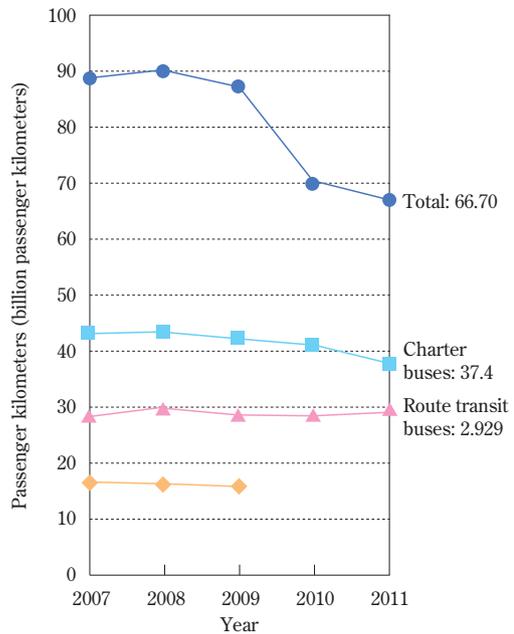


※Domestic buses were excluded from the survey in 2010.

Fig. 2 Passenger volume.



※Domestic buses were excluded from the survey in 2010.

Fig. 3 Passenger volume.

and equipment introduction since the new rules have priority.

The economic situation of the transport industry improved after December 2012, when the yen began to depreciate and share prices rose. However, public economic sentiment remains depressed and the revitalization of the bus industry is likely to require more time.

## 2 The Bus Industry in Statistics

### 2.1. Passenger numbers

The number of bus passengers continues to fall as the structures of peoples' lives change and buses are regarded as a less appealing choice compared with the convenience of other forms of transport. The number of route transit bus passengers in the whole of Japan fell from 4.1771 billion in 2009 to 4.158 billion in 2010 (Fig. 2).

In contrast, the number of charter bus passengers increased by approximately 2 million people to 0.30049 billion from 0.298 billion in 2010. This increase is due to the identification of new demand by expressway tour buses and the number of passengers increased by 2.58 million in 2007, 3.72 million in 2008, and 4.8 million in 2010. This trend is pushing the number of charter bus passengers upward, despite the general gradual decline in this category. However, the expansion of expressway tour buses has led to severe price competition and the effects on vehicle investment and labor costs must not be overlooked.

The operating income of charter bus companies has halved in the last ten years. At the same time, the average yearly working hours of charter bus drivers has

increased to 1.3 times the hours of other industries. This figure easily highlights the increasing burden on bus crews. The development of vehicle equipment to help alleviate this burden and to enhance safety has become more important than ever.

The low prices offered by expressway tour bus operators to appeal to customers are partly due to sales strategies that take advantage of IT tools. Existing expressway route transit bus operators are also working to revise sales methods and fare settings. In the future, services that combine the merits of both types of company may lead to the development of even more user-friendly and reliable means of transportation.

The number of kilometers actually travelled by bus users in 2011 was 66.7 billion passenger kilometers in 2011, another figure that is in decline (Fig. 3).

### 2.2. Market trends

Reflecting the market situation described above, bus sales in Japan continue to fall. However, since the number of registrations has not changed greatly, it is likely that most of the substitute demand is being satisfied by used vehicles.

Fig. 4 shows the trends for bus sales in Japan. Although sales have recovered after the drop due to the Great East Japan Earthquake, demand for heavy-duty buses remains flat. In this market environment, UD Trucks formally announced its exit from the bus busi-

