TRUCKS

Overall Trends

1 Introduction

The automotive industry was severely impacted by COVID-19 throughout 2020. The disease spread throughout the world and in response, people were told to stay home. In the first half of the year, the restrictions imposed on economic activity caused the demand for new vehicles to drop, and stoppages at automobile part plants disrupted the supply chain, forcing automakers to either curtail or stop production. However, vehicle sales exhibited signs of recovery in the second half of the year due to pent-up demand following the restrictions of the first half. The Japanese economic was also strongly affected and, ultimately, both sales of new vehicles and the number of exports dropped. The real grow rate of the gross domestic product (GDP) fell to -4.6%, exhibiting negative growth for the first time in 11 years.

Manufacturers in Japan have been collaborating on initiatives to achieve carbon neutrality. Isuzu and Honda, as well as Hino and Toyota, respectively announced joint research and development projects for heavy-duty fuel cell trucks. Another event that significantly impacted the truck industry was the Japan's declaration to achieve carbon neutrality by 2050 and the subsequent formulation of the Green Growth Strategy. That strategy defines comprehensive measures to have electric vehicles constitute 100% of new passenger vehicles sold by the mid-2030s at the latest. The assessment of targets for commercial vehicles will continue until the summer of 2021. Accelerating the spread of EVs and other electric-powered vehicles has also become expected of trucks.

2 Recent Truck Market Trends

2. 1. Freight Shipments in Japan

Freight shipments in Japan in 2019 amounted to 404.4 billion ton kilometers, a 1.3% decrease compared to 2018. Of those, 213.8 billion ton kilometers were shipped by truck and 169.7 billion ton kilometers was shipped by sea. In terms of share, motor vehicles accounted for 52.9%, sea shipping for 42.70%, trains for 4.9%, and air shipping for 0.20% (Fig. 1).

At the same time, a breakdown by truck type shows that ordinary trucks accounted for 81.0%, light-duty trucks for 1.6%, special-purpose trucks for 17.2%, and mini-vehicle trucks for 0.2% of motor vehicle freight. Those proportions are very similar to those of the previous year (Fig. 2).

2. 2. Number of Trucks in Japan

The number of trucks owned is Japan was 14.30 million at the end of December 2020, a decrease of approximately 10,000 vehicles, or 0.1%, relative to the previous year. Broken down by type of truck, the number of ordinary trucks grew slightly, by 0.8% while that of light-du-

