as well as on accident-avoiding factors. Most of these data are not accessible by the existing data collection techniques.
- Although the effectiveness of passive technologies is evaluated by selecting typical collision configurations, active safety technologies are required to be capable of discerning driver's complex behavior and the constant changes in traffic conditions. Consequently it has been more difficult to establish a method of evaluating the performance of each active safety device. Especially for the diverse behaviors of drivers, more studies are deemed necessary on the influence of human factors over accidents.
- The above challenges to the smooth development of active safety technologies have been recognized as a ongoing issue in other countries as well.
- Accordingly, if more active safety technologies are to be introduced in to the market, there will be a growing need to introduce new accident analysis techniques and new safety technology evaluation methods. By responding to these needs, it will become possible to encourage the introduction of active safety technologies in addition to the enhancement of passive safety measures.

Chapter 2: Vehicle Safety Measures for the Future

Orientation of Future Vehicle Safety Measures

- The traffic safety policies of the Japanese government for the five-year period between 2006 and 2010 are outlined in the '8th Fundamental Traffic Safety Program'. The medium-term goal set in the Program is to realize the world's safest road traffic condition in Japan, and the ultimate goal is to build Japan into an accident free society. One important area identified in the Program is the "assurance of vehicle safety"; accordingly, it will remain important to formulate measures for providing safer vehicles.
- Countries in Europe and North America also identify the reduction of road traffic fatalities as a social challenge and regard vehicle safety measures as an important approach. It is therefore a global trend to promote vehicle safety measures.
- Additionally, it will be necessary to plan vehicle safety measures better reflecting social changes such as the population aging and the dwindling birth rate.
- To further reduce fatalities and injuries, there are growing prospects for the use of ASV and other advanced technologies in future vehicle safety measures.
- Future vehicle safety measures will be aimed not only at reaching the fatality and injury reduction targets set in the '8th Funcamental Traffic Safety Program' but also at the ultimate goal of evolving Japan into an accident free society.
- For these reasons, future vehicle safety measures will be formulated according to the following course of ideas including the setting of new numerical targets:

Section 1: Introduction of New Numerical Targets

1. The Numerical Target of Road Traffic Fatalities

- The fatality reduction target provided in the Recommendation in 1999 will be revised in consideration of the two items below.
  - I The Recommendation's target of a 600 fatality reduction by 2005 and a 1,200 fatality reduction by 2010 as compared to the 1999 baseline is likely to be reached thanks to the vehicle safety measures in effect. Since the vehicles incorporating these safety technologies will further increase and because new safety measures will be added, a further reduction in fatalities is possible.
  - II Also targeted in the '8th Fundamental Traffic Safety Profram' is the reduction of annual traffic fatality toll down to no more than 5,000 by the year 2012, as formally expressed by Prime Minister Koizumi in his 2003 policy speech. Accordingly, the target for 2010 has been modified to a reduction down to no more than 5,500 fatalities.

- On the other hand, after proving substantially effective, the passive technologies in use are predicted to near their maximum potential. If fatalities are to be reduced at a steady pace in the years following 2010, efforts need to be accelerated for the promotion of active safety technologies designed to prevent accidents and slow down crash impact speeds.
- Consequently the following steps will be taken:
  I The Recommendation's target of a 1,200 fatality reduction in 2010 from the 1999 level will be amended to a "2,000 fatality reduction by vehicle safety measures".
  II The target for 2010 onward will be to achieve greater fatality reductions with the help of active safety measures so that the annual toll will be declining at a steady pace even after 2010.

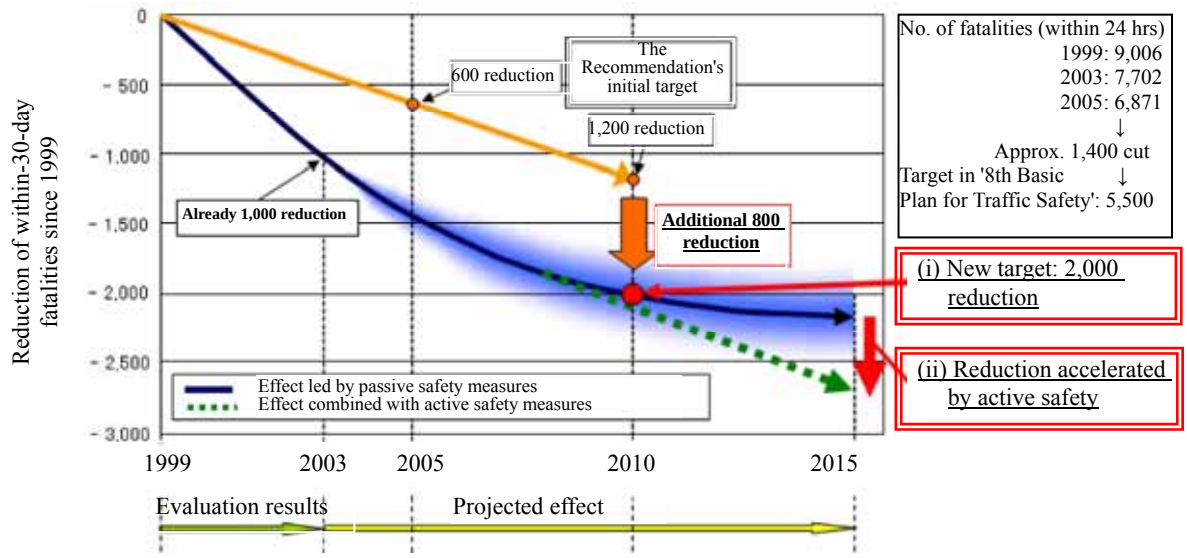


Fig. 17 Schematic of New Target Setting

Table 7 Fatality Reduction Effects of Vehicle Safety Measures (estimates of within-30-day fatalities)

	2003	2005	2010
Full-lap frontal crash	715	900	1,150
Side crash	288	350	600
Offset frontal crash & pedestrian head protection	-	0	50
Future measures	-	-	200
Total	1,003	1,250	2,000

* Recorded numbers for 2003 fatalities

2. The Numerical Target of Road Traffic Accidents and the Injured

- In order to further reduce the number of the injured, a new injury reduction target will be introduced in view of the following realities:
  - I While fatalities are decreasing, the numbers of accidents and injuries have remained at a high level mainly due to an increase in neck injuries from rear-end collisions and in slight injuries.
  - II Provided in the '8th Fundamental Traffic Safety Program' is a target to reduce the number of casualties (fatalities + injuries) to below one million. The casualties in 2005 are estimated at 1.16 million.
- For the annual number of the injured(*), a new target is introduced to achieve a 25,000 reduction by 2010 and a 50,000 reduction by 2015 both as compared to the 2005 baseline.
  - (*) While the '8th Fundamental Traffic Safety Ptrogram' sets a target in terms of the number of casualties, the target introduced in the present Report is in the number of injuries which account for over 99% of casualties.

Table 8 Estimation for Setting the Injury Reduction Target

Accident type	Measure	Reduced injuries	
		2010	2015
Rear-end collision	• Conspicuity improvements by high-mount stop lamps, etc. • Active safety by improved seats, head restraints, brake assist, damage mitigation brakes, etc.	20,000	40,000
Pedestrian	• Visibility improvement by high-brightness headlamps • Brake assist • Pedestrian leg protection (regulation & non-regulatory)	3,000	5,000
Other measures (improved performances of tires, brakes, etc.)		2,000	5,000
Total		25,000	50,000

Note 1. Some experts consider it inappropriate to set an injury number target largely because the number of neck injuries is not likely to decline although their severity may be moderated. There are also reservations that it is difficult to estimate the effect of active safety technologies in numerical terms.

