

DAIMLER

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Mercedes-Benz Bus History

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From landau to low-frame bus: passenger transportation from 1885 to 1926

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- **Benz builds his first bus in 1895**
- **The bus takes a long time to emancipate itself from the truck**
- **First buses with special frames arrive in 1925**

Carl Benz in Mannheim had been approaching the commercial vehicle on a completely different route when Gottlieb Daimler passed away in 1900. Benz concentrated on buses and what we would call vans today. “Combination delivery vehicle” was the name given to the first fast Benz van of 1896 in the marketing jargon of the day.

Carl Benz had even built his first bus two years earlier. Since 1884 he had been offering his motorcars in an optional landau version: a landau is a coach which carries a maximum of eight passengers and has either a folding top or a glazed upper section with a solid roof. Mainly hotels used these landaus to collect their guests from the train station or bring them to their trains. The original idea for the first motorized scheduled service came from the city fathers of Netphen and Siegen in the Siegerland region, who proposed linking their two provincial towns by a bus line. They gave Benz an order to build two engine-powered buses.

Based on the landau, Carl Benz designed a carriage-like vehicle with an enclosed passenger compartment (eight seats), but an unprotected bench for the (two) drivers. The five hp one-cylinder engine displacing 2.65 liters was mounted at the rear, drove the rear wheels by chain and accelerated the vehicle to a top speed of 20 km/h.

Benz delivered the first of these two “intercity buses” on March 12, 1895, the second on March 29 of the same year, for a price of 6000

gold marks each. The buses needed an hour and 20 minutes to negotiate the 15 kilometer route Siegen – Netphen – Deutz, with its five stops and 80 meters difference in altitude. But as it quickly turned out, particularly in the wet the graceful solid rubber tires of these vehicles had to fight an uphill battle against the deep ruts produced by heavy horse and cart combinations. Though conversion to wide iron wheels did improve wheel control, it greatly impaired road grip. To top it all, shortcomings in maintenance, the difficulty of procuring spare parts, and inadequate driver training made the new bus line anything but a joy.

The result was that these buyers quickly ceased operation in the following winter and returned the two buses to Carl Benz. But undoubtedly they deserve recognition for having put the first bus line on wheels in Germany. Such scheduled transportation services already had been in existence in England and France for quite some time, but they employed steam-driven vehicles.

Daimler begins manufacturing buses

It can be assumed that Benz and Daimler – although they never came to know each other personally – kept a watchful eye on each other’s activities. Little wonder then that in 1898 Gottlieb Daimler also quickly took up bus manufacture. He presented four models for a start. Power ranged from four to ten hp; seating capacity, from six to 16.

The first regular bus service was organized between Künzelsau and Mergentheim. But the steep uphill stretches in the Hohenlohe district and the poor condition of the roads went very hard on the ten hp ten-seater. The poor supply of gasoline and spare parts did one more thing to put a quick end to this undertaking. In July 1899 it was curtains for the first scheduled service with a Daimler bus.

Gottlieb Daimler quickly drew conclusions from this experience. For instance, he replaced the belt drive with a four-speed gear-only transmission. “The Daimler motorbus is built in various sizes, and depending on the local conditions it is equipped with engines of different outputs. For level roads the weaker engines suffice, whereas for routes with hills the vehicles must be fitted with the more powerful engines.” These were the words used by Daimler-Motorenengesellschaft to describe its new type of vehicle in 1898, with particular praise for the engine: “The motive power is furnished by the new Daimler ‘Phoenix’ engine, whose practical design is specifically calculated for powering vehicles and is unrivalled in every respect.”

The establishment of a great many bus lines in Germany and abroad followed. The big breakthrough for the bus in Germany came when the Württemberg and Bavarian postal services began ordering motor vehicles in grand style, both to carry parcel post and, a little later, to transport passengers. Up until the outbreak of the First World War, Daimler-Motorenengesellschaft delivered around 350 buses to customers. The biggest buyer was the Royal Bavarian Postal Administration, which took a total of 250 units. Daimler was market leader with a 43 percent market share. Benz was Number 2 with 18 percent market share; Büssing ranked third with twelve percent.