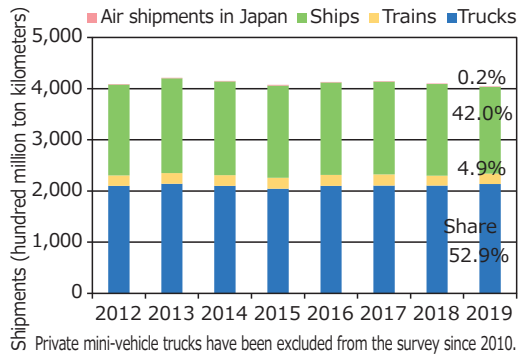

Fig. 1 Freight Shipments in Japan

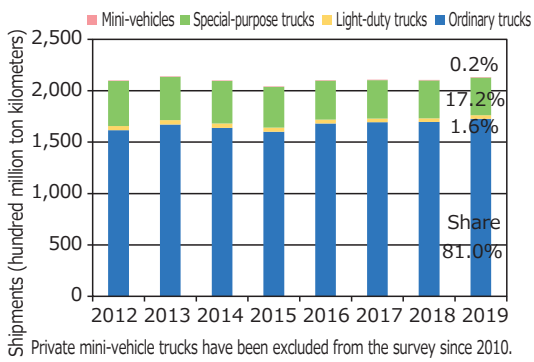

Fig. 2 Freight Shipments by Vehicle Type

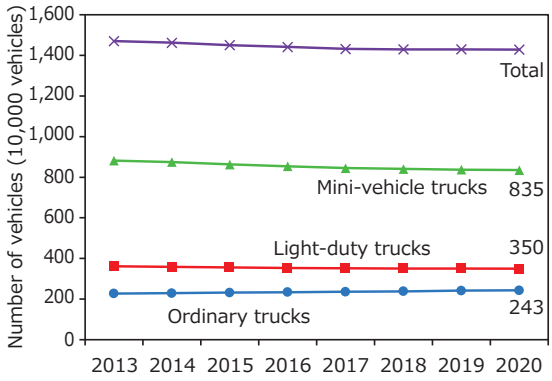

Fig. 3 Number of Trucks in Japan According to Vehicle Type

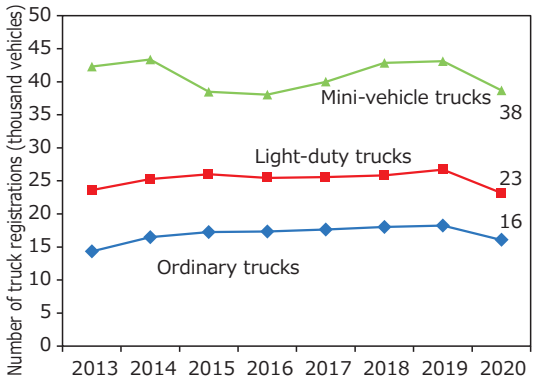

Fig. 4 Number of Truck Registrations in Japan According to Truck Type

ty and mini-vehicle trucks both dropped slightly, by 0.3% (Fig. 3).

2. 3. Number of Truck Registrations in Japan

The number of truck registrations in Japan in 2020 was approximately 780,000, a decrease of 11.5%, or approximately 100,000 vehicles, compared to the previous year. By truck type, ordinary trucks fell by 11.9%, light-duty trucks by 13.2%, and mini-vehicle trucks by 10.3% (Fig. 4).

2. 4. Truck Exports

The number of exported trucks in 2020 was 260,000, a decrease of 65,000 units, or 20%, compared to the previous year (Fig. 5). By destination, exports rose by 17.7% Africa, and by a similar level in Oceania, but decreased in other destinations, with the starkest decline observed in North America, where they dropped by 60.3%.

3 2020 Model Year Trucks and Special Characteristics

3. 1. Trucks Manufactured in Japan

Truck redesign in 2020 mainly focused on expanding safety features and improving driver comfort.

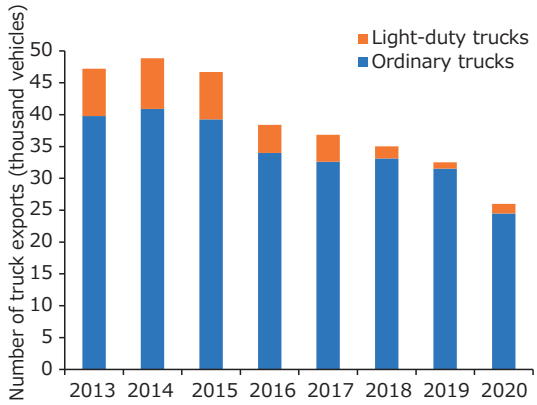

Fig. 5 Number of Truck Exports According to Truck Type

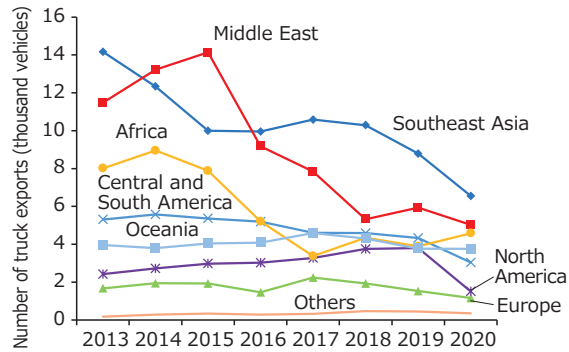

Fig. 6 Number of Truck Exports According to Destination

Fig. 7 Isuzu Giga

Fig. 8 Isuzu Giga Tractor

(1) Heavy-Duty Trucks

February: Isuzu upgraded its heavy-duty Giga truck, adding a lane keeping assist function that provides steering assistance to its millimeter wave adaptive cruise control with all-speed tracking, achieving advanced driver

Fig. 9 Hino Profia Tractor

Fig. 10 UD Trucks Quon

Fig. 11 UD Trucks Quon Tanker Truck

Fig. 12 Hino Dutro

Fig. 13 Toyota Dyna

Fig. 14 Daihatsu Gran Max

Fig. 15 Mitsubishi Fuso Truck and Bus eCanter

support equivalent to Level 2 automated driving, making this option available in its flagship cargo model (Fig. 7).