2. Therefore, to make safety estimation possible, it was assumed that the number of injuries will be reduced between 0 and 10% by total measures including visibility/conspicuity improvement, neck injury reduction, rear-end collision reduction, pedestrian protection and the maximum use of these technologies. An injury reduction rate of 5% is assumed for the estimation in Table 8. In introducing specific injury reducing measures, the effect of each measure will be evaluated separately.
3. "Non-regulatory" means measures such as early evaluation and introduction of prospective technologies even before the establishment of a relevant safety regulation.

3. Other Objectives of Vehicle Safety Measures

In addition to the targets of fatality, injury and accident reductions, it is also necessary to formulate vehicle safety measures aimed at various other objectives which are of large public interests or will reflect social changes. With special attention paid to the current status of vehicle safety measures, especially the measures mentioned in Chapter 1, Section 3, 2-(2), and in view of the '8th Fundamental Traffic Safety Program', the following three additional objectives are identified to be aimed at future vehicle safety measures:

1) To promote vehicle safety measures specifically designed to increase the safety of heavy duty vehicles;
2) To introduce vehicle safety measures intended to build a motor society friendly to pedestrians and elders;
3) To formulate vehicle safety measures for reducing serious injuries and disabilities besides the reduction of fatalities and injuries in general.

Section 2: Promotion of Vehicle Safety Measures

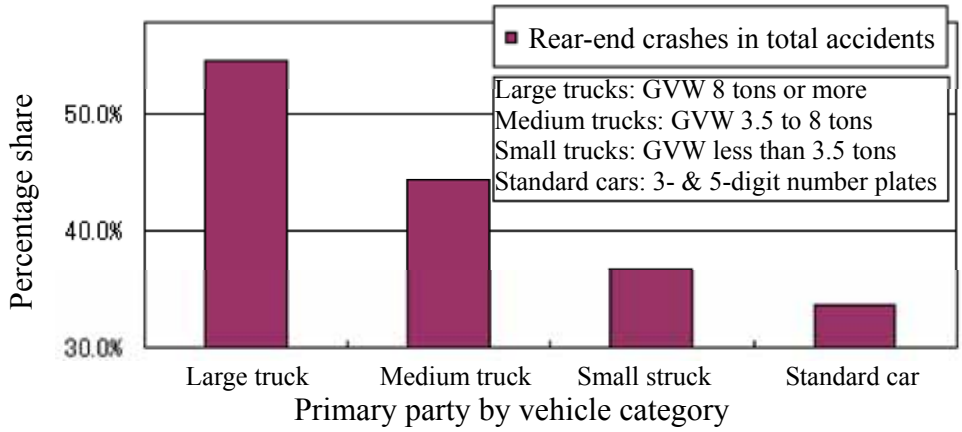
- In light of the fact that the numerical targets set in the Recommendation in 1999 have been virtually achieved, it is appropriate to continue the research and development projects, safety regulation formulation, and safety assessment tests according to the cycle of setting a target → implementing safety measures → evaluating the effect while a) analyzing the accident data, b) cooperating with other countries, and c) ensuring the transparency of the whole process.
- To reach the new fatality and injury reduction targets, vehicle safety measures will be planned on the basis of the cycle concept and in keeping with the following idea:
- To introduce vehicle safety measures that will be easily acceptable to vehicle users and the public in general, it is necessary to determine reasonable priorities and technology introduction techniques and to obtain an optimum mix of safety regulation, ASV promotion and automobile safety assessment.

1. Promotion of Active Safety Technologies

- In order to maintain the fatality reduction pace in and after 2010, it is important to step up the promotion of active safety technology in addition to the passive safety technology which has been effective over the past years.
- Also to achieve the 2010 and 2015 targets to reduce the number of the injured, it is necessary to reduce the number of road traffic accidents by promoting active safety technology.
- Moreover, the promotion of active safety technology is essential for developing the worldclass ASV technologies as a leading element of vehicle safety measures.

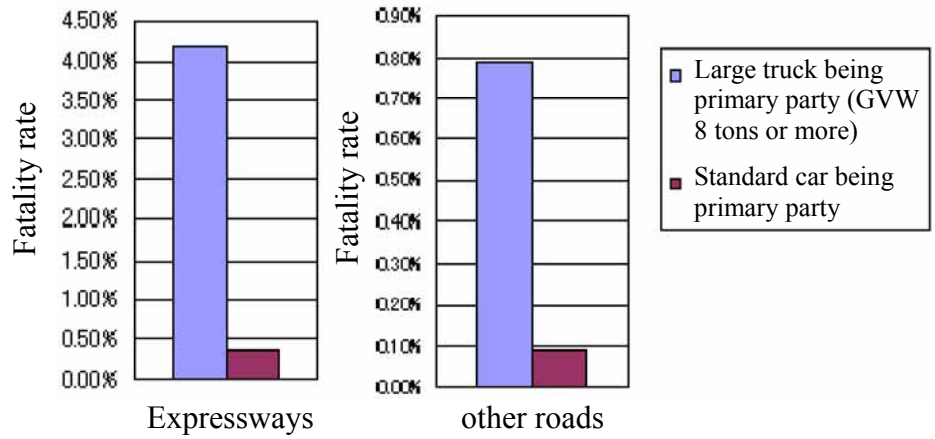
(1) Need for Early Introduction of Measures

- Of specific active safety technologies, those proving to be near maturity, effective in mitigating damage or reducing accidents and high in public demand should be promoted. Measures to realize the early and widespread use of them should be introduced.
- For example, large trucks (GVW not less than 8 tons) account for about 55% of total rear-end collision accidents and record a higher fatality ratio than cars in rear-end collision accidents, thus demanding effective safety measures. There are estimates that rear-end collision fatalities may be reduced by as much as 90% if a 20 km/h slowdown in the average crash impact speed is achieved for heavy duty vehicles by introducing damage mitigation brakes. These brakes are therefore one active safety technology needing early and widespread use. It is necessary to promptly prepare promotion measures for the use of damage mitigation brakes, including financial incentives to lower their costs.



Source: ITARDA, 2001-2003

Fig. 18 Share of Rear-end Crashes in Road Accidents



Source: '2004 Commissioned Research on the Promotion of ASV Technologies',
Japan Automobile Research Institute

Fig. 19 Rear-end Crash Fatalities by Primary Party

(2) Introduction of Effective Promotion Measures

- To expand the use and accelerate the development of preventive safety technologies, the following conditions will be necessary: a) increased knowledge of vehicle users about safety technologies, b) introduction of measures to promote the use of safety technologies, c) formulation of new safety regulations with a view to international harmonization, d) development of even more effective safety technologies.
- The promotion of active safety technologies must be supported by the quantitative evaluation of their effects, which will necessitate further improvements in accident analysis and the establishment of performance evaluation techniques for new technologies.

(I) Establishment of quantitative evaluation methods

- Regarding the quantitative evaluation of preventive safety technologies, the existing accident investigation techniques cannot collect data on how dangers have been evaded in near miss

situations. It is therefore imperative to acquire additional data collection and analysis techniques.