England again played a crucial role. As early as in April 1898 a British customer, the Motor Car Company, got its first bus from Cannstatt, which traveled the long distance to London under its own power and made a strong impression on the big-city dwellers on its inaugural run from the port town of Gravesend to London: “Every man, every woman and every child in Long Acre and along Picadilly stopped in their tracks and stared at the vehicle as it thundered past and resolutely and steadily went its way,” an eye-witness reported.

The next year this first Daimler bus was followed by two more. The buyer this time was the London-based company Motor Traction Co., which likewise used the two buses for scheduled service in London. The success of this early double-decker probably prompted Daimler to offer a complete bus range already in May.

On the other hand, the premiere of a first bus in Stockholm was less of a success. Hardly had the iron-tired vehicle begun plying Stockholm's Drottninggatan in 1899 – this thoroughfare was not surfaced with asphalt, but with cobblestones – the ground began to shake and the violent rumbling provoked furious protest from house owners and tenants. The bus was taken out of service and converted to operate as a truck. “Around a quarter of a century” it provided faithful service at Liljeholmen's sugar mill, as chronicler John Néren notes, adding: “Towards the end, however, it mostly served as a backup.”

The smallest bus model in Daimler's first bus range was designed for six passengers and 200 kilograms of luggage; the biggest bus accommodated 14 to 16 passengers and 450 kilograms of luggage. Cruising speed was between four and 16 km/h; if the engine was powerful enough the bus could take gradients of as much as twelve percent. The curb weight of the lightest variant was 1.1 tons; the heaviest bus tipped the scales at 2.5 tons. The net price for the six-seater was 6800 marks; the bigger models cost 8000, 9200 and 10,500 marks, respectively.

Not included in the price was the heating for the driver's seat and the passenger compartment, which was as simple as it was effective: the system let the engine coolant circulate under the floor and carried a price tag of 180 to 260 marks depending on model. Also available, for an additional charge of 500 to 600 marks, were rubber tires, “but they

only can be recommended for smaller vehicles.” For heavier models with curb weights over two tons the manager recommended ordinary wood wheels fitted with iron hoops.

“These motor vehicles can be put into operation within three minutes,” the sales brochure announced further. Other figures that were worth mentioning in those days included the specific weight of the gasoline and a consumption of 0.36 to 0.45 kilograms of fuel per hour and horsepower at wide-open throttle. At the stated top speed of 16 km/h, in purely mathematical terms this equates to fuel consumption of about 20 to 30 liters per 100 kilometers (8-12 mpg). But since only a very few people will have been familiar then with such comparative values, for the customer the information that fuel cost ten pfennigs per horsepower and kilometer surely was more important.

In every respect, DMG was at pains to emphasize operating safety and reliability. The tank, dimensioned for ten hours’ driving time, was “in a protected position underneath the vehicle,” DMG said, and the water cooling worked efficiently also in winter, “absolutely safely and reliably.” The manufacturer stressed that shifting “is done in a very secure way” and that the foot-operated brake would bring the vehicle “quickly and safely to a full stop.” Nevertheless, the company was not content merely with claims, but granted a three-month guarantee on all parts.

Buses from Baden: SAG in Gaggenau picks up speed

Benz und Daimler were not the only ones who developed a liking for building buses. Another pioneer, domiciled in the city of Gaggenau in Baden, soon also was battling strongly for the lead: it was SAG, which Benz would acquire a few years later to concentrate commercial vehicle production there.