April: The Isuzu Giga Tractor heavy-duty truck was upgraded and equipped with a blind spot monitor, pre-collision braking system with pedestrian detection, millimeter wave adaptive cruise control with all-speed tracking, a new high roof, and highly functional seats. These refinements help mitigate traffic accidents and reduce driver fatigue (Fig. 8).

Hino Motors upgraded the Profia heavy-duty tractor, making it compliant with Japan On-Board Diagnosis II (J-OBD II) and expanding safety features by making the Sight Around Monitor and Driver Monitor II systems standard equipment.

June: A short cab Quon heavy-duty truck model featuring a 295 mm shorter cab was released by UD Trucks. The extended loading space provides a high carrying and load capacity (Fig. 10).

December: A tanker truck model equipped with the 8-liter GH8 engine was added to the Quon heavy-duty truck lineup by UD Trucks. Downsizing the engine reduced weight by approximately 300 kg, and a new "side-kneeling" function that makes unloading liquids more convenient has been added (Fig. 11).

(2) Medium-Duty Trucks

There were no notable product upgrades in this category.

(3) Light-Duty Trucks

April: The Nissan Dutro light-duty truck (Fig. 12) and of the Toyota Dyna (Fig. 13) were upgraded. The detection function of the pre-collision system was enhanced to recognize not only vehicles and pedestrians during the day, but also cyclists and pedestrians at night.

June: Daihatsu announced the Gran Max light-duty truck. Developed as a light-duty commercial vehicle, it is equipped with a new 1.5-liter gasoline engine and offers

Fig. 16 Mitsubishi Fuso Truck and Bus Canter

Fig. 17 Daihatsu Hijet

Fig. 18 Toyota Pixis

Fig. 19 Volvo Trucks FH

excellent fuel economy and low emissions performance. It also provides a full suite of safety systems with the Smart Assist active safety package that provides functions such as collision-avoidance braking and erroneous start prevention (Fig. 14). The Toyota TownAce and Mazda Bongo OEM supply models from Daihatsu also received the same modifications.

August: Mitsubishi Fuso Truck and Bus upgraded its eCanter electric light-duty truck, boosting safety performance by making the collision mitigation braking, vehicle stability control, and lane departure warning systems standard equipment (Fig. 15).

October: Mitsubishi Fuso Truck and Bus released a new Canter light-duty truck model. The cab design was revamped for the first in ten years. The Active Sideguard Assist advance safety system that uses a radar to monitor the left side of the vehicle, which is prone to become a blind spot for the driver, has been installed on a light-duty truck for the first time in Japan. The inclusion of the Truckonnect telematics platform found in the heavy-duty, medium-duty, and electric vehicle lineups addresses the needs for more efficient truck operation and higher levels of safety (Fig. 16).

(4) Mini-Vehicle Trucks

August: Daihatsu upgraded the Hijet mini-vehicle truck, enhancing safety by making the rear sonar and rear erroneous start prevention function standard equipment on vehicles with Smart Assist IIIt, and automatic lighting standard on all models (Fig. 17).

September: Toyota upgraded the Pixis mini-vehicle truck, upgrading the erroneous start prevention function to also activate when backing up, and adding a rear sonar on some grades.

3. 2. Trucks Manufactured outside Japan

February: Volvo Trucks redesigned the FH, FH16, FM, and FMX heavy-duty truck in the European market. The exterior adopts the distinctive V-shaped headlamps, while the interior has been designed with future updates and connectivity services in mind and features a large 12-inch display, improving operability for the driver. The FM and FMX, in particular, offer enhanced comfort by modifying the shape of the cab A pillar to provide an extra 1 m^3 of room. New safety functions include downhill cruise control and all-speed adaptive cruise control (Fig. 19).