- Specifically, the use of drive recorders is being considered. The drive recorders, installed onboard, are designed to record the vehicle conditions (speed, acceleration, etc.) and the driver-occupant conditions (driving operation, seatbelt wearing, etc.) during an accident or in a near miss situation. [For more information on drive recorders, refer to 'Enhancement of Accident Analysis - Use of Drive Recorders' on p.41.]
- The government is urged to promptly organize a panel of experts to establish a technical guideline on the basic performance requirements of drive recorders and determine the followings:
  - ♦ Examination of data items and specifications for drive recorders;
  - ♦ Method of collecting the data recorded by drive recorders in widespread use;
  - ♦ Method of analyzing the collected data;
  - ♦ Overall framework for above implementation; the examination, collecting and analysis.
- In view of the above, effective active safety technologies should be developed by utilizing the data from drive recorders.
- Furthermore, driver behavior simulation by a driving simulator and the traffic simulator prediction of accident reductions by various preventive safety technologies are being developed, and it is necessary for the government to discuss the feasibilities of computer simulation techniques.
- It will also be possible to determine the effects of safety devices by such means as questionnaire surveys aimed at vehicle users.

(II) Establishment of performance evaluation techniques

- Before active safety devices can be promoted and made mandatory, technical requirements concerning their performances must be delineated, utilizing the evaluation techniques proposed in the above (I).
- Some active safety devices may have different activation thresholds or give different effects depending on driver factors and traffic environments, so that for these safety technologies it will be difficult to conduct evaluations in a uniform testing condition. A performance evaluation technique that will overcome such difficulty needs to be established.

(3) Other points of concern

(I) Promotion of active safety technologies

- For encouraging the widespread use of active safety technologies, there should be a combination of various measures in addition to the introduction of regulations. These measures will include industry-university-government cooperation in the ASV project, vehicle user information by the automobile safety assessment scheme, and financial incentives to reduce the costs of new safety technologies.

- Since some active safety technologies pose the difficulty of conducting evaluations in a uniform testing condition, it will not be easy to establish a performance evaluation technique for these technologies and not appropriate to rush into mandating their use. These active safety technologies need to be promoted gradually by deepening the understanding of their effectiveness by vehicle users.
- As for the active safety technologies already in use, the safety regulation study group should quantitatively evaluate their effects, draft their safety regulations and consider other promotion steps.

(II) Enhancement of vehicle users' knowledge

- To enhance the knowledge of vehicle users about active safety technologies, activities such as publicity campaigns, the use of vehicle owner's manuals, and participative education events need to be carried out.
- Because there are very few actual opportunities to recognize a need for active safety technology, vehicle users may be encouraged to experience near miss situations using a simulator or other techniques.
- In developing and promoting active safety measures, it is necessary to respect the three principles adopted to the ASV project -- "driver assist" (the driver is the primary driving party, not technology), "acceptable to drivers" and "acceptable to the public". Especially with regard to acceptability to drivers, the operation of preventive safety devices should be easy and mistake-free. For example, cautioning, warning and drive assisting techniques may be combined according to the type of active safety device in question, while taking acceptability to drivers and the predictable effects of the device into consideration.

2. Enhancement of Passive Safety Measures

Along with the promotion of active safety technologies, passive safety measures will be enhanced to reach the fatality and injury reduction targets and minimize serious injuries and disabilities from road traffic accidents.

(1) Measures emphasizing the reduction of the injured

- For the reduction and mitigation of injuries, the foremost priority is given to neck injury reductions as neck injuries account for a majority of injuries grouped according to data on injured body parts.
- Under the 1998 Agreement, the Global Technical Regulation (gtr) for head restraints is being drafted and scheduled for completion in 2006 to provide harmonized requirements concerning the strength, position, etc. of head restraints. It is therefore necessary to adopt the gtr into the Japanese neck injury reduction measures.
- Euro-NCAP of Europe and the IIHS of the United States are preparing to introduce rear-end crash neck injury evaluations into their automobile safety assessment for consumers. Japan

will also need to consider the informing of vehicle users about the neck protection performances of various models.
- Other than neck injury, safety measures should be aimed also at pedestrian leg injuries on a priority basis, as leg injuries take up a large percentage of total injuries according to body part grouping data.

(2) Proper use of occupant protectors: Rear seatbelts

- In promoting passive safety measures, attention needs to be paid to the failure of some vehicle users to properly use the occupant protection devices.
- According to a joint investigation by the National Police Agency and the Japan Automobile Federation, the rear seatbelt wearing rate is 8.1% at present, a rate much lower than that for the front seats. The wearing of rear seatbelts reduces injury not only to rear but also to front seat occupants. It is therefore necessary to inform the public about the notable protective effect of rear seatbelts and to develop rear seatbelts which will be easier to wear.
- The protective effect of rear seatbelts may be demonstrated to the public by crash reproduction tests, and the wearing of rear seatbelts may be encouraged through the introduction of seatbelt reminders.
- Additionally, the wearing of seatbelts in highway buses and other similar vehicles and the adjustment of head restraint position may be promoted by informing of their protective effects.

(3) Continuation of the existing measures

- Efforts for the promotion of passive safety technologies will continue to include the analysis of accidents and disability causing mechanisms, cooperation with other countries, formulation of safety regulations, and dissemination of automobile safety assessment results.
- Concerning drive recorders, requirements for the installation of an event data recorder (EDR), which records vehicle behavior upon airbag activation, etc., need to be determined since it is possible to advance accident analysis accuracy by utilizing EDR data. The USA and Europe are preparing to introduce an EDR regulation with an eye to improving accident analysis.
- As another passive safety measure, it will be necessary to formulate a compatibility regulation relating to occupant protection in an accident between vehicles of different sizes in keeping with available research results and the drafting of a similar international regulation.

3. Promotion of Safety Measures for Heavy Duty Vehicles

- Two of the characteristics of heavy duty vehicles are their long traveling distances and the seriousness of damage once they are involved in an accident. Consequently, since the release of the Recommendation, measures have been taken to require the mounting of a speed limiter and a rear underrun protector on heavy duty vehicles. Furthermore, the introduction of mandatory front underrun protectors for heavy duty vehicles has been decided. For other

safety technologies also, safety regulations will be formulated by making full use of data from drive recorders or other onboard data recording devices and by conducting accident analyses in greater depth.

- There are views that it is difficult to introduce safety technologies such as an impact absorbing front structure into heavy duty vehicles due to their overall body length. In consideration of technology evaluation results, existing regulations and the interests of related parties, it will be necessary to introduce overall body length restrictions.
- With a notable share of occupants of heavy duty vehicle in total road traffic fatalities, measures to protect them need to be discussed, provided that in-depth accident analysis will be conducted concerning the effects of accident configurations and driving conditions on fatal and non-fatal injuries to occupants of heavy duty vehicle.
- As a harmonized regulation on the protection of occupants of heavy duty vehicle is being prepared under the 1958 Agreement, it will be necessary to take account of this activity.
- Some active safety technologies may fail to give a stable performance when driver behavior is excessively erratic. However, human factors are deemed more uniform in the case of drivers of heavy duty vehicle, as compared to the drivers of passenger cars, due to the former's accumulation of professional driving experiences and the driver trainings provided by many road transport businesses. To take advantage of this, it is necessary for vehicle manufacturers, vehicle users (road transport businesses, industry associations) and government to share data on safety device performances in the market and join hands in developing new technologies.