But until that happened, within a short time SAG made a name for itself as a manufacturer of commercial vehicles. It was not until February 1905 that Georg Wiss, partner in Bergmanns Industrierwerke and son-in-law of a Mannheim industrialist, backed by his wife's fortune, took over the motor vehicle division of Bergmanns Industrierwerke and made it an independent company called Süddeutsche Automobilfabrik. The articles of incorporation dated February 22, 1905, state the company's object as "the fabrication and sales of automobiles." The Swiss design engineer Franz Knecht engaged by him was supposed to see to that: he designed a new production program in which trucks and buses played first fiddle.

The demand definitely was there. For example the establishment of the Gernsbach – Baden-Baden bus line dates from the year 1905, and, of course, buses from Gaggenau operated on it. But the SAG buses quickly gained popularity not only in Baden. In 1905 the company from Baden managed to land a sizable order from Berlin: the Berlin municipal utilities had the first large-capacity bus for 52 passengers built in Gaggenau. In 1906 the Imperial Post Office even became one of the regular buyers of SAG buses.

Trucks and buses go separate ways

For exactly 30 years (counting from the first bus built by Benz), buses and trucks marched in step. It was 1925 when they began to part ways. Until then it was normal for bus bodies to rest on conventional truck chassis whose chief characteristic is a continuous frame. It means the passengers have to do some climbing to get in. The "low bus" manufactured in Gaggenau beginning in 1925 ushered in a new era with a far more convenient entrance for passengers.

But that was not possible without a special chassis. Its frame cranked downwards behind the front axle and then continued on straight to the rear. At the rear it made an upward bend again to create the necessary space for the rear axle. The reward for this effort was that the floor was now just 670 millimeters above the roadway. Page 8

A board divided the entrance into two steps of a little more than 300 millimeters: that would be entirely acceptable for a regular service bus even today.

But the low frame afforded a number of other advantages. For example, the lower center of gravity which this means improved vehicle behavior. Which in turn distinctly enhanced both comfort and safety mainly on interurban coaches with heavily laden roof luggage racks. A brochure of the period put this advantage in a nutshell: “As a result of the low position of the body, the vehicle runs more smoothly and rocks less than a bus of conventional high design.” On top of that, buses with the low frame and a correspondingly lower slung body do not appear so stilted and look far more elegant than their counterparts. This optical break with the truck was a most welcome distinguishing feature for the new industry of passenger transportation.

The bus emancipates itself from the truck

Emancipation included a characteristic long wheelbase, which in turn made it possible for almost all passenger seats to lie between the axles, where seating is most comfortable. This had the further effect that the body generally had to endure less strain. And this provided the opportunity to go over to a generally more lightweight design “which has a favorable influence on tire wear and fuel consumption,” as a 1925 brochure told the customers.

From the beginning Benz produced the “low bus” in several variants. Wheelbases of 5000 millimeters (model 2CNa) and 6000 millimeters (model 2CNb) for bodies with 22 and 39 passenger seats made up the foundation. In addition, these new buses were available in urban and interurban versions, and there were also a number of door variants to choose from. And finally, Benz built these buses for operation with a conductor or as so-called one-man cars.

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The familiar four-cylinder gasoline engines with 40/45 hp and 50/55 hp developed from a displacement of 6.3 and 8.1 liters, respectively, served as drive units for the 7.3 and 8.4 meter long vehicles. This power sufficed for a top speed of about 40 km/h. The fuel consumption was stated by the factory as 18 kilograms of gasoline per 100 kilometers for the smaller unit and 26 for the large engine. There was still no mention of liters at this point.

But the new development far from made buses completely independent of truck design. Even the new offset frame was based on a development for trucks: Benz had introduced it a little earlier for refuse trucks so that the men doing the collecting didn't have to heave the heavy trash cans as high as they used to.

Buses after the merger: the long road to the rear-mounted engine

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- **Bodies made of steel enhance safety**
- **Semitrailer-type buses for maximum 170 passengers**
- **The first bus with a rear-mounted engine debuts in 1951**

After the merger that created Daimler-Benz AG, the letter “N” stood for vehicles with low frames, which in almost all cases were buses. But at the same time there were also trucks with low frames, for instance the N 5 model, a five-ton truck launched in 1928.

