Achieving Greater Safety and Environmental Protection in Road Transport
On the Road to Sustainable Mobility 2014

JAPAN AUTOMOBILE MANUFACTURERS ASSOCIATION, Inc.
Automobiles play an essential role in sustaining economic activities around the world and in enhancing people’s lives. Japanese automakers therefore continuously strive to meet society’s diverse and evolving requirements with respect to automotive performance. In so doing, they also hope to broaden the base of automobile and motorcycle enthusiasts and advance the motorization experience for all.

Greater safety and environmental protection in road transport are pivotal issues in society’s quest for sustainable mobility, and Japan’s automakers are determined to meet the challenges confronting them in these areas. As regards safety, Japanese automakers are—individually and through the activities of the Japan Automobile Manufacturers Association, Inc. (JAMA) which they established in 1967—focusing not only on the introduction of advanced vehicle safety technologies, but also on raising public awareness of the role of all road users in achieving greater road safety. Their initiatives in this area also serve the Japanese government’s stated goal of making Japan’s roads the safest in the world.

With respect to environmental protection and specifically the priority issue of climate change, Japan’s automakers are working hard to supply highly fuel-efficient vehicles and implement other measures promoting CO₂ reduction in the road transport sector to help combat global warming.

This pamphlet brings readers up to date on the strategies and measures adopted domestically by Japan’s automakers to increase road safety and further reduce the impact of automobiles on the environment, on the road to sustainable mobility.

Japan Automobile Manufacturers Association
March 2015
In 2012 automotive shipments (both domestic and export shipments, including motorcycles and parts) in value terms totalled 50.3 trillion yen, accounting for 17.4% of the total value of Japan’s manufacturing shipments that year (Fig. 2).

Vehicle Production
Motor vehicle production in Japan in 2014 grew 1.5% over the previous year to 9.77 million units, with passenger cars, trucks, and buses all showing an increase from 2013 (Fig. 3).

The Mainstay of Goods Distribution
With a 51.3% share of Japan’s total freight transport in fiscal 2012 (see note below), road transport leads all other freight transport modes by a wide margin (Fig. 4). Almost 100% of goods considered daily household necessities—including basic foodstuffs, beverages, fisheries products, fruits and vegetables, textiles and clothing, and other products for everyday use—are transported by road. Locally, interregionally and nationwide, motor vehicles thus play a critical role in goods distribution.

Note: Japan’s fiscal year starts on April 1st and ends on March 31st of the following year.

Responding to the Need for Assisted Mobility
Over their more than century-long existence, motor vehicles have continuously evolved in response to users’ needs and expectations, becoming ever more critical to the conduct of daily life because of their unique capability to transport people and goods door to door at the convenience of their users.

Japan in recent years has seen an increased need for assisted-mobility vehicles as a means to encourage the active participation in society of persons with otherwise limited mobility, including not only the physically disabled but also, in a rapidly aging population, the elderly (Fig. 5).

Achieving Sustainable Mobility: The Road Ahead
Whether in the conduct of economic activities or in other spheres, automobiles are indispensable to modern society and its everyday functioning. Historically, however, expanding motorization has been followed by the unacceptable consequences of rising rates of road accident occurrence and an increasingly adverse impact on the environment.

Sustainability in road transport will not be achieved in the future without taking the necessary measures to maximize road safety and minimize the burden posed by automobiles on the environment. Meeting those goals will require broad-ranging measures and concerted efforts on the part of all the stakeholders concerned, including the automotive and other relevant industries, governments, and vehicle users themselves.
Fig. 6  Road Accidents/Injuries/Fatalities
Overview of the Japanese Automobile Industry's Road Safety Activities

Road Fatalities Continue to Decline

In 2014 road fatalities in Japan totalled 4,113 (down 75.5% from the peak total of 16,765 fatalities recorded in 1970), marking the fourteenth straight year of decline. Road accidents and injuries have also steadily decreased. However, in view of the only incremental decline in road fatalities and the unacceptable loss of life that represents, sustained efforts are needed to further increase road safety (Fig. 6).

Moreover, although road fatalities among “seniors” (persons aged 65 or older) fell slightly in 2014 from the previous year to 2,193, they nevertheless accounted for 53.3% of Japan’s total road fatalities, underscoring the continued critical need for road safety measures specifically targeting the elderly.

