

Transmitted by the expert from Japan

Informal document GRSP-53-07
(53rd GRSP, 13 - 17 May 2013,
agenda item 17)

Guidelines for Improvement of Vehicle Safety Regarding Infant-Carrying Vehicles

March 2013

Vehicle Safety Policy Study Group

Introduction

One of the Safety Regulations for Road Transport Vehicles (Ministry of Transport Ordinance No. 67, 1951) requires that the motor vehicles exclusively used for transport of infants* (hereafter “infant-carrying vehicles”) be marked with an indication that they are infant-carrying vehicles so as to alert the other drivers. On the other hand, under the Safety Regulation, these vehicles are exempt from the obligation to be equipped with seat belts for the following reasons:



- (1) Installation of seat belts will make it difficult for infants to exit in the event of an emergency as they are not able to easily fasten and unfasten their own belts;
- (2) Since the body build varies from child to child depending on the age, it is difficult to designate a specific configuration of the seat belt; and,
- (3) Installation of seat belts will require passengers accompanying infants (preschool/kindergarten teachers, etc.) to assist them with fastening and unfastening of their belts.

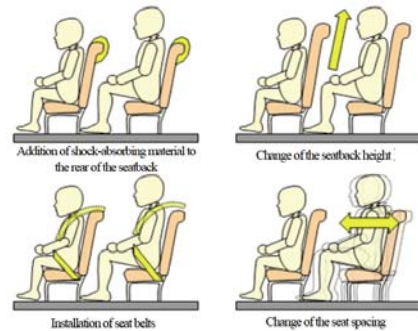
* For the purpose of these Guidelines, the term “infant” means a small child up to the preschool/kindergarten age.

However, in response to the amendment of October 2006 of the Safety Regulation to strengthen the standards for bus seats (implemented in July 2012) as well as to the amendment of June 2008 of the Road Traffic Act (Law No. 105, 1960), in which fastening of seat belts in the backseat of passenger cars was made mandatory, the Vehicle Safety Policy Study Group (study group based on the report “Future Vehicle Safety Policy Towards a Society with No Traffic Accidents” [June 2011] by Subcommittee on Automobile Transport, Land Transport Committee, Council of Transport Policy) has been discussing how to improve vehicle safety with regard to infant-carrying vehicles.

In order to draw up these Guidelines, we utilized the Working Group on Infant-Carrying Vehicles, established under the Vehicle Safety Policy Study Group, to grasp the current status of accidents based on which vehicle safety improvement measures regarding infant-carrying vehicles were discussed. We then organized and evaluated safety measures for new infant-carrying vehicles while at the same time giving sufficient consideration to the current usages of such vehicles. Finally, recommendations that the motor vehicle manufacturers, etc. should follow for the purpose of improving vehicle safety when manufacturing infant-carrying vehicles as well as cautions that the users should take in order to operate infant-carrying vehicles properly have been compiled herein as guidelines.

Primary Safety Measures for Infant Seats in Infant-Carrying Vehicles

- Addition of shock-absorbing material to the rear of the seatback
- Change of the seatback height
- Installation of seat belts
- Change of the seat spacing



Ideally, it would be desirable to equip any vehicle, if it carries an infant, with a child restraint system. Currently, however, no seat belts suitable for infant seats installed in infant-carrying vehicle exist. It is therefore expected that these Guidelines will facilitate development of such seat belts suitable for the infant seats.

Concept and Purpose of the Guidelines

- With safety measures for new infant-carrying vehicles organized and evaluated as well as sufficient consideration given to the current usages of such vehicles, the Guidelines show the direction in which the motor vehicle manufacturers, etc. should develop their infant-carrying vehicles.
- Furthermore, since no seat belts suitable for infant seats installed in infant-carrying vehicles currently exist, the Guidelines will facilitate development of such seat belts suitable for the infant seats.
- Taking into account various safety operation measures already taken by users, the Guidelines do not make the safety measures mandatory but aim to allow users to choose vehicles where certain safety measures have been implemented by them.

1. Current Status of Accidents Related to Infant-Carrying Vehicles (excerpt from the results of an accident analysis conducted in March 2010)

Grasping the current status of accidents and troubles
based on which the safety measures are discussed

Points:

- In many cases, the primary injury-causing vehicle structure is the seat in front, and the injured body parts are the head, face, and/or neck (minor injuries).
- Accident data of 2003-2008 show 0 fatalities, 4 severe injuries, and 565 minor injuries.
- Accidents involving infant-carrying vehicles occur at low speeds.
- Compared to regular buses, the number of casualties per 1,000 vehicles owned is about 1/10 for infant-carrying vehicles.

→ As the subject of the study, we chose accidents in which the head, face, and/or neck is injured by the seat in front (minor injuries), and will indicate safety measures against these accidents as a priority.

→ If the safety measures compiled herein are implemented, about 76% of injuries to infants in frontal collision accidents can be mitigated.