December: Iveco and Volvo trucks announced they would integrate the Amazon Alexa voice service. Enabling voice control of mapping, telephone, and entertainment functions will improve the driver's working environment, safety, and productivity.

Design Trends

1 Introduction

The COVID-19 pandemic caused upheavals in Japan and the entire world throughout 2020. The consequences included manufactures moving their new vehicle unveilings online, and the 2020 International Motor Show Germany, the largest commercial vehicle exhibition in the world, was cancelled. Despite these extreme circumstances, truck manufacturers in and outside Japan announced a succession of new models that offer enhanced safety or reduce the burden on the environment, and models designed for field test monitoring. At the same time, upgrades of current model were also carried out throughout the year. The sections below discuss how manufactures have been adapting their designs to reflect the two major themes of the increasing demands for safety, and the electrification of vehicles for the purpose of achieving carbon neutrality.

2 Trends in Japanese Truck Design

Recent redesigns by Japanese truck manufacturers have been triggered by the need to comply with safety, environmental, or other regulations, and that opportunity was often used to modify designs in an effort to strengthen product appeal. One important theme for heavy-duty trucks is the issue of long driver working hours, which has become a problem over the last several years. Trends in Japanese truck designs are described below with those points in mind.

2. 1. Exterior Design

In April, Isuzu changed the shape of the high-roof Giga heavy-duty tractor to expand storage space in the cabin. The high roof links with the top edge of the windshield, forming a shape integrates with the aerodynamically-oriented cab while securing cabin capacity. The newly adopted adaptive driving beam (ADB) LED headlamps offer drivers better nighttime visibility. The signature lamps set inside the headlamps to enhance conspicuity to other vehicles and pedestrians in the daytime echo the grille with a shape that flares up to the left and right. The sensor for the newly mandatory blind spot monitor (BSM) rear collision warning system has been installed in the bottom of the corner panel (Fig. 1).

Also in April, Hino installed the Sight Around Monitor system sensors found in its cargo line on the Profia heavy-duty tractor by integrating them in the openings at both ends of the bumper.

In August, Mitsubishi Fuso partially redesigned the eCanter electric light-duty truck. The sensor for the now mandatory advanced emergency brake systems (AEBS) was installed in the center of the bumper, and the license plate was shifted toward the right of the vehicle (Fig. 3).

In October, that manufacturer revamped the cab design of the Canter. Based on the concept of “modern and solid”, the new model presents a design distinguished by the black strip with lettering running across the front

Fig. 1 Isuzu Giga Tractor

Fig. 2 Hino Profia Tractor

Fig. 3 Mitsubishi Fuso eCanter.

Fig. 4 Mitsubishi Fuso Canter

Fig. 5 Mitsubishi Fuso Canter Signature Lamps

(Fig. 4). First used in the above-mentioned eCanter, this "Fuso black belt" new design identity has also applied to the Rosa light-duty bus and Aero Queen/Aero Ace sightseeing buses. The manufacturer has used it to establish a clear design identity for the Fuso brand. The black belt is instantly recognizable, making it a distinctive design that makes the Fuso brand stand out at a glance. The Y-shaped signature lamps in the new LED headlamp unit improve conspicuity for other vehicles and pedestrians (Fig. 5). Their brightness also raise nighttime visibility for the driver, contributing to enhanced safety.

2. 2. Interior Design

The Isuzu Giga high-roof model offers an interior cabin height exceeding 1,800 mm, and a header console with a large storage capacity for the various items used in the vehicle. This makes it more comfortable when taking a break at an expressway parking or service area. It also uses an ISRI driver's seat improves comfort while driving by offering 11 position adjustments in various seat portions, a seat heater, and a ventilation function. The warning devices of the driver status monitor (DSM) and blind spot monitor (BSM) safety systems use a design that integrates with the pillar trim, and avoid drawing the driver's attention more than necessary. These improvements combine to help reduce driver fatigue during the long-distance driving common with heavy-duty

Fig. 6 Interior of the Isuzu Giga

trucks (Fig. 6).