Objective: The World’s Safest Roads

Making Japan’s roads the safest in the world is a stated goal of the Japanese government. Its 8th Basic Plan for Road Safety (2006-2010) called for reducing annual road fatalities to fewer than 5,500 by 2010, an objective which was achieved in 2008. The government’s 9th Basic Plan for Road Safety (2011-2015) calls for reductions in annual road fatalities to fewer than 3,000 by 2015 and to fewer than 2,500 by 2018, with a view to ultimately achieving zero fatalities in road transport.

To assist in the government’s road accident reduction efforts and help expedite the development of a sustainable mobile society, JAMA recommends to the relevant authorities comprehensive safety-promotion measures targeting road users, motor vehicles, road infrastructure, and the application of ITS (Intelligent Transport Systems) technologies.

Road Accident Causation and Prevention

Road safety involves the interrelationship of three factors: road users, vehicles, and road infrastructure. Research has indicated that human error is directly or indirectly involved in over 90% of road accidents (Fig. 7).

Greater road safety therefore requires that progress be made in all three areas, on the basis of comprehensive accident causation analysis. Accordingly, those three factors are the focus of JAMA’s and its members’ road safety activities, which are summarized as follows:

- Activities targeting road users include the development and implementation of public awareness-raising campaigns and hands-on driver education programs, as well as the production of road safety educational materials;
- Activities targeting road vehicles include the introduction of advanced vehicle safety technologies, in terms of both active safety (collision avoidance) and passive safety (injury mitigation);
- Activities targeting road infrastructure include petitions and proposals to the government and related agencies calling for specific improvements in Japan’s road infrastructure.

JAMA’s Eight Priority Areas of Focus for Greater Road Safety

JAMA has pledged to support the government’s goal of making Japan’s roads the safest in the world, and has identified eight key areas in which the Japanese automobile industry will invest resources and effort in order to contribute to increased road safety. These priority areas are:

1. Accidents involving pedestrians or cyclists;
2. Special measures for the elderly;
3. Greater use of seatbelts;
4. Delays in driver recognition and incorrect vehicle control;
5. Accidents occurring at twilight/night;
6. Accidents occurring at intersections;
7. Collisions with stationary objects;
8. Vehicle compatibility.

Note: Advancing vehicle compatibility involves improving the safety performance of a vehicle in the event of a crash with another vehicle, with a particular focus on reducing the ability of larger vehicles to cause damage to smaller vehicles in a collision. Greater compatibility is achieved through improvements to vehicle body structure aimed at minimizing occupant injury.

Fig. 7  Road Accidents: Causal Factors & Their Share of Involvement (%)

Automakers are continuously advancing the development and onboard installation of vehicle safety features.

Every spring and autumn, JAMA conducts its own road safety awareness campaigns to coincide with the government’s semi-annual, nationwide traffic safety campaigns.

JAMA conducts “hands-on” training sessions throughout Japan to promote safe vehicle operation by drivers of all ages.

The “Safety Action 21” road safety educational materials created by JAMA target young prospective driver’s license holders.

Users, vehicles, and road infrastructure. Research has indicated that human error is directly or indirectly involved in over 90% of road accidents (Fig. 7).

Greater road safety therefore requires that progress be made in all three areas, on the basis of comprehensive accident causation analysis. Accordingly, those three factors are the focus of JAMA’s and its members’ road safety activities, which are summarized as follows:

- Activities targeting road users include the development and implementation of public awareness-raising campaigns and hands-on driver education programs, as well as the production of road safety educational materials;
- Activities targeting road vehicles include the introduction of advanced vehicle safety technologies, in terms of both active safety (collision avoidance) and passive safety (injury mitigation);
- Activities targeting road infrastructure include petitions and proposals to the government and related agencies calling for specific improvements in Japan’s road infrastructure.

JAMA has pledged to support the government’s goal of making Japan’s roads the safest in the world, and has identified eight key areas in which the Japanese automobile industry will invest resources and effort in order to contribute to increased road safety. These priority areas are:

1. Accidents involving pedestrians or cyclists;
2. Special measures for the elderly;
3. Greater use of seatbelts;
4. Delays in driver recognition and incorrect vehicle control;
5. Accidents occurring at twilight/night;
6. Accidents occurring at intersections;
7. Collisions with stationary objects;
8. Vehicle compatibility.

Note: Advancing vehicle compatibility involves improving the safety performance of a vehicle in the event of a crash with another vehicle, with a particular focus on reducing the ability of larger vehicles to cause damage to smaller vehicles in a collision. Greater compatibility is achieved through improvements to vehicle body structure aimed at minimizing occupant injury.
Road Safety Activities to Date

Japan’s automakers are equipping more and more of their vehicles with advanced safety features to help prevent accidents from happening (active safety) and to increase occupant protection when collisions are unavoidable (passive safety).