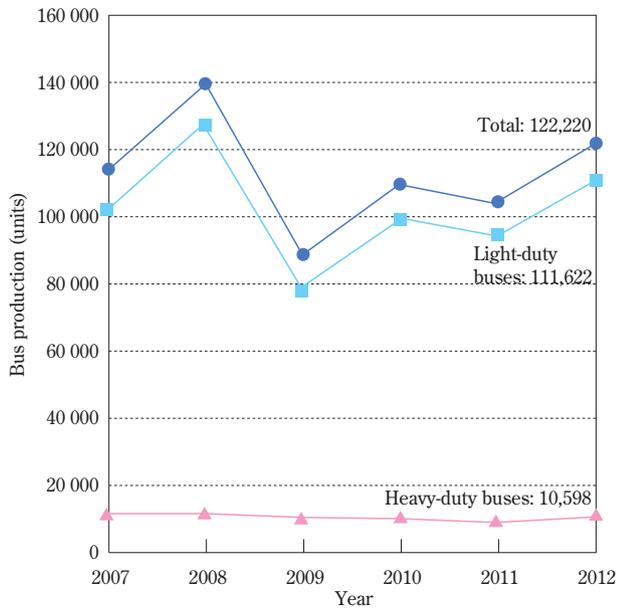
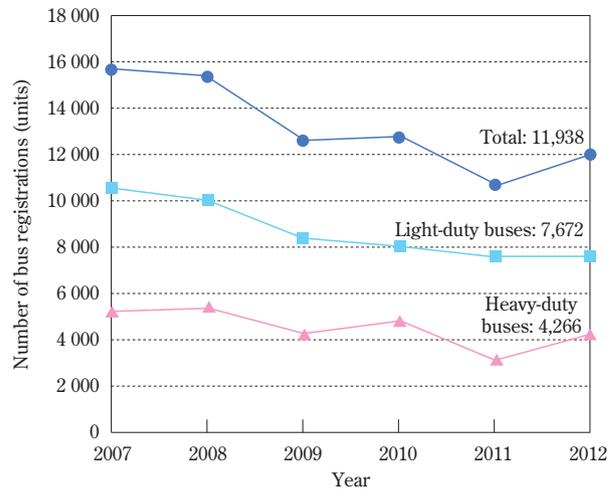


Fig. 4 Bus production in Japan.

ness in August 2012. The company had been deliberating whether to carry on in the bus business after announcing the suspension of negotiations to merge bus businesses with Mitsubishi Fuso in 2010, and the announcement in 2009 by Nishi-Nippon Shatai Kogyo Co., Ltd., the main customer for bus bodies manufactured by UD Trucks, that it was ending its bus manufacturing business. As a result, the number of heavy-duty bus manufacturers in Japan has shrunk from four to three, with only two forming part of an industrial group. Fig. 5 shows the number of bus registrations in Japan.

Table 1 shows bus production by body type. The reduction in super-high decker (SHD) coach bodies, which are the mainstay of both charter and overnight expressway buses, is evident. Led by Japanese sightseeing buses, SHD coaches became popular from the 1990s because of the improved view and ride quality offered by a high-floor construction, effective use of the under-floor area, and the like. However, sales of SHD coaches have declined due to the advent of high-decker (HD) coaches with under-floor sleeping areas for replacement drivers, lower prices, and the like.

Imported buses from Korea have been gaining attention as another choice for bus operators. The number of imported buses has been steadily increasing with some repeat orders placed by major Japanese operators. However, due to the international political situation, such as the dispute over the Senkaku Islands, the number of inbound tourists from China and Korea has declined, lead-



Note 1: From 2003, statistics were collected based on the license plate number registration category rather than according to chassis (excluding mini-vehicles).

Fig. 5 Number of bus registrations in Japan.

Table 1 Declining sales of SHD coaches.