1.1. Scope of the Infant-Carrying Vehicle Accident Analysis

In the infant-carrying vehicle accident analysis, the Japan Traffic Accidents General Database* was used. The period of data used in the analysis was 6 years from 2003 to 2008. Out of vehicle-to-vehicle accidents, single vehicle accidents and person-to-vehicle accidents that occurred during this period, data on buses/microbuses, etc. registered as infant-carrying vehicles involving children up to the age 12 as well as data on other buses/microbuses were extracted. In addition, in the analysis of injuries to passengers, the subjects were limited to passengers of 6 years of age or younger.

* Japan Traffic Accidents General Database (“macro data”) compiled by Institute for Traffic Accident Research and Data Analysis

1.2. Accident Rate per Vehicle Owned for Infant-Carrying Vehicles

The accident rates were calculated from the 2008 data on accidents and on the numbers of vehicles owned. As a result, it was found that the accident rate for infant-carrying vehicles was 1.1%, with 17,957 vehicles owned where 205 vehicles were involved in accidents. On the other hand, for the entire buses/microbuses, the accident rate per vehicle owned was 2.5%, with 230,681 vehicles owned and 5,779 vehicles involved in accidents, which was about double the accident rate for infant-carrying vehicles.

Table 1 Accident Rates of Infant-Carrying Vehicles and Buses

	Infant-carrying vehicles		Entire buses/microbuses	
	No. of vehicles owned ^{*1}	No. of vehicles involved in accidents ^{*2}	No. of vehicles owned ^{*3}	No. of vehicles involved in accidents ^{*2}
Total	17,957	205	230,681	5,779
Accident rate (%)	1.1		2.5	

*1 As of the end of March 2009

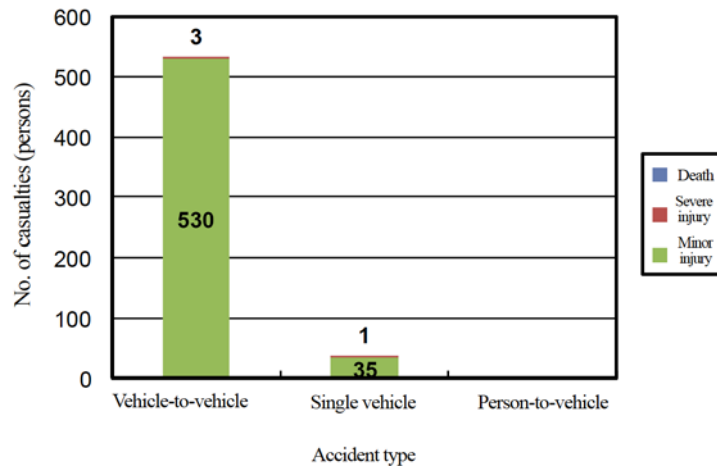
*2 Data of 2008

*3 Total number of buses/microbuses (as of the end of December 2008)

1.3. Numbers of Casualties Among Infant Passengers of Infant-Carrying Vehicles

The numbers of casualties among infant passengers of infant-carrying vehicles recorded during the 6 years from 2003 to 2008, shown by accident type in the chart below, indicate that, for any accident type, there were no fatalities and the numbers of severe injuries were 3 and 1 in vehicle-to-vehicle accidents and single vehicle accidents, respectively; most of the injuries were minor. These data on the numbers of casualties by accident type also show that the number of casualties in vehicle-to-vehicle accidents was 533, which accounted for most of the casualties (93.7%).

Figure 1 Numbers of Casualties Among Infant Passengers of Infant-Carrying Vehicles (by Accident Type)



The numbers of casualties of passengers per 1,000 vehicles owned were calculated from the 2008 data on accidents and on the numbers of vehicles owned. As a result, it was found that there were 3.6 casualties for infant-carrying vehicles, which was about 1/10 of the result for the entire buses/microbuses, 36.2 casualties. It should be noted, however, that in this analysis the number of casualties of passengers of the entire buses/microbuses was not limited by age.

Table 2 Casualty Rate for Passengers of Infant-Carrying Vehicles and Buses

	Infant-carrying vehicles		Entire buses/microbuses	
	No. of vehicles owned*1	No. of casualties*2	No. of vehicles owned*3	No. of casualties*2
Total	17,957	64	230,681	8,340
No. of casualties per 1,000 vehicles owned	3.6		36.2	

*1 As of the end of March 2009

*2 Data of 2008

*3 Total number of buses/microbuses (as of the end of December 2008)

1.4. Collision Speeds of Infant-Carrying Vehicles

With regard to collision speeds of infant-carrying vehicles, we used data on accidents recorded for 5 years from 2004 to 2008 and extracted frontal collision accidents (in which the front of the infant-carrying vehicle collides), rear-end collision accidents (in which the infant-carrying vehicle collides with the following vehicle) and single vehicle accidents (in which the infant-carrying vehicle collides with a road structure) to perform an analysis on simulated ΔV *1.