4. Promotion of Measures for Pedestrians and the Elderly

- A large percentage of fatalities continue to be from among pedestrians, many of them children and the elderly. In view of the ongoing aging and dwindling birth rate of Japanese society, it is important to enhance measures to protect pedestrians and the elderly with emphasis on the following aspects:
  I Protection of children and the elderly as pedestrians;
  II Protection of the elderly as drivers;
  III Mitigation of injuries to the elderly.
- There will be greater demands for vehicle manufacturers to develop safer vehicles by responding to the fact that occupants and pedestrians are diverse, not uniform, people. These demands will be particularly strong with the area of pedestrian and the elderly protection.
- With regard to measures for elderly drivers, research into human behavioral characteristics should be conducted to take account of wide individual differences in the physical response abilities of the elderly

(1) Pedestrian Protection Measures

- Japan has been an active participant in the drafting of a pedestrian protection Global Technical Regulation under the 1998 Agreement. The results of this harmonization effort should be adopted, while automobile safety assessment information needs to be initiated on the

pedestrian protection performances of various vehicle models.

- Additionally, with respect to the issue of potential endangerment of pedestrians by noiseless hybrid and other electric vehicles, studies will be necessary on actual risks and whether or not measures must be introduced.

(2) Measures for the elderly as drivers

- There are an increasing number of accidents caused by elderly drivers. Studies are necessary to determine how the physical functions of elderly drivers affect accident configurations and accident causing mechanisms so as to develop preventive safety technologies for elderly drivers.
- For example, brake assist systems (supporting the drivers with insufficient brake stepping force) and night vision systems (supporting the driver with infrared forward visual data at night and in foggy weather) will be studied to determine their effects and necessary performance levels.

(3) Crash damage mitigation for the elderly

- Vehicles answering the following needs should be developed to cope with the increase of driver's license holders and their aging as a whole:
  - I With the aging and weakening of the body, accidents tend to generate more serious injury to the elderly. Furthermore, it becomes less easy to maintain a proper driving posture. There are growing needs for occupant protection devices catering to the elderly and for vehicles enabling the drivers of many sizes and shapes to maintain a proper driving posture.
  - II There are needs for vehicles to ensure a satisfactory visibility to the drivers of many sizes and shapes.
  - III Needs are high for buses capable of preventing the elderly falling from inside and outside of the vehicle.

Section 3: Points of Concern for Vehicle Safety Measures

Individual vehicle safety measures have been studied in Section 2. Discussed in Section 3 are the points of concern common to all vehicle safety measures.

1. Linkage of Safety Regulations, ASV Project and Automobile Safety Assessment

- For the promotion and development of active safety technologies, various types of vehicle safety measures need to be combined with the formulation of safety regulations.
- In planning a safety measure, it is necessary to compare its cost with its quantitatively evaluated effect and performance as explained in the previous Section 1-(2).
- Accordingly, it is advantageous to link the formulation of safety regulations, the ASV project and the automobile safety assessment scheme in the following manner:
  - I Promotion of automobile safety assessment based on safety regulations and technology promotion;
  - II Promotion of ASV technologies based on automobile safety assessment;
  - III Linking of safety regulations and technology promotion with the ASV project.

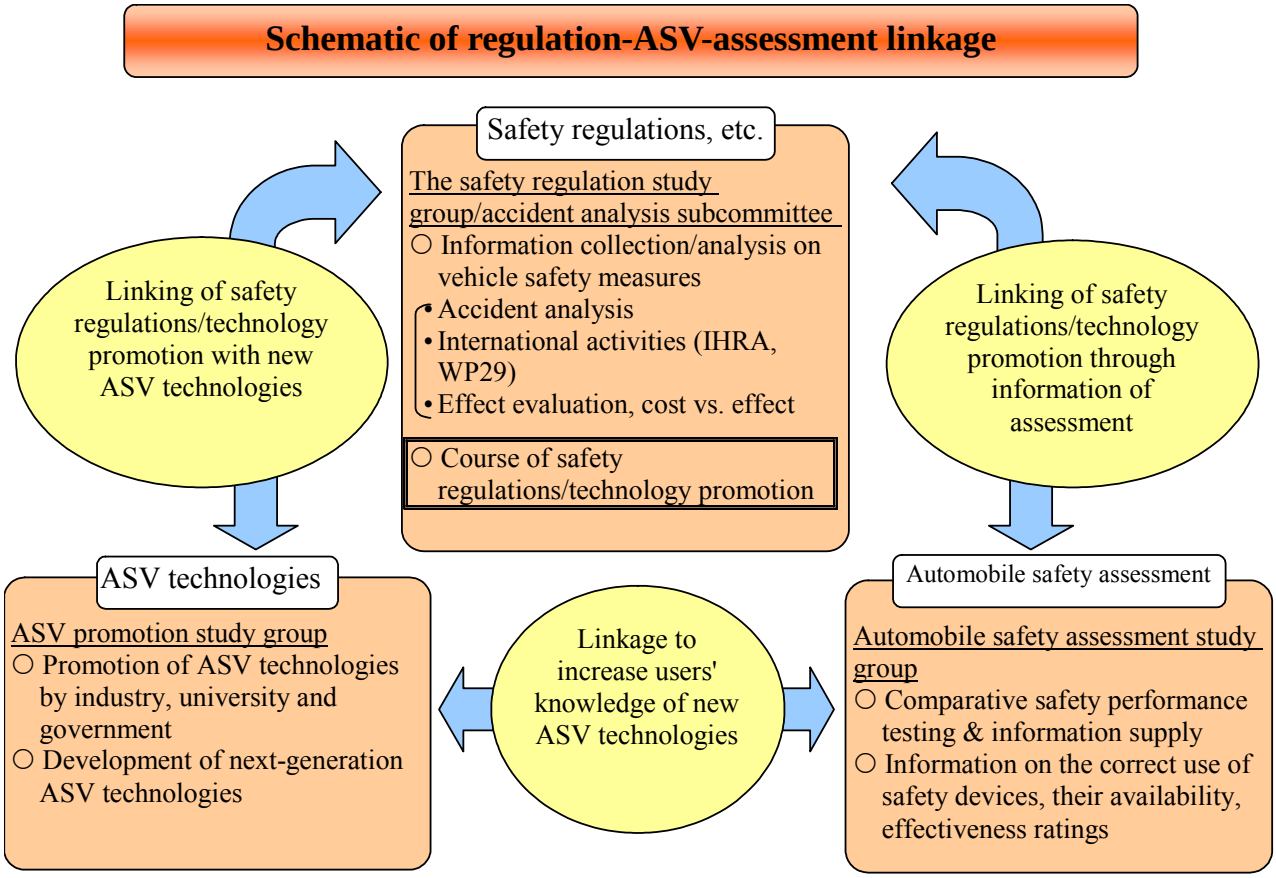


Fig. 20 Organic Linkage of Regulations, ASV & Assessment

2. Promotion and Correct Use of Safety Devices

To realize the widespread and effective use of safety devices, it is essential that vehicle users have sufficient knowledge of the effectiveness and correct operation of these devices. Accordingly, the following points need to be noted in addition to the discussions made in the previous Section 1-(3) and Section 2:

- To enable vehicle users to select and utilize safety devices capable of higher performance, information on the functions and correct use of safety devices will be disseminated by taking the actions below.
  - Further enhancement of the automobile safety assessment scheme for supplying information to vehicle users;
  - Diversification of safety information to be supplied to vehicle users, including the rating results of child restraints and the rating results of safety for the elderly and children, in light of the birth rate downtrend and population aging.
- The use of drive assists and other safety devices has been increasing especially in passenger cars, but it is difficult to utilize safety devices in rented cars and other new-to-use vehicles. Information therefore needs to be supplied to vehicle users concerning what safety devices are installed in which vehicle models.
- The automobile safety assessment scheme has greatly contributed to the early introduction of the full-lap frontal collision regulation and the side collision regulation and to the improvement of vehicle occupant protection in collisions. Automobile safety assessment can be further enhanced and improved in harmony with the formulation of new safety regulations. It will be beneficial to spread information on ASV technologies through automobile safety assessment.
- To enable vehicle users to learn the effectiveness of safety devices through experience, the use of simulators will be expanded (refer to the previous Section 1-(3)).
- With tires closely related to the braking and other basic performances of vehicles, the importance of maintaining the tire pressure at proper levels must be explained to vehicle users and automotive business operators.