In parallel with the expanded installation of onboard safety equipment, JAMA and its members are engaged on a continuous basis in real-world accident analysis, cutting-edge accident simulation studies, and the advancement of test methods for safety evaluation.

The Japanese government’s aforementioned goals of reducing the annual number of road fatalities to fewer than 2,500 by 2018 and making road transport in Japan the world’s safest and most efficient (by 2030) are constituent elements in its vision for Japan as the globally “most advanced IT nation,” as described by the Public-Private ITS Initiative/Roadmaps undertaking. To expedite the achievement of those goals, JAMA is recommending strong government promotion of the widespread use of intelligent driver support systems and pedestrian protection technologies.

Promoting Greater Road Safety Awareness

• **Through public awareness-raising campaigns**

  Twice yearly, JAMA carries out its own road safety awareness campaigns targeting all road users, which are timed to coincide with the government’s nationwide traffic safety campaigns conducted every spring and autumn. JAMA’s campaigns promote, for example, front and rear seatbelt use; correct helmet use; and the early use of headlamps at twilight. In addition to their own promotion of early headlamp use at twilight, some prefectural governments, in cooperation with local police and retailers, are also encouraging the wearing and use of reflective materials, particularly for the safety of elderly pedestrians.

• **Through nationwide driver education programs**

  A number of organizations including JAMA and the Japan Automobile Federation jointly conduct educational programs targeting drivers of all ages and, in a format designed expressly for that purpose, senior drivers specifically. These programs feature one-day, hands-on training sessions held across Japan to heighten awareness of safe driving practices. Participants in those sessions are increasingly being given the opportunity to drive cars equipped with advanced safety features such as electronic stability control and collision-mitigation braking.

Developing & Disseminating Original Road Safety Educational Materials

**“Safety Action 21” educational materials for teenagers**

JAMA targeted the youngest segment of the driving population in developing this set of road safety educational materials, in an effort to curb the high rate of accident occurrence in this demographic. High schools use these materials to provide practical training in road safety awareness to prospective driver’s license holders and other young road users, such as bicyclists. Note: “Safety Action 21” materials can be downloaded free of charge from JAMA’s Web site, by accessing [www.jama.or.jp/safe/safety/index.html](http://www.jama.or.jp/safe/safety/index.html).

The Need for Road Infrastructure Development

Improvements in road infrastructure are a key factor in reducing accident occurrence. To upgrade road and traffic management infrastructure nationwide, JAMA is appealing to the government to promote: a) The maintenance of aging roads and ancillary road structures to extend their service life; the upgrading of interurban highway networks; and the transfer of road infrastructure management to local governments, with an emphasis on limiting new local road construction; b) Increased installation of guardrails in school zones; and expanded construction of bicycle lanes; c) Road narrowing and the construction of speed bumps to prevent driving speeds in excess of 30 km/h on community roads; and the creation of a safe and convenient road environment for all road users, including pedestrians, bicyclists, motorists and commercial vehicle drivers; and d) The wider introduction of intelligent driver support systems; and the expansion of advanced communications infrastructure at major intersections nationwide.