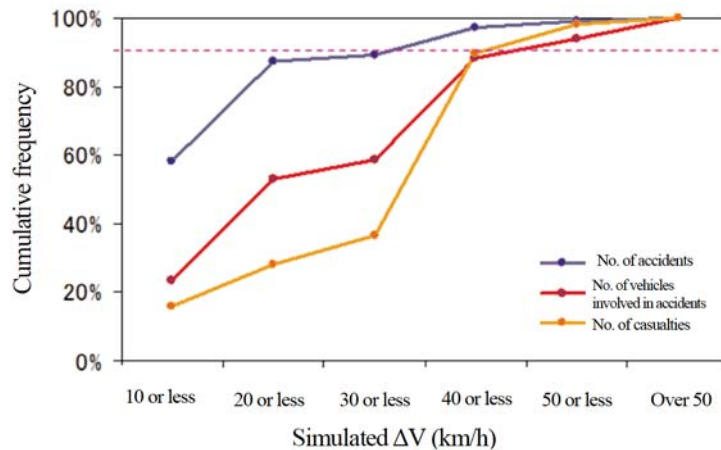
There were 103 extracted accidents, 17 vehicles involved in accidents where 1 or more vehicle passengers were injured or killed, and 57 infant casualties. The ΔV simulation analysis was performed for these accidents.

In any case analyzed, the cumulative frequency of simulated ΔV was 40 km/h or less at cumulative 90%. Since no organized data on simulated ΔV for the other buses/microbuses is available, we cannot make a comparison; however, it has been reported that the simulated ΔV for general passenger cars is about 50 km/h even at cumulative 50% and becomes as high as 70-80 km/h at cumulative 90%*2.

*1 “Simulated ΔV ” is a speed calculated from the danger-recognition speed and vehicle weight by the law of momentum conservation. This simulation was performed to determine the change in speed between before and after the collision.

*2 Source: Shimamura, M., Yamazaki, M. & Fujita, G. Effect of Seatbelt Usage of Rear Seat Occupants on Injury Severity of Front Seat Occupants.

Figure 2 Simulated ΔV for Infant-Carrying Vehicles in Frontal Collisions



1.5. Collision Areas on Infant-Carrying Vehicles in Accidents

Among the collision areas on infant-carrying vehicles in accidents, the front accounted for about 30%, which was the highest percentage. This was followed by the right front corner and the left front corner, indicating that collision occurs at the vehicle's frontal area in many of the accidents. In contrast, the right side, rear, right rear corner, and left rear corner accounted for less than 10%.

Table 3 Collision Areas on Infant-Carrying Vehicles

	Front	Right front corner	Left front corner	Right side	Left side	Rear	Right rear corner	Left rear corner
No. of vehicles involved in accidents	393	229	206	125	176	109	46	39
	(29.7%)	(17.3%)	(15.6%)	(9.4%)	(13.3%)	(8.2%)	(3.5%)	(2.9%)

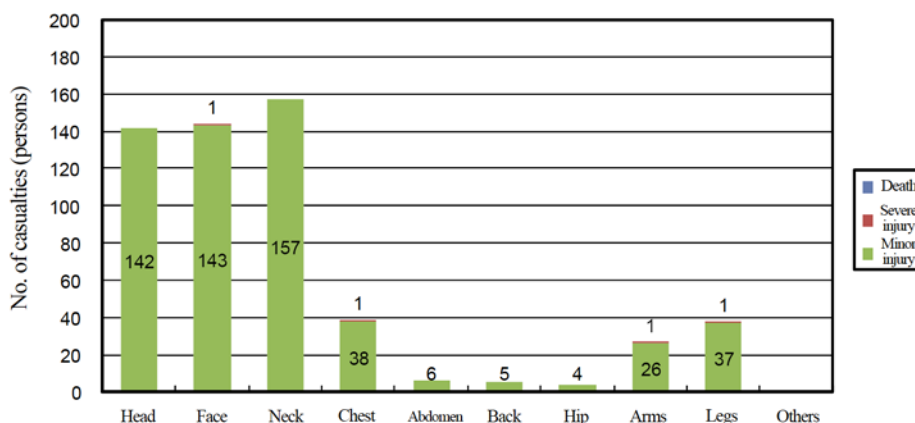
1.6. Injured Body Parts of Injured Passengers

As stated above, most of the injuries to infant passengers of infant-carrying vehicles were minor. As for the injured body parts, the head, face, and neck accounted for about 80% of all the parts.