3. Vehicle Safety Measures Incorporating New Technologies

(1) New-generation technology areas

(I) As the autonomous detection drive assist system developed under the ASV project has difficulty reducing accidents at intersections, further studies are needed on the next-generation intercommunication drive assist system which will enable information exchanges between vehicles or between the vehicle and the pedestrian.
The infrastructure-collaborating drive assist system proposed in the New IT Strategy (decided by government in January 2006) will be defined with regard to its necessary technologies and its role sharing with the autonomous detection type and intercommunication type drive assist systems. It is however clear that a drive assist system utilizing communications technology will need to be introduced into the market.
Also, technical investigations are needed to appraise the potential of each new-generation safety technology and determine the basic course of future safety technology development.

(II) As one prospective drive assist technology, the intelligent speed adaptation prompts the driver to observe the speed limit and other traffic rules. While practical use has already begun for the large vehicle speed limiters and seatbelt reminders, for new safety technologies to be accepted smoothly a public consensus must be formed on the basis of

their performances in actual use, their effects, and their social impacts. Consequently, information should be collected and analyzed from many areas including overseas information.

(2) Other

(I) Over the recent years hybrid vehicles have come into widespread use, while fuel cell vehicles are under development. As these new vehicles employ high voltage, there is a growing realization today that the safety of these new vehicles should be ensured against high voltage in collisions or during the handling of wrecked vehicles. This is one example suggesting a strong need to examine the safety of any new technology from many angles in order to establish a comprehensive safety regulation. Regarding a safety regulation for fuel cell vehicles, it will also be necessary to move side by side with the drafting a fuel cell Global Technical Regulation that started in 2005.

(II) Safety devices incorporating electronic control technologies depend heavily on the reliability of information processing technology for their satisfactory performances. As safety devices must keep their satisfactory performances throughout service life, it is necessary to discuss how to build a system of ensuring the reliability of safety devices throughout use, including the supply of information to vehicle users concerning the maintenance of safety devices and the improvement of new technology inspections. In this connection, passenger cars to be produced from 2008 onwards are required to have an onboard diagnosis system designed to detect the deterioration of the emission gas catalyst during vehicle service life. Similar in-use precautions will be necessary for safety devices.

(III) Though in widespread use, navigators and other information supply devices may distract the driver's attention from driving and thereby increase accident risks unless the driver uses the device properly. It is therefore necessary to review how to spread the correct use of these devices and how to display drive information so as not to overly distract the drivers.

(Reference) Enhancement of Accident Analysis - Use of Drive Recorders

- An onboard recording device called "drive recorder" is being put to practical use particularly by taxi companies for training their driver employees in Japan. Overseas, the use of a similar device called "event data recorder" (EDR) is beginning and there are moves to formulate a regulation for automotive data recording devices.
- However, technical questions on data recording and ethical questions on the handling of collected data still remain unanswered, and the following steps need to be taken promptly to bring the use of data recording devices into reality:
- To enable the use of data from data recording devices, it is necessary to clarify to whom the data will belong, which entities will be qualified to analyze the data, and how the data will be handled and stored. In addition, to the items identified in Chapter 2, Section 2, 1-(2), the following items needs to be clarified with regard to the objective and method of data collection:
  1) Specification of data to be recorded for the evaluation of various safety devices and for the purpose of accident analysis.
  2) The recording device's durability, effectiveness and practicability for accident analysis use.
  3) Regulatory status of recording devices, data collection methods, data analysis methods.

Table 9　Drive Recorders and EDRs

	Drive recorder	EDR
Profile	Recording of vehicle behavior in an accident or a rapid deceleration in terms of video images and deceleration data	Recording of safety device operation in a crash
Objectives	• Driver education • Accident analysis, near miss analysis	• Check on if airbag, etc. operated • Accident analysis
Recording trigger	Reaching a certain deceleration (braking)	• Chiefly upon airbag activation
System outline	• Compact camera for forward monitoring • Recording images and vehicle data from shortly before to shortly after an accident or near miss	• Recording of vehicle motion and steering data from shortly before to shortly after an accident • Part of the electronic control mechanism for airbags
Major recorded data	• Forward field images • Brake pedal operation, vehicle speed • Direction indicator operation • GPS positioning	• Acceleration, brake/acceleration pedal operation, vehicle speed • Seatbelt wearing • Airbag activation timing • Other
Other	• Expanding use as a retrofit device	• Generally equipped on new vehicles • The US has an EDR regulation; Europe in preparation

REFERENCE MATERIAL

REFERENCE MATERIAL 1

The Road Transport Subcommittee of Land Transport Committee of the Transport Policy Council
List of Technology and Safety Working Group Commissioners
(Honorifics omitted, in order of the Japanese syllabary)

Chairperson	Masaichi Iguchi	Emeritus Professor, University of Tokyo
Commissioner	Reiko Okutani	Representative Director of The R Co., Ltd. (Until December, 2005)
Commissioner	Toshio Shitara	Head of Japanese Council of Transport Workers' Unions
Commissioner	Masahiro Sugiyama	Professor, Graduate School of Commerce, Waseda University
Commissioner	Hirotaka Yamauchi	Professor, Graduate School of Commerce and Management, Hitotsubashi University
Temporary Commissioner	Rumiko Iwasada	Motor journalist
Temporary Commissioner	Minoru Kamata	Professor, Graduate School of Engineering, University of Tokyo
Temporary Commissioner	Sadao Horino	Associate Professor, Faculty of Engineering, Kanagawa University
Temporary Commissioner	Kouji Mizuno	Associate Professor, Graduate School of Engineering, Nagoya University
Temporary Commissioner	Tetsuya Muroyama	Executive Commentator, NHK
Temporary Commissioner	Kenichi Yoshimoto	Emeritus Professor, University of Tokyo
Special commissioner	Tetsuo Taniguchi	Head of Automotive Safety Research Department, National Traffic Safety and Environment Laboratory (Independent Administrative Institution)
Special Commissioner	Eiji Toyoda	Executive Director of Japan Trucking Association
Special Commissioner	Masatoshi Matsunami	Vice President of Japan Automobile Federation, Inc.
Special Commissioner	Mitsuhiko Yamashita	Head of Safety and Environmental Technology Committee, Japan Automobile Manufacturers Association, Inc.
Special Commissioner	Kouji Yoshida	Managing Director of General Insurance Association of Japan, Inc.
Special Commissioner	Masanobu Wada	Managing Director of Japan Automobile Importers Association

* The Land Traffic Committee members are underlined.