	2004	2005	2006	2007	2008	2009	2010	2011
SHD	392	488	290	288	267	100	156	97
HD	1 107	1 301	1 385	1 362	1 513	1 183	1 292	1 016
Total (SHD+HD)	1 499	1 789	1 675	1 650	1 780	1 283	1 448	1 113
SHD/Total (%)	26.1	27.3	17.3	17.4	15	7.8	10.8	8.7

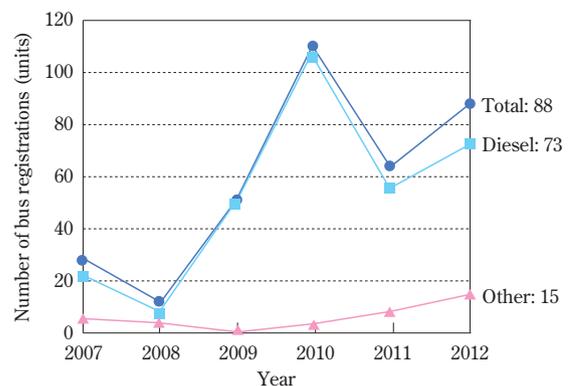


Fig. 6 Number of imported bus registrations.

ing to fewer orders from operators dealing with overseas tourists (Fig. 6).

Reflecting the contraction in bus demand, regional bus operators are reducing vehicle sizes. As a result, these operators are increasing the proportion of medium-duty route transit buses and adopting used vehicles as an alternative to new vehicles, trends which are greatly affecting new vehicle sales. Most of these used vehicles are being sourced from operators in major cities that tended to replace vehicles after roughly 12 years due to NOx emissions regulations and the like. However, after

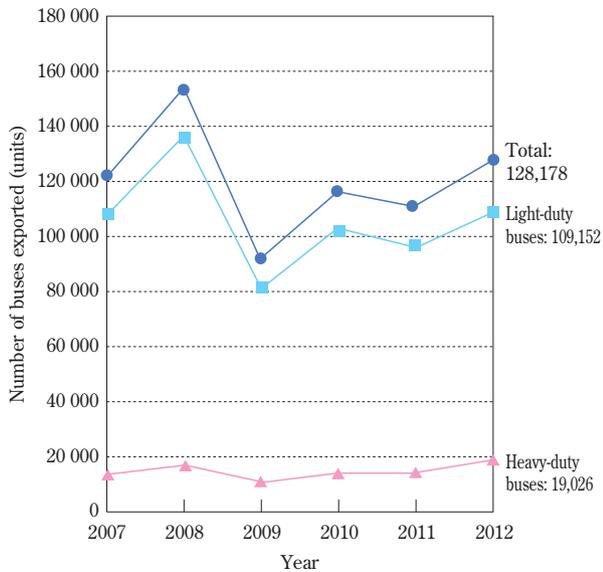


Fig. 7 Bus exports.

lowering the age of fleets in this way, some operators are now adopting a policy of longer term use. Consequently, this trend is likely to affect both operators attempting to take advantage of used bus procurement opportunities and companies selling new buses.

Fig. 7 shows the trends in export markets, which have supported Japan's bus industry for a number of years. Exports of light-duty completed buses have remained robust and make up a majority of sales. However sales of heavy- and medium-duty bus chassis and components remain limited. Trends for export destinations remain unchanged with low exports to the economically growing BRICS nations (Fig. 8). In contrast, countries in Asia, Africa, the Middle-East, and other strong markets for Japanese buses, are experiencing growing momentum toward the introduction of modern public transportation systems such as bus rapid transit (BRT) systems (see below). Consequently, the capability of Japanese manufacturers to meet this demand will be an issue in the future.

### 3 Regulatory Trends

#### 3.1. Japan's preferential tax scheme for environmentally friendly vehicles

Improvements to Japanese buses in recent years have tracked the application of environmental regulations. All new buses sold in 2012 comply with the latest regulations related to emissions, noise, and the like. From April 2012, bus purchases became eligible under Japan's preferential tax scheme for environmentally friendly