3 Trends in Truck Design outside Japan

European manufacturers have mostly completed their major redesigns to comply with the Euro VI emissions regulations for heavy-duty diesel vehicles, and a few manufacturers carried out complete or partial redesigns.

3. 1. Exterior Design

In February 2020, the German MAN completely redesigned its medium- and heavy-duty trucks. The previously separated cab and bumper grilles of the TGX heavy-duty truck were joined, adopting a new design emphasizing the top-to-bottom integration of the cab and bumper. In the grille front lid representing the MAN identity, the black CMF portion was changed to matte, providing a more vivid contrast with the chrome badge. The bottom part of the bumper has also been given a trapezoid design. The TGM medium-duty truck (Fig. 8), TGL light-duty truck (Fig. 9), and TGS off-road model (Fig. 10), which were completely redesigned at the same time, shares the front grille and bumper design, establishing a uniform feel for the MAN family.

In February, the Swedish Volvo Trucks gave the FH heavy-duty truck a facelift. The V-shaped signature lamps facing the interior of the headlamps, which constitute that manufacturer's identity, were modified to give their exterior itself a V shape. The enhanced trim variation also combines a front grille with the same color as the cab with a grey lower bumper and mirrors (Fig. 11).

In the FM, the redesign was used as an opportunity to unify the cab with that of the FH. The only difference in appearance for the FM short- to medium-distance transportation model is the height of the cab (Fig. 12). The off-road FMX model was also redesigned. In addition to the LED specifications noted above, differently-shaped halogen headlamps are also offered, and the headlamp protector and lower protective guard plate have been made

Fig. 7 MAN TGX

Fig. 8 MAN TGM

Fig. 9 MAN TGL

Fig. 10 MAN TGS

Fig. 11 Volvo FH

Fig. 12 Volvo FM

Fig. 13 Volvo FMX

standard equipment (Fig. 13).

3. 2. Interior Design

The new MAN TGX also features a revamped interior design. The meters were changed from an analog to a fully liquid crystal display one that takes full advantage of the traditional MAN layout, and the instrument panel extending from that display leans closer to the driver than in previous models. With this change improving instrument panel readability and making the rotary knob control, called SmartSelect, easier to use, the design has become more driver-oriented than ever (Fig. 14).

The facelifts of the Volvo Trucks FH and FM were accompanied by modifications to the interior design. The

Fig. 14 Interior of MAN TGX

Fig. 15 Interior of Volvo FH

main color in areas near the driver was changed from beige to dark grey tones, and the meters were replaced with a full liquid crystal display. The layout was changed to bring the navigation system previously recessed to the side of the meters forward, and a touch panel LCD screen was adopted. Finally, a fine decorative silver was applied to the edges of adjoining trims, blending with the new dark grey tones to project an impression better suited to the class of the vehicle (Fig. 15).

4 Concept and Electric Vehicle Design

The intensifying pace of the transition from internal combustion engines to electric power for passenger vehicles made itself felt in 2020. Similarly, and despite minor differences between manufacturers, the start of a transition to battery powered EVs mainly for light- and medium-duty trucks, and to fuel cell vehicles for heavy-duty trucks, was observed in 2020.

4.1. Concept and Electric Vehicle Design in Japan

In March 2020, Toyota and Hino announced the joint development of a fuel cell truck based on the Hino Profia heavy-duty truck. The envisioned vehicle will have a design based on the existing model that expresses the superior environmental friendliness of the FCV truck with

Fig. 16 Toyota & Hino Fuel Cell Truck

Fig. 17 Daimler Truck GenH2

an integrated form through the air deflectors, air dams, side skirts and other aerodynamic devices, and graphics presenting a clean impression (Fig. 16).

4.2. Concept and Electric Vehicle Design outside Japan

In September, the German Daimler Truck unveiled its GenH2 fuel cell truck with a cruising range of over 1,000 km. It eschews the grille front lid that has characterized the Daimler Truck identity, and adopts a distinctive design featuring thin headlights that go through the trapezoid grille. Liquid hydrogen tanks are place between the wheels on the first axle and those on the second axle, and the side skirt design presents a distinctive cross-section that takes advantage of the round shape of those tanks.