World Report on Road Traffic Injury Prevention: Abstract

World Health Organization
Geneva
2004

Introduction

Road traffic injuries are a major but neglected public health challenge that requires concerted efforts for effective and sustainable prevention. Of all the systems with which people have to deal every day, road traffic systems are the most complex and the most dangerous. Worldwide, an estimated 1.2 million people are killed in road crashes each year and as many as 50 million are injured. Projections indicate that these figures will increase by about 65% over the next 20 years unless there is new commitment to prevention. Nevertheless, the tragedy behind these figures attracts less mass media attention than other, less frequent types of tragedy.

The World Report on Road Traffic Injury Prevention[1] is the first major report being jointly issued by the World Health Organization (WHO) and the World Bank on this subject. It underscores their concern that unsafe road traffic systems are seriously harming global public health and development. It contends that the level of road traffic injury is unacceptable and that it is largely avoidable.

This report has three objectives:

- To raise the level of decision-making based on consciousness, proactive commitment and accurate information at all levels – governments, industries, international organizations and nongovernmental organizations – for implementing a scientifically proven strategy for effectively preventing road traffic accidents. It is necessary to react to this worldwide challenge of reducing road traffic fatalities and injuries by the concerted efforts of all parties involved.

- To help change the concept of how to successfully prevent road traffic accidents. It is necessary to move away from the view that road traffic accidents are the price to be paid for mobility and economic growth, and to focus on activities at all levels of road traffic systems.

- To help organizations to build effective partnerships and make road traffic systems safer for drivers. Such partnerships should be built horizontally between governmental departments, and vertically between all levels of government, and between governments and nongovernmental organizations. At a governmental level, departments such as public health, transportation, finance, law enforcement and other related areas should establish close cooperation with each other.

This summary of the World Report on Road Traffic Injury Prevention is intended mainly for those in charge of planning road safety policies nationwide, and who are closely involved in road safety issues and needs at the local level. The theory and conclusions contained here are drawn from the full report and quoted from its cited studies.

Concerns about Public Health

Worldwide, more than 3,000 people are killed in road traffic accidents every day. Low-income and middle-income nations account for about 85% of the deaths and 90% of annual disability-adjusted life years (DALY) lost in road traffic accidents.

[1] 1 M. Peden, et al., " World Report on Road Traffic Injury Prevention", Geneva, World Health Organization, 2004

The projections indicate that road traffic fatalities will decrease by about 30% in high-income nations from 2000 to 2020, while fatalities will actually increase in low-income and middle-income nations. Without appropriate measures, road traffic accidents are predicted to be the third leading cause of the world burden of disease by 2020 (Table 1) (1).

Table 1

DALY Rank Comparison on Top-10 Causes of World Burden of Disease			
1990		2020	
Rank	Disease or Injury	Rank	Disease or Injury
1	Lower respiratory tract infection	1	Ischemic heart disease
2	Diarrheal disease	2	Monopolar depression
3	Perinatal period condition	3	Road traffic injury
4	Monopolar depression	4	Cerebrovascular disease
5	Ischemic heart disease	5	Chronic obstructive lung disease
6	Cerebrovascular disease	6	Lower respiratory tract infection
7	Tuberculosis	7	Tuberculosis
8	Measles	8	War
9	Road traffic injury	9	Diarrheal disease
10	Congenital abnormality	10	HIV

DALY: Disability-adjusted life years. DALY is a health gap measure that combines years of life lost due to premature death and years of healthy life lost due to disability.
Source: Reference 1

Social and Economic Costs of Road Traffic Accidents

The people who are killed, injured or disabled in road traffic crashes have networks with other people including families and friends who are deeply affected. Worldwide, tens of millions of people are affected by the death or disability of family members resulting from road traffic accidents. It is impossible to put a price on the worldwide human sacrifice, pain and social loss caused by road traffic crashes and injuries.

The economic cost due to road traffic crashes and injuries is estimated to account for 1% of gross national product (GNP) in low-income nations, 1.5% in middle-income nations and 2% in high-income nations, giving a global cost of US$518 billion a year. The costs in low-income and middle-income nations account for US$65 billion, exceeding the amount they receive as development aid. (2)

Road traffic accidents are a huge burden not only on the global and national economies but also households. Many families lose their breadwinner in road traffic accidents, or have to accept the burden of caring for someone disabled by an accident, and thus fall into poverty.

Table 2

Global Research and Development Funds for Main Issues			
Disease or Injury	US$ Million	1990 DALY Rank	2020 DALY Rank
HIV/AIDS	919 to 985	2	10
Malaria	60	8	-
Diarrheal disease	32	4	9
Road traffic injury	24 to 33	9	3
Tuberculosis	19 to 33	-	7

Source: Reference 3

REFERENCE MATERIAL 3

Number of Deaths and Injuries by Damaged Area and Accident Type

2004	Automobile Driver (Dead)						Pedestrian (Dead)	Motorcycle (Including small motor vehicle) (Dead)	Bicycle (Dead)
	Vehicle to Vehicle				Single vehicle crash	Total			
	Frontal crash	Rear-end crash	Head-on crash	Other					
Head/Face	175 10.9%	31 1.9%	87 5.4%	40 2.5%	241 15.0%	574 35.8%	1,307 58.1%	679 51.7%	591 68.8%
Neck region	35 2.2%	3 0.2%	14 0.9%	6 0.4%	52 3.2%	110 6.9%	91 4.0%	85 6.5%	34 4.0%
Legs	16 1.0%	3 0.2%	1 0.1%	0 0.0%	8 0.5%	28 1.7%	61 2.7%	22 1.7%	14 1.6%
Arms	2 0.1%	0 0.0%	0 0.0%	0 0.0%	2 0.1%	4 0.2%	9 0.4%	2 0.2%	4 0.5%
Chest/Abdomen region	217 13.5%	55 3.4%	60 3.7%	39 2.4%	296 18.5%	667 41.6%	414 18.4%	394 30.0%	119 13.9%
Back/Loins region	5 0.3%	1 0.1%	5 0.3%	4 0.2%	3 0.2%	18 1.1%	191 8.5%	43 3.3%	37 4.3%
Other	61 3.8%	12 0.7%	15 0.9%	10 0.6%	104 6.5%	202 12.6%	177 7.9%	88 6.7%	60 7.0%
Total	511 31.9%	105 6.6%	182 11.4%	99 6.2%	706 44.0%	1,603 100.0%	2,250 100.0%	1,313 100.0%	859 100.0%