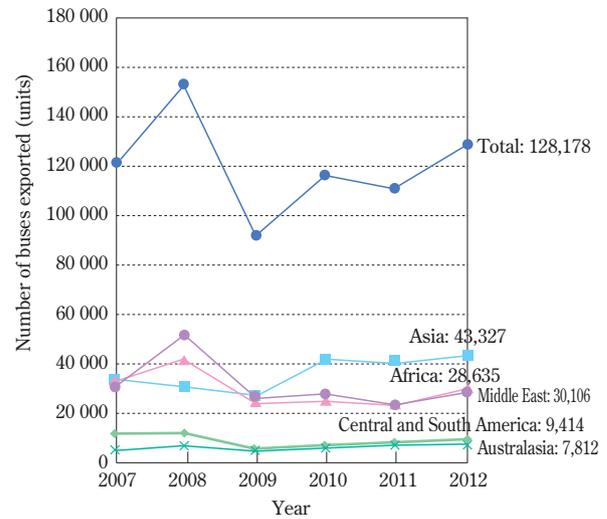


Fig. 8 Main export destinations.

vehicles, which lowers or abolishes excise duty and the vehicle weight tax for vehicles with excellent environmental performance and fuel efficiency. Buses that meet the 2015 heavy-duty vehicle fuel economy standards are eligible for these purchase incentives. Under this system, vehicles that satisfy the post new long-term emissions regulations and emit 10% less NOx and particulate matter (PM) than the standard are eligible for a 50% tax reduction. A further 5% improvement in emissions increases the tax reduction to 75%, and a further 10% improvement results in a 100% tax reduction (if only the new post long-term emissions regulations are satisfied, improving on the fuel economy standard by 5% results in a 50% tax reduction, and a 10% fuel economy improvement results in a 75% tax reduction). Although this tax-reduction system based on the heavy-duty vehicle fuel economy standards and emissions characteristics has not resulted in technological changes to buses, the emissions codes appended to the vehicle model code of many buses have changed. Even in the case of buses with a low production volume per model, model categorization including emissions codes has become more complicated, including the launch of bus models with the same external appearance and multiple emissions codes, buses with three-letter emissions codes, and so on.

#### 3.2. Enhancement of seat safety

Tighter seat regulations came into force for buses registered from July 1. The details of these regulations are described below in the section on bus body structures.



Fig. 9 Hino S'elega.



Fig. 11 Mitsubishi Fuso Aero Queen.



Fig. 10 Hyundai Universe.



Fig. 12 Isuzu Erga Hybrid.

### 3.3. New structural requirements for driver-only buses

The seat options for sightseeing coaches have changed a great deal. In addition, structural requirements for driver-only buses (often called “one-man” buses in Japan) on urban routes have also been revised. These topics are also described below in the section on bus body structures.

## 4 New Buses

### 4.1. Heavy-duty sightseeing coaches

In April, the RU1A series with a new engine was added to the Hino S'elega and Isuzu Gala lines. These buses combine the newly developed 9-liter TI engine and a 7-speed transmission to achieve excellent economic and dynamic performance. This is the first application of a 7-speed transmission to a bus. These new series are being sold alongside conventional HD coaches with a 13-liter engine. Although these coaches also feature measures to strengthen the seats, the appearance remains unchanged from the 2011 model (Fig. 9).

Hyundai also launched the 2012 Universe model

in April. The positions of the headlamps have been changed to meet new lighting regulations and the appearance of the coach has been face-lifted. Appearance was also enhanced by the addition of a larger roof spoiler as standard equipment (Fig. 10).

Mitsubishi Fuso upgraded its sightseeing coach models in July. In addition to measures to enhance seat safety, these vehicles include enhanced safety measures such as a lane departure warning system and cameras to enhance the field of view to the left as standard equipment. Although the external appearance is virtually unchanged, the air-conditioning (A/C) system has been switched from a sub-cooling type, which has been standard on sightseeing coaches for some time, to a new under-floor direct cooling system on all models. Some grades also use Korean-built seats as standard equipment to reduce costs. A collision damage mitigation brake system was added in December (Fig. 11).

### 4.2. Heavy- and medium-duty route transit buses

In August, Isuzu launched the Erga Hybrid (Fig. 12). The technical details of this bus are described below in the section on bus body structures.