Daimler Truck also announced the battery powered eActros Long Haul electric vehicle at the same time as the above GenH2. Offering a cruising range of approximately 500 km, the model is intended for regular transport. The design follows that of the GenH2 in eliminating the grille front lid, but adopts a layout that separates the long narrow headlamps from the grille.

In internal combustion engine vehicles, the radiator grille not only provided cooling, but had also been increased in size to symbolize its status. In BEVs and fuel cell vehicles, the engine is replaced by motors, and the radiator grille itself has become unnecessary. However,

Fig. 18 Daimler Truck eActros Long Haul

because it also forms a part of the vehicle identity, the grille is not necessary eliminated. Instead, manufacturers are attempting to balance the pursuit of electric vehicle style with identity through approaches such as modifying the CMF while making the most of the squareness of the grille. The no-grille electric truck design of the GenH2 and eActros Long Haul announced by Daimler Truck challenge that approach. Taking the aerodynamic improvements and attendant enhancement of electricity consumption efficiency achieved by removing the grille into account, the impression struck by these two models could become the norm as electrification becomes more common.

Body Structures

1 Cab and Chassis

1. 1. Product Trends

(1) Heavy-Duty Trucks

Table 1 shows the large trucks announced in Japan in 2020, and the main product technology trends.

A model of the Isuzu Giga equipped with advanced driver support functionality corresponding to Level 2 automated driving was unveiled. The millimeter wave adaptive cruise control with all-speed tracking was complemented with an LKA function, and the super single tire, which contributes to reducing the weight of the vehicle and enhancing fuel economy was added as an option.

Isuzu announced a Giga Tractor model that helps mitigate traffic accidents and reduce driver fatigue by installing a tractor-specific safety system optimally tuned for the vehicle behavior unique to the trailer, as well as offering a comfortable driving environment aimed at enhancing the labor conditions of drivers.

Hino introduced a Profia Tractor model that includes the Sight Around Monitor and driver monitoring systems, as well as hands-free audio, as standard equipment. It also offers an optional tire pressure monitoring system that can assist with preventive maintenance and avoid a suspension of operation.

A short cab model and a lightweight tanker truck model were added to the UD Trucks Quon lineup.

Amid calls for initiatives to reduce exhaust emissions, achieve decarbonization, and use renewable energy to reduce the global burden on the environment, manufacturers have been developing fuel cells for heavy-duty trucks. In addition, field tests of automated driving are being conducted to solve issues such as the labor shortage caused by the aging of driver and decrease of the working population. The public and private sectors have joined forces on truck platoon driving initiatives aimed at raising logistics efficiency and reforming work styles. The four major manufacturers have come together to work on developing technology and establishing the necessary cooperative technologies that will enable the early commercialization of the platoon driving system proposed by the government.

(2) Medium-Duty Trucks

Table 2 shows the medium-duty trucks announced in Japan in 2020, and the main product technology trends.

All manufacturers announced models featuring advanced safety systems. The Mitsubishi Fuso Fighter has been equipped with a system that detects the risk of an accident when making a left turn and uses an alarm to warn the driver, while the Hino Ranger has been equipped with a collision-avoidance assist system capable

Table 1 Main Product Technology Trends for Heavy-Duty Trucks in 2020

Month of launch	Name of vehicle model	Main characteristics
February	Giga (Isuzu Motors)	Specifications Added (Advanced driving support functions installed)
April	Giga Tractor (Isuzu Motors)	Redesign (Equipped with advanced safety systems)
	Profia Tractor (Hino Motors)	Redesign (Equipped with advanced safety systems)
June	Quon UD Truck	Specifications Added (Short cab variant introduced)
December	Quon UD Truck	Specifications Added (Short cab variant introduced)

Table 2 Main Product Technology Trends for Medium-Duty Trucks in 2020

Month of launch	Name of vehicle model	Main characteristics
March	500 Series (Hino Motors)	A model equipped with an Allison Transmission is used by a major Australian cement maker
September	Ranger (Hino Motors)	Decided to participate in the 2021 Dakar Rally

Table 3 Main Product Technology Trends for Light-Duty Trucks In 2020

Month of launch	Name of vehicle model	Main characteristics
April	Dutro (Hino Motors)	Specifications Added (Improved safety system functions)
	Dyna (Toyota)	Specifications Added (Improved safety system functions)
August	eCanter (Mitsubishi Fuso)	New electric light-duty truck model announced Equipped with advanced safety systems.
October	Canter (Mitsubishi Fuso)	Redesign Equipped with advanced safety systems.

of detecting pedestrians, as well as a system that emits a warning upon detecting driver distraction.