2004	Automobile Driver (Dead and Injured)						Pedestrian (Dead and Injured	Motorcycle (Including small motor vehicle) (Dead and Injured	Bicycle (Dead)
	Vehicle to Vehicle				Single vehicle crash	Total			
	Frontal crash	Rear-end crash	Head-on crash	Other					
Head/Face	2,236 0.6%	4,067 1.0%	8,251 2.1%	4,153 1.0%	4,670 1.2%	23,377 5.8%	20,830 24.4%	19,861 11.4%	36,509 19.2%
Neck region	9,104 2.3%	194,858 48.7%	61,835 15.5%	45,208 11.3%	5,006 1.3%	316,011 79.0%	4,105 4.8%	16,588 9.5%	13,668 7.2%
Legs	2,278 0.6%	1,200 0.3%	4,513 1.1%	2,732 0.7%	1,908 0.5%	12,631 3.2%	31,592 37.1%	74,579 42.6%	77,940 41.0%
Arms	975 0.2%	832 0.2%	4,045 1.0%	2,596 0.6%	1,487 0.4%	9,935 2.5%	13,713 16.0%	37,223 21.3%	33,065 17.4%
Chest/Abdomen region	2,692 0.7%	1,976 0.5%	7,040 1.8%	3,661 0.9%	3,613 0.9%	18,982 4.7%	4,640 5.4%	13,260 7.6%	11,267 5.9%
Back/Loins region	707 0.2%	8,090 2.0%	5,236 1.3%	3,812 1.0%	901 0.2%	18,746 4.7%	10,352 12.1%	13,254 7.6%	17,713 9.3%
Other	63 0.0%	15 0.0%	20 0.0%	16 0.0%	105 0.0%	219 0.1%	189 0.2%	111 0.1%	89 0.0%
Total	18,055 4.5%	211,038 52.8%	90,940 22.7%	62,178 15.5%	17,690 4.4%	399,901 100.0%	85,521 100.0%	174,876 100.0%	190,251 100.0%

2000	Automobile Driver (Dead)						Pedestrian (Dead)	Motorcycle (Including small motor vehicle) (Dead)	Bicycle (Dead)
	Vehicle to Vehicle				Single vehicle crash	Total			
	Frontal crash	Rear-end crash	Head-on crash	Other					
Head/Face	276 11.9%	52 2.2%	105 4.5%	51 2.2%	434 18.8%	918 39.7%	1,518 59.8%	828 52.6%	684 69.5%
Neck region	50 2.2%	7 0.3%	16 0.7%	8 0.3%	78 3.4%	159 6.9%	127 5.0%	96 6.1%	22 2.2%
Legs	24 1.0%	0 0.0%	3 0.1%	6 0.3%	9 0.4%	42 1.8%	59 2.3%	28 1.8%	15 1.5%
Arms	2 0.1%	0 0.0%	1 0.0%	1 0.0%	4 0.2%	8 0.3%	5 0.2%	6 0.4%	2 0.2%
Chest/Abdomen region	253 10.9%	62 2.7%	86 3.7%	43 1.9%	371 16.0%	815 35.2%	425 16.7%	438 27.8%	141 14.3%
Back/Loins region	5 0.2%	1 0.0%	3 0.1%	1 0.0%	7 0.3%	17 0.7%	159 6.3%	34 2.2%	34 3.5%
Other	132 5.7%	15 0.6%	19 0.8%	20 0.9%	168 7.3%	354 15.3%	247 9.7%	145 9.2%	86 8.7%
Total	742 32.1%	137 5.9%	233 10.1%	130 5.6%	1,071 46.3%	2,313 100.0%	2,540 100.0%	1,575 100.0%	984 100.0%

2000	Automobile Driver (Dead and Injured)						Pedestrian (Dead and Injured	Motorcycle (Including small motor vehicle) (Dead and Injured	Bicycle (Dead)
	Vehicle to Vehicle				Single vehicle crash	Total			
	Frontal crash	Rear-end crash	Head-on crash	Other					
Head/Face	3,832 1.0%	4,370 1.2%	11,508 3.0%	5,907 1.6%	7,132 1.9%	32,749 8.6%	23,866 26.7%	23,483 12.5%	37,657 21.4%
Neck region	9,700 2.6%	176,961 46.6%	54,463 14.3%	38,411 10.1%	3,868 1.0%	283,403 74.6%	3,312 3.7%	13,469 7.3%	10,427 5.9%
Legs	3,441 0.9%	1,452 0.4%	5,551 1.5%	3,301 0.9%	2,609 0.7%	16,354 4.3%	34,559 38.7%	84,655 45.6%	73,578 41.8%
Arms	1,250 0.3%	795 0.2%	4,379 1.2%	2,740 0.7%	1,718 0.5%	10,882 2.9%	12,204 13.7%	37,256 20.1%	28,037 15.9%
Chest/Abdomen region	3,060 0.8%	1,786 0.5%	7,017 1.8%	3,691 1.0%	3,814 1.0%	19,368 5.1%	4,718 5.3%	13,188 7.1%	9,951 5.6%
Back/Loins region	865 0.2%	6,764 1.8%	4,887 1.3%	3,415 0.9%	939 0.2%	16,870 4.4%	10,474 11.7%	13,490 7.3%	16,403 9.3%
Other	132 0.0%	18 0.0%	22 0.0%	20 0.0%	168 0.0%	360 0.1%	263 0.3%	169 0.1%	110 0.1%
Total	22,280 5.9%	192,146 50.6%	87,827 23.1%	57,485 15.1%	20,248 5.3%	379,986 100.0%	89,395 100.0%	185,710 100.0%	176,163 100.0%

Background color and Ratio	50% –	40% – 50%	30% – 40%	20% – 30%	10% – 20%

* Automobile drivers are quoted from the overview data of accidents conducted by the accident analysis committee.
* Pedestrians, motorcycles (including small motor vehicles) and bicycles are quoted from the traffic statistics (National Police Agency).

Road Traffic Safety Program and Policy Position of
Automobile Assessment in EU Nations

1. Framework of Road Traffic Safety Policy in the EU

(1) Establishment of "White Paper (Common Transport Policy)" in 2001

In September 2001, the Commission of European Communities adopted the "White Paper (Common Transport Policy)" in which objectives were set, including that they would reduce the number of traffic fatalities by half (40,000 to 20,000 deaths for the 15 EU nations) by 2010 (com(2001)370). According to the White Paper, there are two main policies to achieve this: 1) balancing controls on speeding, drunken driving, etc. within the region, and 2) introducing new technology to improve safety.

(2) Establishment of "European Road Traffic Safety Plan" in 2003

In June 2003, the Commission of European Communities adopted the "European Road Traffic Safety Plan" which summarized comprehensive and exhaustive safety measures necessary for attaining the numerical target noted above based on the decision by the Council of Transport Ministers in June 2000 and subsequent discussions at the same Council and the EU Parliament. The Plan sets forth six key policies to reduce fatalities and specific measures:

(a) Improvement of road users' behaviors
(b) Utilization of technology to improve automobile safety
(c) Improvement of road-related infrastructure
(d) Safety for freight truck and passenger transport businesses
(e) Emergency service and care for those involved in accidents
(f) Accident data collection, analysis and public announcement

In January 2004, the European Road Safety Charter was launched to encourage civil societies to take action toward attaining the target. Consequently, businesses, automobile clubs, related organizations, schools, media and communities were called on to take action.

(Reference) EURO NCAP's Position for European Road Traffic Safety Policy (Forecast)

At a seminar to mark the 10th anniversary of the EURO NCAP held in November 2005, J. Barrot, the Commission's Vice-President, delivered a speech and noted that EURO NCAP had been playing a significant role in promoting road safety as well as other safety measures; that road safety would be a part of the package of measures; and that EURO NCAP needed to step up work to attain the ambitious goal of halving traffic fatalities by 2010.