Table 4 Injured Body Parts of Injured Infants

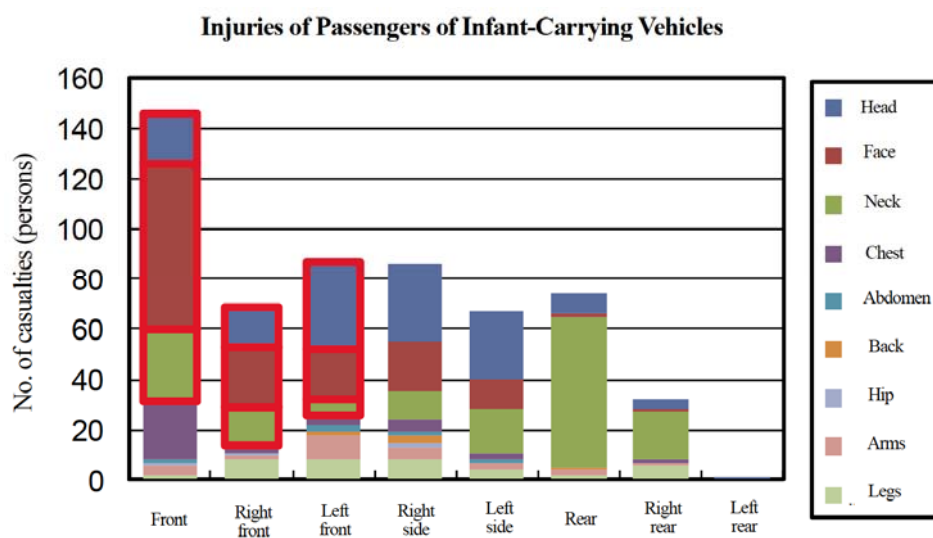
	Head	Face	Neck	Chest	Abdomen	Back	Hip	Arms	Legs	Others	Total
Death	0	0	0	0	0	0	0	0	0	0	0
Severe injury	0	1	0	1	0	0	0	1	1	0	4
Minor injury	142	143	157	38	6	5	4	26	37	0	558
Total	142	144	157	39	6	5	4	27	38	0	562
	(25.3%)	(25.6%)	(27.9%)	(6.9%)	(1.1%)	(0.9%)	(0.7%)	(4.8%)	(6.8%)	(0.0%)	(100.0%)

Figure 3 Injured Body Parts of Injured Infants



Furthermore, the data on injured body parts sorted by collision area on infant-carrying vehicles show that the head, face, and neck injuries in frontal collisions (collision areas: front, right front, and left front) accounted for about 76%.

Figure 4 Injured Body Parts (by Collision Area on Infant-Carrying Vehicles)



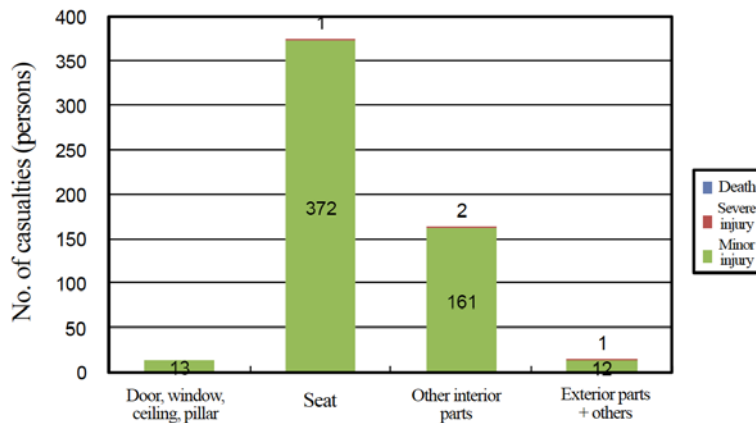
1.7. Vehicle Structures Causing Injuries to Passengers

In the infant-carrying vehicle accidents, the seat accounted for 2/3 of all the vehicle structures that caused injuries to infant passengers. Here, “other interior parts” are structures in the passenger compartment excluding the door, window, ceiling, pillar and seat as shown in the table below. They may include the floor, handrail, and side wall other than the door. In addition, “exterior parts + others” may include the outer panel of the vehicle that the injured passenger was riding, and the other vehicle in the collision.

Table 5 Vehicle Structures Causing Injuries to Infants

	Door, window, ceiling, pillar	Seat	Other interior parts	Exterior parts + others	Total
Death	0	0	0	0	0
Severe injury	0	1	2	1	4
Minor injury	13	372	161	12	558
Total	13 (2.3%)	373 (66.4%)	163 (29.0%)	13 (2.3%)	562 (100.0%)

Figure 5 Vehicle Structures Causing Injuries to Infants



1.8. Summary of the Accident Analysis

The accident rate for infant-carrying vehicles was about half the rate for buses/microbuses, and the number of casualties per vehicle owned was about 1/10. Furthermore, during the period from 2003 to 2008, which was covered in the analysis, there were no fatalities, and the number of severe injuries was 4; most of the injuries were minor.

With regard to the collision speeds at the time of accidents, the simulated ΔV , as determined from the danger recognition speed and vehicle weight, was 40 km/h or less at cumulative 90%. As for the injured body parts, the head, face, and neck accounted for about 80%, and for the injury-causing vehicle structures, the seat accounted for about 2/3.