Three basic models made up the first post-merger range of buses: N1 stood for the 16-passenger bus with four-cylinder M 14 engine. The N2, which used the six-cylinder M 26, was designed for 26 passengers. N5 in turn referred to the big flagship of the period, which offered space for a maximum of 60 passengers and was powered by the four-cylinder M 5 engine.

Of course, this wide-meshed range did not suffice in times of decreasing business activity to secure an adequate volume of orders for the factory. As early as 1928 a number of new models were added and the existing range was modernized.

Wood gives way to strong steel in the bus

One aspect of this modernization was that steel soon made itself useful in bus bodies in place of wood. For passenger transportation, in 1930 Daimler-Benz already was offering a new all-steel body that made the vehicles sturdier, safer and yet lighter. Until then, wood had been the preferred material of bodybuilders. Step by step, from 1930 on Daimler-Benz introduced a framed steel structure to supplant

wood, and in doing so anticipated today's designs: on a chassis with a low frame the bodybuilders placed a delicate-looking steel framework consisting of channel-shaped pressed steel ribs, which in combination with cross members and longitudinal members created a kind of cage. To strengthen the connections the designers used so-called gusset plates. Rivets durably joined this meshwork, and rivets served to attach the panels to the body afterwards.

The new design combined numerous advantages. A body like this weighs less than the wooden frameworks with metal paneling used up until then; the stability also profited from the new architecture. Spectacular photos drastically underscored the high load-bearing capacity of the new body, as documented by one showing a considerable number of employees of the Sindelfingen body plant gathered on the roof of the new bus. As steel, unlike wood, does not splinter, the all-steel construction went hand in hand with higher passive safety: "Since in collisions injuries caused by splinters of wood are impossible," one contemporary brochure summed it up.

Additional badges on the buses promoted the new technology. They read: "Steel Body Daimler-Benz AG Sindelfingen." Though the chassis of the buses came from the Gaggenau plant at the time, Sindelfingen was responsible for the body – since 1928 Sindelfingen served as bus plant of Daimler-Benz. The large buses took the lead in the transition to all-steel bodies; the smaller models followed during the next few years.

In 1935 Daimler-Benz summed up the results: "For the smallest and the biggest buses and for all-weather vehicles, all-steel bodies are the choice because this design has shown itself to be superior to wood structures in every respect." In practically no time at all the factory had changed over its entire program.

Semitrailer-type buses come in fashion in the 1930s

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The LZ 4000, LZ 6000 and LZ 8000 tractor trucks built starting in 1933 were very popular not only for transporting freight, but also passengers. The advantages of the tractor/semitrailer combination in freight transportation resulted (and still do today) from the decoupling of tractor and load-carrying unit. On the one hand, this makes a very favorable ratio of combination curb weight to payload possible. On the other hand, the distributing of the load among three axles permitted advancing into payload regions which had appeared impossible until then in view of the low weight of the means of transportation itself.

In particular, the tractor/semitrailer combination also cost little in taxes. To calculate tax, the authorities only included the weight of the (unladen) semitrailer which rests on the axles of the tractor unit. What the axles of the semitrailer of the empty combination have to carry is simply disregarded. On top of that, the tractor/semitrailer combination permitted dispensing with staff which was absolutely required for many a drawbar trailer combination: “We should especially emphasize,” the advertising of that period stated in a somewhat laconic style “that operation of the tractor is handled by the driver alone, i.e., ONE-MAN OPERATION.”

To top it all, compared with conventional drawbar trailer combinations the tractor/semitrailer combination afforded much greater flexibility. After all, demountable platforms as are common mainly in dual-mode transport today were not yet a topic in those days. So anyone in those days who planned his transport operations in the form of a shuttle service or wanted to make use of different bodies could not get around the tractor/semitrailer combination: it alone enabled switching between different body concepts or simply parking the load carrier for loading or unloading and continuing to make productive use of the

tractor during that time – even for passenger transportation, if need arose.