Other heavy- and medium-duty route transit buses



licensing by European manufacturers, bus exports from China to the European market soon reached several thousand. Although the precise data has not been analyzed, it seems that this is a realistic figure based on cases where European manufacturers added Chinese-built buses to product lineups and then sold these in markets that prioritize low prices, such as Eastern Europe and Russia.

## 2 Public Policies for Encouraging Improved Bus Services

In the field of urban public transportation, public consensus has been reached both in Europe and around the world that enhancing bus transportation is as an effective means of helping to protect the environment and to reduce infrastructure and city costs. The European Bus System of the Future (EBSF) that was announced in April 2008 is a good example of this public consensus.

EBSF is an international project supported by the European Commission (EC) with participation by eleven EU countries and 42 business partners, including five bus manufacturers, transportation businesses, research institutions, and the like. The aims of the project are to make use of advanced tools depending on the city, improve the usability and convenience of bus transport, and to increase the number of users. The project budget was 26 million euros and activities were carried out in seven cities in six countries (France, Spain, Hungary, Germany, Sweden, and Italy). All participating cities aimed to improve usability and user numbers by introducing a wide range of technologies, such as a fare collection system, priority running, vehicle concepts, and the like.

Example ideas involved designing a vehicle with the cockpit located in the center to improve drivability and the development of BRTs (i.e., high-speed, high-efficiency transport systems using buses) with transportation capacities close to Europe's popular tram systems. By doing so, another aim of the project was to improve the image of the bus in the urban landscape. In all cases, the idea of enhanced bus services contributing to society is entering the mainstream in cities throughout the world as well as in Europe. The effectiveness of enhancing public transportation had gained a wide consensus even before the attention created by the EBSF project. At the very least, the fact that Europe seems to have shaken free from the debate about the value of continuing



Fig. 1 EvoBus Setra S500 ComfortClass.

existence of bus services is one point of difference with Japan.

## 3 Examples of New Buses

Showcases for the European and American bus industries include BusWorld, which is held in odd-numbered years in Belgium, as well as exhibitions hosted by the International Association of Public Transport (UITP) and the triennial American Public Transportation Association (APTA) exhibition. However, the largest commercial vehicle show in the world is reputed to be the Internationale Automobil-Ausstellung (IAA) International Motor Show, which focuses on commercial vehicles in even-numbered years. The latest show was in 2012. Local manufacturers use this show for world premieres and the following sections will describe prominent entries in this show from a design standpoint.

### 3.1. Setra S500 (Germany)

The Setra S500 is a new sightseeing coach unveiled by EvoBus GmbH, a member of the Daimler group. The S500 enhances the characteristics of the S400 and has an aerodynamic drag (CD) value of 0.33. It also features a new engine with a new lightweight fluid retarder that uses engine coolant (Fig. 1).

The design has a strong presence and its identity is immediately recognizable as a Setra. It also has an unusual downward character line at the rear, which differs from the long-term mainstream European styling that uses paint design or styling to express an upward moving design at the rear. Rather than chasing after new ideas or change, this new coach creates a feeling of nostalgia for the first generation Setra S8 that underlines the established reputation of the company (Fig. 2).

### 3.2. Neoplan Jetliner (Germany)

Neoplan is a company with strong name recognition even in Japan. It is currently a member of the MAN group. Although members of the top management of



Fig. 2 Setra S8 (first launched in 1951).



Fig. 3 Neoplan Jetliner.

the company that played an active role in the industry in the past have moved onto rival manufacturers, the launch of the Starliner in 2004, the Cityliner in 2006, and the Skyliner in 2010 ushered in a new era for Neoplan sightseeing coaches. The Jetliner, which was launched in 2012, is a general-purpose sightseeing coach that is lower key than previous launches by the company. However, it retains the same precise styling as the other models in the Neoplan family and has sufficient product appeal as a sales leader (Fig. 3).