1.9. Subject of Study for the Guidelines

The result of the analysis on infant-carrying vehicle accidents revealed that there are very few fatal or severe accidents involving infant-carrying vehicles. Consequently, as the subject of the study, we chose accidents in which the head, face, and/or neck is injured by the seat in front (minor injuries), and will indicate safety measures against these accidents as a priority.

If the safety measures compiled herein are implemented, about 76% of injuries to infants in frontal collision accidents can be mitigated.

2. Safety Measures That Should Be Implemented in New Vehicles

Points:

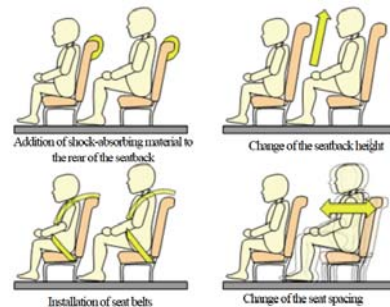
- **Events that need early improvement of safety**
 - ✓ Events in which the head, face, and/or neck is injured by the seat in front (minor injuries)
- **Specific safety measures**
 - ✓ Shock-absorbing material to be added to the rear of the seatback;
 - ✓ Seatback height to be increased by about 100 mm;
 - ✓ Installation of seat belts not to be required until those suitable for infant seats in infant-carrying vehicles are developed; and
 - ✓ Seat spacing to remain unchanged.
- **When to implement the safety measures based on the Guidelines**
 - ✓ In order to be able to respond to the users wishing to purchase vehicles in which the safety measures based on these Guidelines are implemented, the motor vehicle manufacturers, etc. shall develop such vehicles by around 2015.

2.1. Specific Safety Measures

The result of the analysis on the current status of infant-carrying vehicle accidents found that infants get injured (minor injuries) when they hit the infant seat (seat in front) in most of the accidents. Based on this understanding, we first discussed the “Expected effects”, “Issues of concern”, “Evaluation”, etc. for each of the specific safety measures listed under the Primary Safety Measures for Infant Seats Installed in Infant-Carrying Vehicles below and then evaluated various combinations of these measures.

Primary Safety Measures for Infant Seats Installed in Infant-Carrying Vehicles

- Addition of shock-absorbing material to the rear of the seatback
- Change of the seatback height
- Installation of seat belts
- Change of the seat spacing



2.2. “Expected Effects”, “Issues of Concern”, “Evaluation”, Etc. for Each of the Specific Safety Measures

2.2.1. Addition of shock-absorbing material to the rear of the seatback

Expected effects:

- As mentioned in Section 1 above regarding the results of the accident analysis, among the injured body parts, the head, face, and neck accounted for about 80%, and among the

injury-causing vehicle structures, the seat accounted for about 2/3. Based on these findings and on the infant dummies' behaviors observed in the collision experiments described below, damages can be expected to reduce if the rear of the seatback of the seat in front has a shock-absorbing property for when infants hit the seatback.

- **Infant behaviors in collisions (results of collision experiments)**

The sequences of photos below show the results of collision experiments conducted by National Traffic Safety and Environment Laboratory to grasp the behaviors of infants with and without seat belts on.

The infant dummy sitting closer to the camera and the one sitting farther away simulate a 3-year-old child and a 6-year-old child, respectively.

"0ms" in the first photo indicates the point at which the infant-carrying vehicle started to collide with something, and the following sequence of photos captures the infant behaviors through the subsequent passage of time.

(1) Behaviors of infants without seat belts on

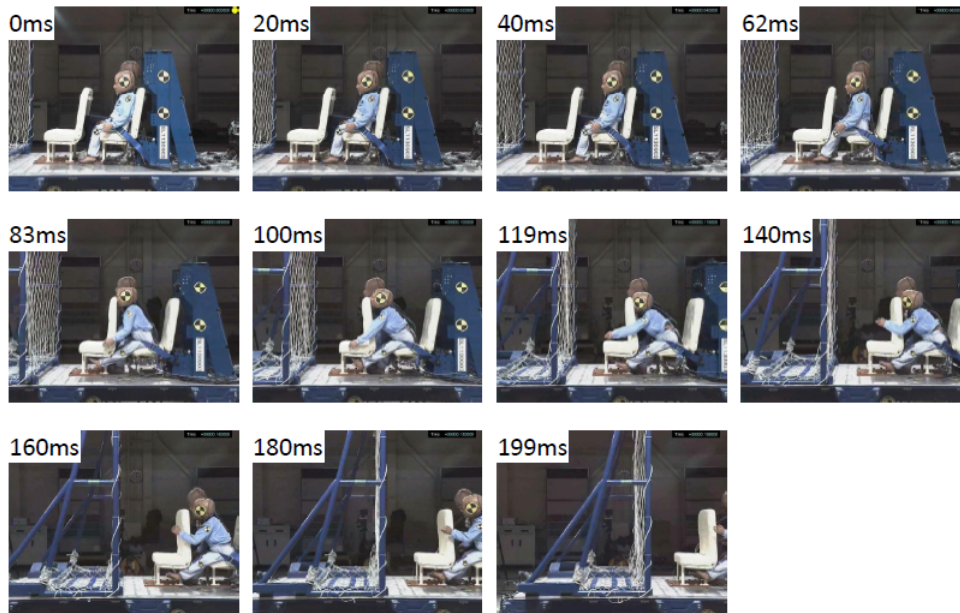
Following the collision of the infant-carrying vehicle, the infants moved forward while remaining in the seated position. Their knees then came in contact with the rear of the backseat of the seat in front. With this contact point as a pivot point, they rolled forward.