---

**Table 1 Safety Feature Onboard Installation Status**

<table>
<thead>
<tr>
<th>Safety Feature</th>
<th>Installation Status</th>
<th>In % of models (in vehicle units)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Anti-lock braking system (ABS)</td>
<td>17 (172) 98.8</td>
<td>4,154,008 98.1</td>
</tr>
<tr>
<td>Brake assist</td>
<td>172 (182) 95.5</td>
<td>4,027,462 96.0</td>
</tr>
<tr>
<td>Unfastened seatbelt warning (driver’s seat)</td>
<td>175 (173) 97.2</td>
<td>4,152,200 98.0</td>
</tr>
<tr>
<td>Unfastened seatbelt warning (front passenger’s seat)</td>
<td>84 (80) 46.9</td>
<td>2,160,110 51.1</td>
</tr>
<tr>
<td>High-intensity discharge headlamps</td>
<td>171 (47) 76.1</td>
<td>2,917,438 47.8</td>
</tr>
<tr>
<td>Adaptive front-lighting system (AFS)</td>
<td>43 (13) 25.9</td>
<td>232,084 5.5</td>
</tr>
<tr>
<td>Back-up monitoring (near obstacle detection)</td>
<td>120 (19) 95.7</td>
<td>878,949 20.8</td>
</tr>
<tr>
<td>Vehicle perimeter monitoring</td>
<td>35 (7) 19.4</td>
<td>161,539 3.6</td>
</tr>
<tr>
<td>Vehicle perimeter obstacle warning</td>
<td>32 (4) 17.6</td>
<td>192,839 4.6</td>
</tr>
<tr>
<td>Blind-monitoring</td>
<td>15 (10) 61.0</td>
<td>561,135 11.8</td>
</tr>
<tr>
<td>Night-vision monitoring</td>
<td>4 (0) 0.0</td>
<td>2,175 0.1</td>
</tr>
<tr>
<td>Curve detection</td>
<td>16 (1) 8.9</td>
<td>46,357 1.1</td>
</tr>
<tr>
<td>Tire-pressure monitoring</td>
<td>12 (0) 0.0</td>
<td>71,858 1.7</td>
</tr>
<tr>
<td>Driver distraction warning</td>
<td>25 (2) 13.9</td>
<td>152,851 3.6</td>
</tr>
<tr>
<td>Inter-vehicle distance warning</td>
<td>29 (1) 15.1</td>
<td>175,599 4.1</td>
</tr>
<tr>
<td>Lane-departure warning</td>
<td>32 (1) 16.7</td>
<td>134,068 3.2</td>
</tr>
<tr>
<td>Rear collision warning-equipped headrest control</td>
<td>7 (0) 3.9</td>
<td>3,014 0.1</td>
</tr>
<tr>
<td>Collision-mitigation braking system (pre-collision safety)</td>
<td>45 (1) 27.2</td>
<td>197,419 4.7</td>
</tr>
<tr>
<td>Adaptive cruise-control</td>
<td>37 (0) 20.6</td>
<td>189,996 4.3</td>
</tr>
<tr>
<td>Adaptive cruise-control with low-speed following mode</td>
<td>6 (0) 3.3</td>
<td>94,289 2.2</td>
</tr>
<tr>
<td>Full-range adaptive cruise-control</td>
<td>12 (1) 6.7</td>
<td>98,051 2.3</td>
</tr>
<tr>
<td>Lane-keeping assist</td>
<td>15 (3) 7.2</td>
<td>12,953 0.3</td>
</tr>
<tr>
<td>Back-up monitoring (parking assistance)</td>
<td>17 (0) 9.4</td>
<td>13,983 0.3</td>
</tr>
<tr>
<td>Navigator-based gearshift control</td>
<td>25 (0) 13.9</td>
<td>45,887 1.1</td>
</tr>
<tr>
<td>Pre-collision braking</td>
<td>35 (0) 20.0</td>
<td>250,888 5.0</td>
</tr>
<tr>
<td>Electronic stability control</td>
<td>143 (60) 79.4</td>
<td>2,267,799 60.6</td>
</tr>
<tr>
<td>Traction control with ABB</td>
<td>128 (82) 71.1</td>
<td>2,247,900 58.4</td>
</tr>
<tr>
<td>Navigation-based speed sign alert with brake assist</td>
<td>11 (0) 0.6</td>
<td>104,207 2.3</td>
</tr>
<tr>
<td>Rearward-approaching-vehicle warning</td>
<td>7 (0) 3.9</td>
<td>60,855 1.4</td>
</tr>
<tr>
<td>Acceleration suppression for pedal misapplication</td>
<td>24 (0) 13.3</td>
<td>526,812 12.5</td>
</tr>
<tr>
<td>Side airbags</td>
<td>133 (58) 73.9</td>
<td>1,160,114 27.4</td>
</tr>
<tr>
<td>Curtain airbags</td>
<td>134 (57) 74.4</td>
<td>1,073,737 25.4</td>
</tr>
<tr>
<td>Keyless ignition</td>
<td>116 (11) 65.5</td>
<td>2,158,976 59.5</td>
</tr>
<tr>
<td>SOFIFIX anchorage (for child safety seats)</td>
<td>172 (168) 95.5</td>
<td>1,189,445 29.9</td>
</tr>
<tr>
<td>Three-point seatbelt for rear seat ass’t</td>
<td>127 (119) 84.7</td>
<td>1,251,453 33.3</td>
</tr>
<tr>
<td>Total</td>
<td>190</td>
<td>4,234,874</td>
</tr>
</tbody>
</table>

Notes: 1. Figures are for passenger cars produced in 2015 for Japan’s domestic market. 2. "In no. of models" indicates the number of models in which the safety feature is installed as standard or optional equipment. Figures in parentheses indicate the number of models in which the safety feature is standard equipment. 3. "In % as a means of a percentage of the total number of models/units produced. 4. Passenger cars were include minivans. 5. In 2013 a total of 150 passenger car models (2,956,038 vehicle units) featured a rear center seat. Minivans do not feature a rear center seat.