(3) Light-Duty Trucks

Table 3 shows the light-duty trucks announced in Japan in 2020, and the main product technology trends.

Models of the Nissan Dutro and Toyota Dyna equipped with collision-avoidance assist system capable of detecting pedestrians at night and cyclists were unveiled.

A new model of the Mitsubishi Fuso Canter featuring a revamped cab design was released. The Active Sideguard Assist advance safety system that uses a radar to monitor the left side of the vehicle, which is prone to become a blind spot for the driver, and emits a warning if an object is detected, was installed on a light-duty truck for the first time in Japan. It is also equipped with the Truckonnect platform enabling remote management of vehicles using data from vehicles in operation, as well as the Fuso Easy Access System that enables the doors to be locked or unlocked at the press of a switch, and is suited to the needs of light-duty truck driving that involves getting in and out of the vehicle frequently in urban environments.

Mitsubishi Fuso also announced a new eCanter light-duty electric truck featuring advanced safety systems. It addresses the issue of CO_2 reduction through an electric drive that does not produce emissions. It also exhibits less noise and vibration than diesel vehicles, making it suited to late night or early morning urban environment needs, contributing to more efficient work time zones and to reducing the burden on the driver.

Table 4 Main Product Technology Trends for Mini-Vehicle Trucks In 2020

Month of launch	Name of vehicle model	Main characteristics
August	Hijet (Daihatsu)	Equipped with advanced safety systems. (Added safety system functions)
September	Pixis Truck (Toyota)	Equipped with advanced safety systems. (Added safety system functions)

(4) Mini-Vehicle Trucks

Table 4 shows the mini-vehicle trucks announced in Japan in 2020, and the main product technology trends.

Models of the Daihatsu Hijet Truck and Toyota Pixis Truck equipped with a rear sonar and rear erroneous start prevention function were announced. The Daihatsu Hijet series also celebrated the 60th anniversary of its launch in November 2020. That series has produced a cumulative total of approximately 7.4 million units.

(5) Trucks Manufactured outside Japan

Scania has introduced its P-, G-, R-, and S-series, as well as EVs, into the Japanese market. Its safety features include a cabin structure that meets the Sweden passive safety standards, which are among the strictest in the world, as well as a 360° camera system, adaptive cruise control, and a rear detection system.

Volvo has similarly entered the Japanese market with its FH series. The series features safety systems such as adaptive cruise control with a collision mitigation braking system, lane departure warning, lane change support, and driver alert support.

Daimler Truck is seeking to reduce CO_2 emissions by developing EVs and fuel cell vehicles. At the same time, it is aiming for the early commercialization of Level 4 automated trucks to improve transportation efficiency and productivity. Truck manufacturers in Europe, Japan, and elsewhere are also conducting joint development on EVs and fuel cell vehicles, or engaging in collaborative technical development to produce products that efficiently provide excellent cruising range and environmental performance.

1. 2. Interior Comfort

Packaging Japanese truck cabin within the regulatory limit has resulted in prioritizing loading space. However, a comfortable space must be provided to truck drivers who spend a long time in the cabin. High roof models and short cab models that make use of the roof area are offered for heavy-duty trucks, and the Hino Ranger medium-duty truck also offers a high roof variation comparable to that of heavy-duty vehicles. The high roof variants offered by manufacturers offer greater storage

space, providing roof consoles, pockets, and pipe hangers.

Other approaches include storage with cooling and heating capabilities that do not use an air conditioner, and the inclusion of a console on the floor or storage space under the seat. Models that facilitate moving in the cabin by making the floor flat have been introduced. Highly functional seats with various adjustable functions, including seat heaters, ventilation, damping, and armrest position help reduce fatigue, and the installation of USB ports enhances convenience.