NHTSA Vehicle Safety Legislation and Basic Study Priorities 2005 – 2009
(Revised in January 2005)

– Summary –

Preface

- Existing priorities (2002 – 2004): (1) Promotion of seatbelt use, (2) Reduction of dangerous driving, (3) Response to vehicle rollovers, (4) Vehicle crash incompatibility, and (5) Betterment of NHTSA data system.
- Short-term priorities for regulations (05, 06): Rollover, heavy truck tires, protection against side-impact crash, surveillance system for tire pressure, event data recorder, CRS for large children
- Long-term possible legislative proceedings (2007 – 2009): Separation of tire beads, tire strength, ABS function for truck trailer

1. Approach to the Compatibility of Passenger Cars and Light Trucks

- Increase in the number and size of light trucks, vans and utility vehicles (LTV, rated vehicle total weight less than 10,000 lb)
- The number of fatalities in crashes between passenger cars and light trucks exceeded that in crashes between passenger cars for the first time in 10 years.
- Glare-related issues due to the higher positions of headlights in LTV
- The first initiative to protecting one's own vehicle is to revise FMVSS214, side impact protection (head protection, thoracic region and pelvis protection, additional test using a 75-degree pole with an approach angle. Both 5th percentile adult female and 50th percentile male dummies are used). The second initiative is the requirement to protect the other party by the principle of average height of force (AHOF).
- Test to evaluate ES-2 as a next-generation dummy and to evaluate a World SID dummy when possible in the future
- Characteristics of the mobile variable barrier in the future
- Potential risks of side airbags for out-of-position children and undersized adults
- Development of a research program on AHOF and initial rigidity
- Voluntary standards relating to strengthening compatibility (geometric alignment in the front zone with energy absorption mechanism to better structural alignment and loading path)

II. Prevention and Reduction of Rollover Collisions

- Effectiveness of restraint system, reduction of occupants thrown out of door and window, prevention of crushing of roofs, and improvement of indoor pads for occupants
- Rollover on the pavement surface is less frequent than when off-road, on soft soil, on stone curbs, or when colliding against guard rails and tumbling

- Electronic stability control (ESC) is effective for preventing rollover on the pavement surface only. It has a potential safety effect, and prevents a vehicle from hitting something causing it to tumble off the road.
- Use of side curtain airbags and improvement of window glass
- Restraint performance requirements for occupants. Rollover sensor. Pretensioner activated by rollover sensor, belt load limiter, integrated belt, other advanced belt systems.

III. Collision Prevention

- More effective warnings for imminent collision, improvement of driving skills, broadening of vision. Direct or indirect visibility, stability on tires, brakes, direction and rollover, improvement of vehicle lighting, signals and markings.
- Aspherical mirror (approved in European nations)
- Study of human-factor and fail-safe issues for indirect vision to find out the best selection
- Separation of tire beads
- Study on the aging of tires
- Tire consumers program
- Tire Pressure Monitoring System (TPMS). Detects and issues an alarm when the air pressure shortage exceeds 25%. TPMS dysfunctional indicator.
- Distraction of the driver (new technology such as mobile phone, head-up display, navigation display)

IV. Safety Improvement for Heavy Trucks

- Braking performance
- Tractor equipped with electronically controlled braking systems (ECBS)
- Compatible control of the brakes of the tractor and trailer
- Development of requirements for ABS performance for trailers
- TPMS
- Central tire inflation (CTI) system to automatically keep the tire pressure at an appropriate level

V. Hydrogen, Fuel Battery and Alternative-Fuel Vehicles

VI. Protection of Children in Small Cars

- Revisions of CRS Standards, FMVSS213 (update of bench seat used to dynamically test CRS, wider test corridor by sled pulse, improved infant test dummy, and expanded applicability to children weighing up to 65 pounds)
- Protection of children in the event of side impact collision
- 3-year child test dummy for side impact collision
- Requirements for dynamic sled similar to the one developed by ISO
- Expansion of applicability of occupant protection in the event of inner collision in FMVSS201 to improve child protection

- Head protection of a child upon collision with inner side in the event of oblique collision
- CRS performance requirements for children weighing more than 50 pounds

VII. Data for Collision Prevention Measures

- Data immediately before collision have been added in the data collection system, but collision prevention data are still lacking.
- Analysis of collisions and risky events in the data of driver's behavioral study under natural driving conditions
- Development, implementation and analysis of investigation on collision causes, for drawing up collision prevention standards
- Drawing up the standards for event data recorders (EDR)

VIII. Vehicle Safety Information for Users: Revision of Frontal and Side Impact Test Program

- Information service by NCAP to users improves vehicle safety.
- NCAP has recently added such information as seatbelt reminder and side airbag out-of-position test. In 2004, the dynamic rollover test was also undertaken.
- Revision of frontal and side impact test program at NCAP

Appendix A. Other Significant Potential Legislation and Study

A. Additional Measures for Non-Coexistence

- Improved energy control

B. Additional Measures for Collision Prevention

- Reduction of glare. High mount headlight, HID, fog lamp and other lamps
- New requirements for light distribution, automatic aiming, lowering of mounting position, flushing system
- AFL. Glare control is not fully performed in some driving scenarios.
- Braking issues for small cars. Electronic braking distribution, braking assistance, regenerative braking systems (RBS), EBS, electric hydraulic systems
- Road departure crash warning system
- Rear-end collision prevention system. Adaptive cruise control system with automatic braking and collision warning system
- Drowsy driver detection and warning system

C. Collision Countermeasures

- Advanced dummies, such as dummies having kinetic characteristics to respond to low acceleration upon braking for imminent collision
- Potential fatalities by air bags deployed in a low-speed collision. A next-generation air bag
- Improvement of protecting the occupants regardless of their physiognomy. Minimizing the risks

by air bags deployed to infants, children and other occupants especially in low-speed collision

- Frontal and oblique impact. Never overlook the risks brought by this regulation, to the occupants of the other vehicle.
- Study on minimum performance standards for occupant protection system and objective tests for detection before collision

D. Other Vehicles

- School buses are only required to install wheelchairs.
- For school buses, lap belts are least advantageous as they tend to cause neck serious injury and sometimes abdomen injury. Heightening the seat back. Lap/shoulder restraint system.
- Safety of motor coaches. Emergency escape and windows, improvement of braking and stability control in the event of rollover, occupant protection, improvement of crushable roof, and advanced restraint systems

E. Other Groups of People

- Older drivers. Night lighting and glare, controls and indication, vehicle characteristics causing attention to wander, validity of mirror, comfort and convenience of safety belts
- Collision prevention technology is advantageous especially for older drivers. ACC, collision warning system, back or lane change proximity detection system, variable illumination of light distribution type and improving nighttime visibility, route guidance. Intelligent cruise control or frontal collision prevention systems.

F. Additional User Information for Measures

- CRS

REFERENCE MATERIAL 6

The Transport Policy Council of Ministry of Land, Infrastructure and Transport (The Land Transport Committee) No.29
June 12, 2006

Minister of Land, Infrastructure and Transport
Mr. Kazuo Kitagawa

Land Transport Committee of the Transport Policy Council

Head of Road Transport Subcommittee
Masahiro Sugiyama

Road Transport Subcommittee of Land Transport Committee of the Transport Policy Council
Results of Discussion at Technology and Safety Working Group (REPORT)

We recently held a meeting of the Technology and Safety Working Group to discuss future vehicle safety measures in light of the 8th Fundamental Traffic Safety Program. As attached separately, the report has been compiled today as the "Vehicle Safety Measures for Building a Society Free from Road Traffic Accidents".