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Tatzelwurm: space for 170 passengers

The smart practice of alternating between freight and passenger transportation with one's tractor quickly took root in those days. During the economic boom of the 1930s the population acquired a mobility which the manufacturers of mass conveyances no longer could satisfy with their old concepts. Tractor/semitrailer combinations designed as gigantic large-capacity buses and called Tatzelwurm (a mythical reptile of Alpine provenience) stepped into the breach. The biggest of its kind reached the impressive length of 18.7 meters and could carry no less than 170 passengers including standees.

As time went on, the three-member basic range of 1933 was joined by an additional model which can be viewed as a consistent development towards higher payloads. The new tractor LZ 10000 shown by Daimler-Benz at the 1938 Berlin auto show was designed for a total payload of ten tons – ten tons, with a combination weight of only 17 tons and a chassis weighing easily 3800 kilograms. Compare this: the three-axle flat-bed truck L 10000 without body already weighed 7400 kilograms. Under its hood the LZ 10000 still had the lean six-cylinder from the Lo 3500, which had meanwhile been upgraded to 100 hp and 7.3 liters displacement with a ten millimeter bigger stroke and a five millimeter smaller bore.

As a side note, in response to the quickly progressing expansion of the Reichsautobahn system, from 1935 on stylish, futuristic design studies for new touring coaches of unprecedented dimensions quickly were produced. Daimler-Benz, Büssing-NAG, Henschel, MAN and Vomag approached the public with impressive plans for gigantic large-

capacity buses. Daimler-Benz presented a model of one such vehicle at the 1935 Berlin auto show. The MB 805 V12 diesel previously used in locomotives was supposed to give this vehicle a particularly strong heart; a proper engine room was provided for it at the back of the bus. Under discussion were outputs of 350 and 450 hp. However, the Second World War put an abrupt end to these pipedreams.

First postwar bus arrives as early as 1948

After war's end the want and need were great and no one could waste a thought on futuristic vehicles such as this. But in March 1948 Daimler-Benz already managed to introduce the new O 4500 bus. This vehicle took up the traditional cab-behind-engine design, but integrated it into an aesthetically extremely pleasing overall design.

As if they knew their time would soon be up and the forward-control or cab-over-engine vehicles couldn't be stopped, the long-nosed buses of the postwar days flaunted especially elegant designs. More akin to a coquettish snub nose than a powerful hood, the conventional front end of the vehicle fitted into an overall picture which seemed to express mainly one thing: verve. The stylistic elements serving to create this impression were an arched roof, a rounded rear end, and a lateral line which lightly and elegantly rose like a treble clef from hood to window area and then seemed to bow down in an agreeable way at the rear of the bus.

But design as an end in itself is something no one could have afforded in the hard times after the war, when the car played practically no role and bus and rail were responsible for mobility. In part a certain economical calculation was at the root of the novel, light design of the O 4500, because key raw materials still were rationed.

True, as early as 1949 General Director Wilhelm Haspel was able to state it was clearly evident “that the problem of the available iron” soon would belong to the past. But the builders of the O 4500 and the O 5000 which soon joined it made economical use of steel for good reason, practicing systematic lightweight design. The side walls, for example, were nowhere more than 50 millimeters thick. Nevertheless, the O 4500 and O 5000 impressed with “remarkably high vibration fatigue limits,” as a description from those days underlines.

“Rigorous efforts were made,” the same text continues, “to arrange and design all load-bearing elements so that clear loading ratios resulted and torsional strain has been almost entirely eliminated.” The arched roof had two different functions: One is that it provided a tremendous amount of standing room in the center aisle – the headroom was 2050 millimeters. But it also gave the vehicle added strength which could not be attained with a strictly cubical design.