Source: JAMA
Increasing Vehicle Fuel Efficiency

Early Compliance with Targets

JAMA member automakers continuously strive to increase fuel efficiency in, and thus reduce CO\(_2\) emissions from, the vehicles they produce. Committed to achieving fuel efficiency targets as early as possible, they introduce into the market vehicles that meet those targets, ahead of the targets' enforcement dates.

Reductions in Vehicle Weight

For greater vehicle fuel efficiency, JAMA member automakers are reducing the weight of the vehicles they produce (Fig. 9).

Yearly Improvements in Vehicle Fuel Efficiency

As a result of the aforementioned and other efforts of Japan's automakers, the average certified fuel efficiency of new passenger cars has steadily risen. In 2013 it reached 21.3 km/\(\ell\), thereby largely surpassing the government's 2015 target of 16.8 km/\(\ell\) and even exceeding its 2020 target of 20.3 km/\(\ell\).

Table 2  Japan's 2015 & 2020 Fuel Efficiency Targets

<table>
<thead>
<tr>
<th>Year</th>
<th>Fuel Efficiency Targets</th>
</tr>
</thead>
<tbody>
<tr>
<td>2015</td>
<td>Passenger cars</td>
</tr>
<tr>
<td></td>
<td>Up 23.3% from 2004 performance</td>
</tr>
<tr>
<td></td>
<td>Trucks, GV&lt;3.5t</td>
</tr>
<tr>
<td></td>
<td>Trucks, GV&gt;3.5t</td>
</tr>
<tr>
<td>2020</td>
<td>Passenger cars</td>
</tr>
<tr>
<td></td>
<td>Up 24.1% from 2006 performance</td>
</tr>
</tbody>
</table>

Table 2 notes:
1. Next-generation vehicles include hybrid, plug-in hybrid, electric, fuel cell, natural gas and clean diesel vehicles.
2. Summary information on these vehicles' environmental performance is available on JAMA's Web site at www.jama.or.jp/eco/eco_car/info/index.html.

Promoting the Wider Use of Next-Generation Vehicles

The use of next-generation vehicles is becoming an increasingly significant factor in Japan's reduction of CO\(_2\) emissions in its road transport sector. In view of their outstanding environmental performance and steadily growing demand, Japanese automakers are expanding the supply of these vehicles to the domestic market. In 2013 there were 4.13 million next-generation vehicles in use in Japan, most of which were hybrids (Fig. 11).

Fig. 11 Status of Next-Generation Vehicle Use in Japan

Note: Figures are for domestic passenger cars and are JC08 test cycle-based.
Reducing CO₂ Emissions at Facilities

To help curb global warming, JAMA member companies have long made strenuous efforts to reduce energy consumption and otherwise cut CO₂ emissions at their production plants. Since 2008, CO₂ reductions are being achieved on a combined basis by JAMA member companies together with the member companies of the Japan Auto-Body Industries Association (JABIA).

After joining the Japan Business Federation’s “Commitment to a Low-Carbon Society” initiative and expanding their CO₂ reduction activities to also include administrative and research facilities, JAMA and JABIA member companies are now aiming to reduce their combined facility-generated CO₂ emissions to 7.09 million tons (a 28% reduction from the 1990 level) by 2020 and to 6.62 million tons (a 33% reduction from 1990) by 2030.*

*Subject to possible revision as a result of shifting electric-power supply parameters

In 2013 JAMA and JABIA members’ combined facility-emitted CO₂ totalled 7.25 million tons, down 100,000 tons from 2012, reflecting a decrease of 100,000 kℓ in their energy consumption from the previous year (Fig. 12). JAMA members will continue to implement multiple measures enabling them to manufacture high-quality automobiles at lower rates of energy consumption.

The Kyoto Protocol Target Achievement Plan & CO₂ Reduction in Japan’s Transport Sector

The enforcement of the Kyoto Protocol in 2005 prompted the Japanese government to formulate, in the same year, its Kyoto Protocol Target Achievement Plan to help the country meet its goal of reducing total CO₂ emissions to 6% below the 1990 level by 2008-2012. The plan prescribed individual CO₂ reduction targets and specific reduction measures for Japan’s industrial, consumer, transport, and other major sectors. Of Japan’s total CO₂ emissions, the transportation sector accounts for roughly 20%, of which 90% are auto-emitted—making CO₂ reduction in road transport a priority concern. Japan’s transport sector has made important progress in CO₂ emissions reduction since the early 2000s, chiefly by means of increased vehicle fuel efficiency and greater efficiency in truck use (Fig. 13).