Experiment conducted by National Traffic Safety and Environment Laboratory

(2) Behaviors of infants with 2-point belts on

Following the collision of the infant-carrying vehicle, the infants rolled forward with the hip belt as a pivot point.



Experiment conducted by National Traffic Safety and Environment Laboratory

Issues of concern:

- While the addition of shock-absorbing material does not raise any issue of great concern, an even more damage-reducing effect can be expected if it is combined with the increase of the seatback height, as suggested by the infant behaviors in collisions.

Evaluation:

- Using this measure combined with the increase of the seatback height, effective damage reductions can be expected for accidents in which the head, face, and/or neck is injured by the seat in front (minor injuries).

2.2.2. Change of the seatback height

Expected effects:

- An increased seatback height can be expected to be effective, to a certain degree, in preventing infants from moving forward and being thrown over the seatback of the seat in front in a collision (the seat can restrain infants more effectively).
- If shock-absorbing material is added to the rear of the seatback, a damage-reducing effect can be expected for when infants hit the seat in front.

Issues of concern:

- Considering the actual conditions of operation and usage of these vehicles, where adult passengers constantly watch infant passengers that they accompany, the seatback height

needs to be a height that takes into account the visibility of infants for those adult passengers.

- The infant behaviors observed in the collision experiments indicate that shock of the infants hitting the seat cannot be absorbed just by increasing the current height of the seatback.

Evaluation:

- Using this measure combined with the addition of shock-absorbing material to the rear of the seatback, effective damage reductions can be expected.
- This measure can be expected to be effective, to a certain extent, in improving the seat's infant-restraining property.

2.2.3. Installation of seat belts

Expected effects:

- The seat belt restrains infants to the seat in a collision, which means that it can prevent them from falling from the seat or being thrown out of the vehicle.
- The 3-point belt can stop the movement of infants' shoulder, preventing them from hitting the rear of the seatback of the seat in front.

Issues of concern:

- Since the body build varies largely among infants using infant-carrying vehicles (most of whom are 3 to 6 years old), it will be difficult to use the seat belt correctly if it is of a fixed configuration. Therefore, if seat belts are to be installed, it will be necessary to adjust each belt every time in accordance with the body of the infant using it and to ensure the correct use by making sure that the lap belt fits the hip bones properly without any twist, etc.
- If the seat belt is not used correctly, it may cause the following injuries in the event of accidents:
 - The lap belt may intrude into the infant's abdomen and damage internal organs, etc.
 - In the case of the 3-point belt, the shoulder belt may apply pressure to the infant's neck and compress the carotid artery, etc., causing injuries.
- In the event of an emergency such as vehicle fire, the infant passengers must be rescued out of the vehicle rapidly; unless the seat belt has a structure such that infants can unfasten it easily by themselves, it will be difficult for them to exit from the vehicle in a short time.
- At present, no seat belts exist that can solve the above issues and are suitable for the infant seats installed in infant-carrying vehicles.

Other matters to be noted:

- While a simplified seat belt using the tape fastener is effective as an educational tool to accustom children to fastening and unfastening of the seat belt, its capability to restrain infants in collisions is very low. Moreover, it is highly possible that its adhesive property will deteriorate over time in use due to dust deposits, etc. on the adhesive surface, resulting in insufficient restraining of infants in collisions. For these reasons, it should be noted that

this type of seat belt does not necessarily lead to improved safety.

Evaluation:

- Although the seat belt is effective for preventing infants from falling from the seat, being thrown out of the vehicle, etc., currently no seat belts exist that are suitable for the infant seats installed in infant-carrying vehicles. Hence, in the future, we should urge the motor vehicle manufacturers, etc. to develop seat belts that take into account the actual conditions of usage of infant-carrying vehicles and which infants can fasten and unfasten by themselves correctly and easily, and depending on the progress of such development, we should discuss how to treat such seat belts in terms of vehicle safety improvement.

2.2.4. Change of the seat spacing

Expected effects:

- We cannot identify expected effects of the change of the seat spacing alone.

Issues of concern:

- If the seat spacing is reduced from the current spacing, infants with a large body build such as 6-year-olds may not be able to sit in the seat.
- The infant behaviors observed in the collision experiments suggest that, if the seat spacing is increased without restraint by the seat belt, the shock on infants hitting the seat in front will become stronger, which may result in serious injuries.