Interior spaciousness as never before

Despite a relatively slim overall width of 2460 millimeters, which made the bus fit “to drive on narrow roads,” the engineers were able to design a great deal of spaciousness into the interior. A clear interior width of 2250 millimeters easily permitted placing five comfortable seats next to each other at the rear of the bus. And the center aisle also was worth an extra look: “Extra wide,” the factory pointed out, “on a scale you can never hope to find anywhere else, taking the usual twin seat configuration as a basis.” Not only lightness and verve, but a certain degree of spaciousness too was quite en vogue in the postwar years.

Demands for comfort also began to be heard again. The customers appreciated the painstaking care which Daimler-Benz applied to the

heating and ventilation of the O 4500 and O 5000. A ventilation switch in the standard-fit fresh-air heater, for example, was one of the many small details which distinguished the O 4500 and its big brother, the O 5000. In addition, there was a special duct which sent warm air across the windshield and prevented it from becoming fogged or iced up. Page 16

Air conditioning for the warm time of the year was still out of the question in the late 1940s, instead this postwar model series featured an ingenious ventilation system. “Sensibly arranged flaps and ducts conduct fresh air, draft-free, into the interior of the vehicle,” a contemporary description praised the mode of operation of the system, which continuously circulated the air inside the bus. Two large air scoops on the roof permitted air to “wash around the inner ceiling without creating a draft.” These devices were supplemented by more rustic and certainly not entirely draft-free ventilating means such as a crank-operated window on the driver’s side plus three sliding windows and a ventilator window at the rear of the bus.

As touring coaches, the two variants were designed for 39 to 47 passengers. The urban bus variant could carry a maximum of 60 passengers.

A proven foundation for frame and floor

For the chassis of models O 4500 and O 5000, on the other hand, Daimler-Benz relied on proven components of many years standing. The Gaggenau factory supplied the chassis-cum-cowl, which was closely related to the low-frame truck chassis, much in the tradition of prewar buses. The engines of these first postwar buses also were the equivalents of the engines in the corresponding truck models, L 4500

and L 5000, which both used the proven prechamber diesel engine OM 67/4.

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This engine originated in the 1930s and, as six-cylinder variant, was a welcome supplement to the legendary 3.8-liter unit OM 59 introduced in 1932, which, as first production diesel engine in a light truck, really made the diesel popular in the commercial vehicle. The technical data for this engine list “120 hp maximum output” and “112 hp continuous output,” which propelled the O 4500 to a top speed of 62 km/h and the O 5000 usually to a speed of 65 km/h, but could even push it to 75 km/h with a special gear ratio.

However, this first little postwar bus family was not destined to live a long life. From spring 1948 to autumn 1950 a total of 649 units left the Sindelfingen plant as complete buses. Including the units supplied to customers as chassis, the production figure for the O 4500 and O 5000 buses was exactly 770 units. Even though their conventional cab-behind-engine design and low-frame construction marked them as members of a species which was gradually nearing extinction, and they would have to leave the field to the forward control vehicles and the self-supporting body design which soon came into fashion, they did have one thing to their credit: making a fresh start, they pointed the way forward in a difficult period and effectively provided urgently needed mobility in their simple, yet elegant way.

In the truck, the engine moves underneath the cab; in the bus, to the rear

As with the trucks of Mercedes-Benz, in the case of the buses it was mainly export customers at first who pressed for forward control variants. From the introduction in summer 1950 of the conventional hooded bus O 6600, derived from the L 6600 truck, it took exactly

until spring 1951 to give the O 6600 a little flat-nosed brother. The O 6600 replaced the previous five-ton bus O 5000 in 1950 and had a 145 hp diesel engine from the OM 315 series. This last big cab-behind-engine model from Daimler-Benz was offered for sale until 1955 (from 1954 under the model designation O 304) and attained a production volume of 625 units.

The new forward control bus of 1951 was called the O 6600 H. It had a length of eleven meters and an OM 315 engine transversely mounted in its rear end. Further features of this highly up-to-date bus: electrically shifted ZF Media six-speed transmission, bolted-on lightweight steel body, rubber-mounted anti-roll bars. People were surprised.