JAMA recommends that the road transport sector worldwide implement the following specific measures in the four areas concerned.

- Measures to increase vehicle fuel efficiency
  - Fuel efficiency standards for passenger cars and trucks should be adopted by all countries/regions, taking into account local conditions and circumstances.
  - Lighter vehicles with consequently higher fuel efficiency should be increasingly introduced into the market.
  - Next-generation vehicles (including hybrids) should progressively replace conventional vehicles to ensure a steady increase in the overall fuel efficiency of the vehicle fleet.
  - Green vehicle purchasing incentives should be implemented by governments to encourage the purchase of highly fuel-efficient and low-emission vehicles and thereby accelerate the replacement of the vehicle fleet.

- Measures to diversify automotive fuel supply
  - The widespread use of low-carbon fuels and sources of energy, such as biofuels and electric power generated by renewable energy, should be facilitated in line with national requirements. Key to expanding the biofuel supply will be the commercialization of new fuels such as cellulosic ethanol and biomass-to-liquid (BTL) fuels, which have no adverse impacts on food supply and soil quality. Technological development should be advanced through the coordinated efforts of industry, government and academia.

- Measures to improve traffic flow
  - Road congestion mitigation should be achieved through the adoption by governments of road infrastructure-related measures that represent the most effective responses to local conditions. Improving traffic flow through road construction and road infrastructure development is a particularly urgent priority in countries with rapidly expanding motorization. In most cases, ITS (Intelligent Transport Systems) technologies are effective in improving traffic flow.
  - Low-carbon urban planning—especially in areas where significant population influxes are projected—should incorporate effective road congestion-mitigation measures, including road network development and ITS applications, from the earliest stage of planning.
Ten Tips for Fuel-Conserving Ecodriving (as promoted in Japan)

1. Accelerate gently.
2. Maintain a steady speed and keep your distance.
3. Slow down by releasing the accelerator.
4. Make appropriate use of your air conditioner.
5. Plan your itinerary to avoid congested routes.
6. Check your tire pressure regularly.
7. Reduce your load.
8. Respect parking rules and regulations.
9. Check the readings on your fuel efficiency-monitoring equipment.
10. Don’t warm up or idle your engine.

Anticipated Impact of the Recommended Measures on Global Road Transport CO₂ Emissions

JAMA has carried out a hypothetical study to estimate the potential for CO₂ reduction in global road transport assuming the combined implementation of the measures recommended above. Study results showed that a very significant reduction in CO₂ emissions could be achieved (Fig. 14).

Fig. 14 CO₂ Emissions Reduction Potential in the Global Road Transport Sector assuming the implementation of recommended measures

Emissions Reduction in Gasoline-Powered Passenger Cars

JAMA member automakers are energetically introducing low-emission vehicles (LEV) into the domestic market. In 2013 LEV-certified passenger cars accounted for over 98% (4.27 million units) of total new passenger car shipments. Emissions from more than 97% of these LEVs were reduced by at least 75% from 2005 emission standards (Fig. 15).

Since the introduction of vehicle emission regulations in Japan, JAMA members have developed and advanced numerous technologies to enable compliance. Those most commonly in application today for gasoline-powered vehicles are electronically-controlled fuel injection (for more efficient combustion) and catalytic converter technologies, the result of important development breakthroughs.

Japan’s low-emission vehicle certification system initially used 2000 emission standards as baseline criteria, whereby passenger cars surpassing those standards by 25%, 50%, or 75% were LEV-certified. With the introduction in 2005 of new, more stringent emission regulations, the system was expanded to include passenger cars that surpass the 2005 standards by 50% or 75%. This system has been highly effective in promoting the widespread use in Japan of passenger cars with significantly reduced exhaust emissions.

Fig. 15 Low-Emission Passenger Car Shipments Compared to Total Passenger Car Shipments (Domestic)

Other JAMA publications in English and accessible on JAMA’s Web site include:

- The Motor Industry of Japan (annual)
- Report on Environmental Protection Efforts (annual)
- Automotive Technologies in Japan
- PM₂.₅₋₅PM₁₀ in Ambient Air & Related Activities in Japan