Evaluation:

- It is difficult to reduce the seat spacing from the current spacing.
- If seat belts are installed: Since the infant behavior in collisions varies depending on the seat belt specifications (2- or 3-point belt), we need to study seat belt specifications in conjunction with appropriate seat spacing.

2.3. Evaluation of Combinations of the Specific Safety Measures

We evaluated combinations of the specific safety measures, i.e., addition of shock-absorbing material to the rear of the seatback, change of the seatback height, installation of seat belts, and change of the seat spacing. The results of the evaluation are compiled in the table below.

While it was found that addition of shock-absorbing material and/or change of the seatback height can reduce damages in collisions at low speeds, if the existing belts are used without modification, problems may occur with regard to emergency exiting, etc.

Table 6 Evaluation of Combinations of the Specific Safety Measures

Specific Safety Measures		(1) Addition of shock-absorbing material to the rear of the seatback	No		Yes		
		(2) Change of the seatback height	Unchanged	Unchanged	Higher	Unchanged	Higher
		(3) Installation of seat belts	Unchanged (no belt)	Unchanged	Unchanged (no belt)	Use of the existing belts without modification	
		(4) Change of the seat spacing	Unchanged		Unchanged		
Items of evaluation	Effects in collisions	Falling from the seat/being thrown out of the vehicle	P	P	F	E	E
		Protection of the head and neck (including the face)	P	F	G	E	E
	Easiness of emergency exiting	Emergency exiting in panic situations	E	E	E	P	P
		Emergency exiting in rollover accidents	G	G	G	P	P
		Emergency exiting in vehicle fires, etc.	E	E	E	P	P
	Usability of belts	Correct fastening/unfastening	NA	NA	NA	P	P
		Time required for fastening/unfastening	NA	NA	NA	P	P
		Usable regardless of body build	NA	NA	NA	P	P
	Visibility of infant passengers	Easiness of checking the status of belt	NA	NA	NA	F	F
		Visibility of infants	E	E	F	E	F
Other matters to be noted	Safety education for infants	NA	NA	NA	E	E	
	Effect on commercial value	Price/widespread use of the equipment	NA	NA	NA	High	High
		Reduction of the number of seats (capacity)	NA	NA	NA	Mid	Mid

Note:

1. In the “Items of evaluation” section, the letters denote the following: E (Excellent), G (Good), F (Fair), P (Poor) and NA (Not Applicable).
2. In the “Other matters to be noted” section, the letters NA denotes “Not Affected”, and the words “High”, “Mid”, and “Low” refer to the level of effect.

2.4. Necessary Safety Measures and Their Technical Requirements

As a result of the discussions in Sections 2.2. and 2.3. above, it is desirable that the following safety measures be taken for new vehicles.

2.4.1. Addition of shock-absorbing material to the rear of the seatback

It is desirable that shock-absorbing material meeting certain requirements on shock-absorption property be added to the rear of the seat, using the existing technical standards for reference.

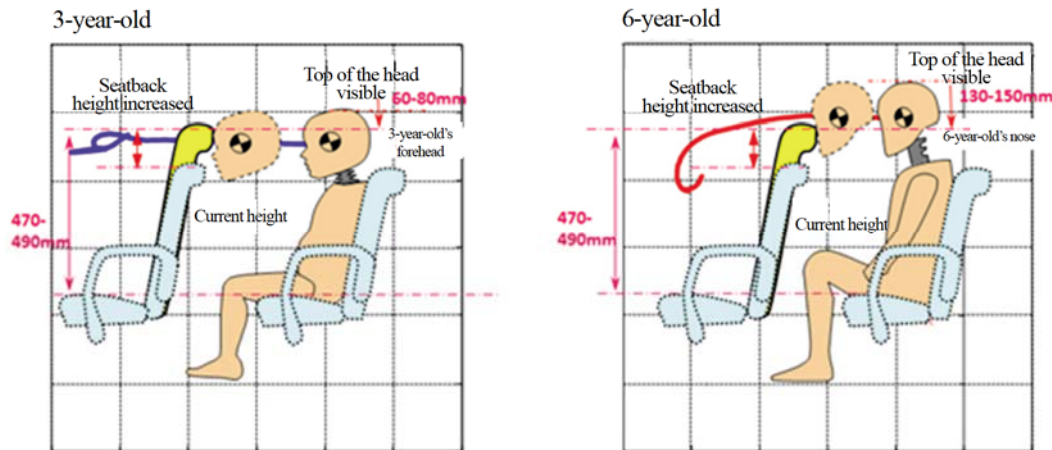
Specifically, for adding shock-absorbing material to the rear of the seatback, it is desirable that the requirements on energy absorption characteristics of the rear part of seat backs*, which are part of the requirements for bus seats in the United Nations Regulation No. 80 under the 1958 Agreement, or similar requirements be met. In addition, it is desirable that the vehicle structure installed in front of the foremost infant seats meet those energy absorption requirements in the UN Regulation or similar requirements as well.