### 3.3. Viseon (Germany)

Viseon is an up-and-coming manufacturer that was started up by a former key member of Neoplan. The company originally differentiated itself from MAN with short HD models. However, in only a short time, Viseon has enhanced its model lineup with a 12 meter HD and a double decker with a length in excess of 12 meters. The company's motif is the letter "V", and the "V" window graphic gives Viseon's buses a sense of individuality (Fig. 4). On the business front, Viseon has attracted investment from Chinese bus manufacturers and has ventured into the competitive international market in recent years.

### 3.4. AutoTram Extra Grand (Germany)

This is a 3-car 5-axis double articulated bus with a total length of 30.73 meters jointly developed by a research institute, university, transportation company, and the Goppel Bus GmbH bus manufacturer in Germany.



Fig. 4 Viseon LDD 14.



Fig. 5 AutoTram Extra Grand.

It boasts a passenger capacity of 256 people and was developed under the assumption of use in a BRT. Until recently, the longest double articulated bus had three connected cars and a total length of less than 25 meters. Other articulated bus models have two cars with two axles in the rear section to maximize seating capacity. This new bus exceeds its rivals. It is a hybrid bus that combines a 6-liter diesel engine with a 120 kW motor and lithium-ion battery. A demonstration test was planned and it attracted strong attention at the IAA venue from Chinese business. Although nothing stands out from the standpoint of styling design, it will have a powerful presence in the urban landscape (Fig. 5).

### 3.5. Solaris Urbino 12 E (Poland)

This is a full-size model from an up-and-coming manufacturer in Poland to complement a medium size electric bus launched in 2011. It is powered by a 600 V lithium-ion battery and a 160 kW motor, enabling a cruising range of 150 km on a single charge.

Although the development of full-size electric buses is making progress in China, European manufacturers are generally favoring hybrid buses that combine a small displacement diesel engine with a battery. Therefore,



Fig. 6 Solaris Urbino 12 E.



Fig. 8 Haargaz Urbanit.



Fig. 7 King Long city bus.



Fig. 9 AMZ City Smile.

the development of a full-size electric bus gained a large amount of attention. The symmetrical front and other elements of the body styling are typical of city buses manufactured by Solaris Bus and Coach S.A. The bus is even designed with right-hand drive for the UK market (Fig. 6).

From the standpoint of other alternative powertrains, city buses powered by CNG and LNG were also exhibited at the show despite the limited available markets.

### 3.6. King Long city bus (China)

Chinese manufacturers have started to actively participate in and exhibit buses at the IAA International Motor Show and BusWorld in recent years. These exhibited buses have been designed to comply with the common European regulations and the external appearance is equivalent to European buses. The engines and components in these buses are already widely used throughout Europe and the presence of these vehicles in the market has been received with comparatively minimum resistance by European businesses. The King Long bus shown in Fig. 7 is equipped with the standard specifications of European buses.

### 3.7. Urbanit (Israel)

The Israeli bus manufacturer Haargaz exhibited a low-floor (called a “no-step” bus in Japan) articulated bus called the Urbanit at the 2012 IAA International Motor Show. Designed for BRTs, the Urbanit has eye-catching styling. With the capacity for only 40 seats and 100 standing passengers, the Urbanit is not large for its class, but the design places a higher priority on a flowing style. The sleek style of the Urbanit stands out in city bus design, which trends to prioritize flat functional designs. As a result, it may well be welcomed onto the market. The chassis is manufactured by MAN and is compliant with Euro 5 regulations (Fig. 8).

### 3.8. AMZ (Poland)

The Polish vehicle manufacturer AMZ has built military vehicles and ambulances for some time. It entered the bus market in 2011 and exhibited a prototype at Bus World in 2011. By the 2012 IAA International Motor Show, the number of variants had expanded and AMZ chose to exhibit an electric bus. It has an eye-catching cubic body consisting of flat surfaces and somewhat over-decorated bold window graphics. This type of individualistic design is probably important for emerging manufacturers (Fig. 9).