1. 3. Operability

Japanese society is aging rapidly, with 29% of the population aged 65 and over. In addition, women now account for 20% of all drivers, and securing truck driver personnel requires operability that takes women and the elderly into account.

Manufacturers have been incorporating universal design, installing automatic transmissions that put selecting the D, N, or R shift positions and shifting between gear stages within hand's reach, switching to larger multi-information displays, setting steering wheel switches that require little eye movement, enabling easy audio control with touch panel displays, setting buttons that start the engine or switch between modes, and adopting key systems with immobilizers and keyless entry functions.

1. 4. Noise and Vibration

Manufacturers have been applying measures against noise and vibrations to cabins and engine compartments in to address truck driver fatigue caused by long distance driving and the issue of road noise made prominent by the switch to EVs. These measures include applying sound absorbing material such as glass wool or felt to cover plates such as plastic parts, optimally placing sound absorbing and damping material, and using flush surface designs for exterior parts to reduce wind noise.

1. 5. Safety

Safety is divided into active and passive safety, and both areas have undergone significant improvements. Passive safety calls for unique measures for cabover trucks, and occupant protection is achieved through higher rigidity and reinforcements to mitigate the deformation of the cabin in a collision.

In addition, trucks feature front and rear underrun protection, which effectively restricts sliding under the cab in the event of a collision with a passenger car. Active safety includes AEBS forward object detection collision mitigation braking systems with pedestrian detection, vehicle electronic stability control (ESC), lane departure warning systems (LDWS), and other systems intended to prevent rear-end collisions or mitigate damage.

Driver support systems include forward and rear erroneous start prevention systems, lane-keeping assist (LKA), adaptive cruise control with all-speed tracking, blind spot monitors (BSMs) that detect objects in blind spots and emit a warning, driver status monitors (DSMs) that mitigate driver distraction or drowsiness, automatic lighting systems that prevent forgetting to turn on the headlights when driving at night or through a tunnel, automatic wipers, and more.

The adoption of LED headlamps to improve nighttime visibility is growing, and there are even variable light distribution LED headlamps that automatically block only the locations where the light strikes a preceding or oncoming vehicle, and automatically control the direction of illumination based on steering operation.

1. 6. Aerodynamic Characteristics

Better aerodynamic characteristics contribute significantly to improving fuel efficiency, decrease wind noise, mitigate the accumulation of dirt on the vehicle body from mud splashes, and also lead to improved handling stability and controllability. Manufacturers are therefore working on improving those characteristics. Top and side spoilers are used to compensate for the difference in level between the truck cabin and body. The top, notably, features an adjustable roof spoiler or high roof shaped with aerodynamic characteristics in mind, and other parts of the roof are also shaped to account for the flow of air. Aerodynamic characteristics are considered in the shape of the cabin and corners as well. The front grille shape and openings contribute significantly not only to aerodynamic performance, but also to engine cooling performance, leading manufacturers to work on optimizations aimed at raising fuel efficiency. Aerodynamic characteristics are also being improved by setting side skirts between the wheelbases and spoilers at the end of the rear body.

1. 7. Corrosion Prevention

Vehicle service life has been getting longer, making higher levels of corrosion prevention for vehicle parts necessary. Solutions such as increasing the proportion of anti-corrosion plates in cabin body parts and improving the quality of chassis part coatings are being applied.

Plastic parts are also adopted to counter corrosion occurring at the mating portion with adjoining parts or caused by flying rocks.

2 Rear Body

Rear bodies are expected to address diversifying logistics and improve transport efficiency. Swap body containers, which allow the cargo bed to be detached from the vehicle body and make it possible to carry out loading tasks in that state are becoming more widespread, and contributing to both raising the productivity of logistics and reforming work styles. Trucks with van bodies, which can be driven with an ordinary driver's license are also being sold. The equal widths of the cabin and body means the width of the vehicle can be easily ascertained, making it easy to drive for women and younger drivers and offering a solution to the severe labor shortage.