* Performance requirements for seats of buses/microbuses. The rear of the seat backs of seats is required to have energy absorption characteristics so that it can absorb impact energy generated when occupants sitting in the seats immediately behind these seats hit these seats in front of them. The Regulation states that when an impactor

simulating the adult head hits the seat in front at a speed of 24.1 km/h, the impactor's deceleration shall not exceed 80 G continuously over 3 ms (milliseconds).

2.4.2. Change of the seatback height

For infant seats, it is desirable that the height from the seating surface to the top of the seatback be higher than the current height (to be about 470-490 mm) so that the visibility of infants for adult passengers accompanying them will not be lowered and that damages will be effectively reduced for 6-year-old infants with a large body build as well.



2.4.3. Installation of seat belts

The installation of seat belts is not required until seat belts suitable for the infant seats installed in infant-carrying vehicles are developed.

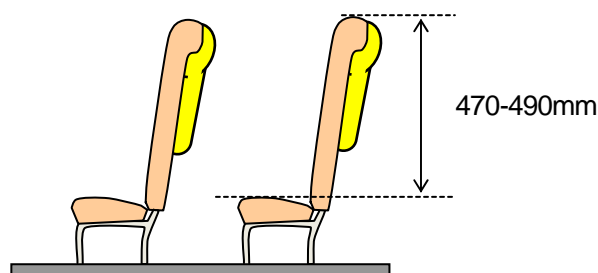
2.4.4. Change of the seat spacing

Since the installation of seat belts is not required, the seat spacing does not need to be changed.

2.5. When to implement the safety measures based on the Guidelines

In order to be able to respond to the users wishing to purchase vehicles in which the safety measures based on these Guidelines are implemented, the motor vehicle manufacturers, etc. shall start development of infant seats early and develop such vehicles by around 2015, while taking into account schedules for designing, prototype manufacturing, production/distribution system building, etc.

(Illustration of the safety measures implemented)



3. Favorable Safety Measure for In-Use Vehicles

3.1. Specific Safety Measure

Although the purpose of these Guidelines is to allow the future users to purchase new vehicles equipped with seats in which the safety measures are implemented, this section aims to allow the current users of in-use vehicles, i.e., preschools/kindergartens, etc., to choose this safety measure as part of their efforts to improve safety of their current vehicles.

In the case of in-use vehicles, unlike the safety measures for new vehicles described in Section 2, it is difficult to re-design the existing infant seats. Therefore, the safety measure is limited to the minimum measure for these existing infant seats.

3.2. Favorable Safety Measure and Its Technical Requirements

3.2.1. Addition of shock-absorbing material to the rear of the existing seatback

It is favorable that material whose property is similar to that required in the safety measure for new vehicles specified in Section 2.4.1. above be added.

The possible methods may include covering the seatback with the shock-absorbing material, peeling the seat leather and replacing it with a new leather after adding the shock-absorbing material, and so on*.

* Replacing the existing infant seats with the seats in which the safety measures are implemented to be installed in new vehicles can be one of the methods.

3.3. When to implement the safety measure based on the Guidelines

In order to be able to respond to the users wishing to add to their existing seats the shock-absorbing material in which the safety measure based on these Guidelines is implemented, it is desirable that the motor vehicle manufacturers, etc. start development of shock-absorbing material for the existing seats early and develop parts by around 2015, while taking into account schedules for designing, prototype manufacturing, production/distribution system building, etc.

4. Matters to Be Noted Regarding Vehicle Operation

For the improvement of vehicle safety regarding infant-carrying vehicles, in addition to the vehicle safety measures, the user of infant-carrying vehicles need to make the following efforts:

- Avoid operation on motorways, etc. of infant-carrying vehicles not equipped with seat belts.
- If the conventional seat belts are to be installed without modification, it is desirable that education/training be provided to infants as well as to adults (drivers, preschool/kindergarten teachers, nursery teachers, etc. that accompany infants) so that the infants can learn to correctly fasten and unfasten the seat belts. In particular, it is desirable that drills for emergency situations such as vehicle fires be held.

5. Future Tasks

If further safety measures for infant-carrying vehicles are to be discussed, we also need to study and facilitate safety measures other than those that address accidents in which the head, face, and/or neck is injured by the seat in front as compiled in these Guidelines.

Since no seat belts exist today that are suitable for the infant seats installed in infant-carrying vehicles, the motor vehicle manufacturers, etc. shall develop seat belts that take sufficient consideration of the actual usage conditions and that have solved various issues and shall aim in the next 3-5 years to allow the users wishing for the installation of the appropriate seat belts to choose such seat belts when buying new vehicles. It should be noted that, in addition to the general seat belts, various ideas exist such as the restraint system used in roller coasters, a mechanism where the belt is detached automatically, and seats facing each other. The effectiveness, etc. of these alternatives need to be studied in the future.