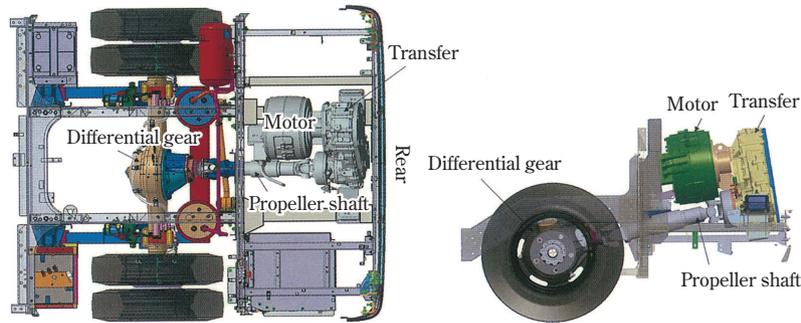


Fig. 2 Structure of Hino Poncho EV.



Fig. 3 Mini electric bus on public road.



Fig. 4 Layout of Isuzu Erga Hybrid.

Ltd. and Tokyo R&D Co., Ltd. are also developing and modifying electric buses.

Another example is a mini electric bus manufactured by Senyo Kogyo Co., Ltd. (length: 5 meters, width, 1.5 meters, passenger capacity: 11 people) that is currently in operation in amusement parks and the like, and is also registered for use on public roads (Fig. 3). Some have also acquired business license plates.

### 2. 2. Isuzu Erga Hybrid

The Erga Hybrid uses a parallel hybrid system developed by the American Eaton Corporation. Combined with Eaton's 6-speed Automated Manual Transmission (AMT), which is an electrically controlled mechanical transmission, this bus achieves economical performance regardless of differences in driving style. Although installing the battery unit and related components at the right-rear of the bus reduces the passenger capacity by three seats, the external dimensions of the bus are the same as a conventional diesel bus, ensuring equivalent maneuverability (Fig. 4).

### 2. 3. Open-top bus in Fukuoka city

Two open-top buses started operation in Fukuoka city in April. Open-top buses tend to have a double-decker structure with the roof of the upper deck removed.

These buses are very popular since customers can enjoy 360-degree views in the sunshine and breeze. Common all over the world for sightseeing tours in cities, open-top buses started regular operations in Japan in September 2004. Subsequently, Fukuoka city announced plans to introduce a similar type of bus. Operation was planned and run by Nishi-Nippon Railroad Co., Ltd. and the bus itself was developed by Hino Motors. The bus features a high-floored bus body over a low-floor chassis with traction supplied to four axles and air suspension. It is described as a double-decker despite only having three seats on the lower deck at the rear overhang. The bus is also compliant with barrier-free regulations by including a wheelchair lift (Fig. 5).

### 2. 4. Night bus innovations

Several new buses have been launched with the aim of differentiating night buses from other inter-city route transit buses. The capacity of a conventional long-distance night bus with passengers in three rows of single seats is 27 or 28 people. One example of a new bus emphasizes comfort by having only 12 seats in two rows each. However, this bus was registered before the seat regulations changed in July. The repercussions of the



Fig. 5 Open-top bus in Fukuoka city.



Fig. 7 Entertainment-oriented bus.



Fig. 6 Example of seat layout in night bus to emphasize comfort.



Fig. 8 Mobile product display vehicle taking advantage of the maneuverability and interior space of a bus.

new rules on night buses are not yet clear (Fig. 6).

## 2. 5. Entertainment-oriented buses

Willer Travel Inc., a well-known operator of expressway tour buses, has developed a new entertainment-oriented bus for trips by club members. The interior and exterior of the bus is designed to resemble a spaceship and screens have been placed along the sides instead of windows. These screens show linked images with the

screens in front of the seats, allowing for a highly realistic game-playing environment. This idea captures the essential concept of a charter bus to make full use of the enclosed dedicated interior space (Fig. 7).

In addition, although not registered as a passenger bus, a mobile product display and sales vehicle has been developed taking advantage of the maneuverability, interior space, and external appearance of a bus (Fig. 8).