Despite its high price, the O 6600 H met with a relatively good reception. But it remained an outsider of its class, as did the O 6600 T that soon was added, a trolleybus whose electric motor drew its juice from an overhead wire. During the 1950s it was very much the fashion in German and foreign cities to replace streetcars with trolleybuses. The O 6600 T (together with its successor, the O 320 T) managed a total production run of 364 units (including two chassis for out-of-house bodies). For comparison: the overall production figure for all other variants of the 6600 bus family together was 2560 units.

The world champion bus in the guise of the O 321 H

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- **First Mercedes bus with new semi-integral design**
- **Basis of the brand face of Mercedes buses**
- **More than 30,000 units produced**

Daimler-Benz really only got back into the swing of things with the O 321 H, a medium-sized forward-control bus with nine seat rows which impressed customers with a remarkably spacious luggage compartment beneath the floor of the passenger area. This was a result of the new self-supporting construction featuring a frame/floor assembly with a body firmly welded to it and serving also to support the structure. Kässbohrer in Ulm had come out with its first “Setra” in 1952, a circumstance which tremendously hastened the advent of the O 321 H (just three years after the O 6600 was introduced). Incidentally, Setra stands for selbsttragend (self-supporting).

Launched in 1954, the O 321 H set standards versus the competition particularly in styling. The avant-garde Mercedes designers limited the use of chrome, which the others used profusely, to a minimum. After all, the harmonious shape was supposed to develop an effect of its own. Dealers and customers took a very different view of this and loudly called for the usual tinsel. Not having to be asked twice, Daimler-Benz complied with these wishes, simultaneously demanding a hefty increase in list price. And suddenly it had a hot seller on its hands.

In 1954 Germany’s national soccer team won the World Cup for the first time. But few thought during production start-up that the new Mercedes-Benz bus would also prove to be made of world champion material. Taking into account chassis and production outside Germany, the versatile bus enjoyed worldwide unit production figures

of nearly 30,000 over a long career spanning 16 years – more than any bus before it.

On December 6, 1954, St. Nicholas' Day, the first O 321 H came off the production line in Mannheim, the plant that not long before had been declared the central bus plant of Daimler-Benz AG. Its semi-integral design was a major departure from the conventional chassis construction and, with the exception of the major drive assemblies, removed all similarities in design between buses and trucks once and for all. Just a few years earlier, the Mercedes-Benz O 6600 H had heralded this development, with its forward-control cab position and rear-mounted engine. Its body, however, had been built on an entirely conventional ladder-type chassis.

The backbone of the O 321 H on the other hand was a frame/floor assembly designed to be self-supporting. The body was then welded firmly to this high-strength frame. Together these two components resulted in an extremely rigid body shell, lending the overall design higher stability, lower weight and – with the removal of the chassis side members – a larger luggage compartment between the two axles. Coil springs on the front axle instead of the leaf springs used hitherto served to improve ride comfort. The O 321 H heralded a new era in Mercedes-Benz bus design.

At the same time, the separate frame/floor assembly of the new bus permitted the company to continue supplying conventional bodybuilders with the chassis. And coachbuilders in Germany and elsewhere gladly availed themselves of the opportunity to create individual body designs for buses of every conceivable kind.

Nevertheless, as a complete vehicle with three-pointed star, the original Mercedes-Benz O 321 H was pleasing enough to the eye in its

own right. The curvaceous body created a thoroughly harmonious effect, the distinctive oval radiator grille incorporating the large brand symbol and circular headlamps. The same grille adorned the new cab-over-engine trucks of the 1950s – a feature clearly reminiscent of the legendary 300 SL – and forged an original brand bus face which still endures 50 years after the premiere of the O 321 H in the modern Mercedes-Benz Travego coach.

At the time of production start-up for the Mercedes-Benz O 321 H, buses were far less specialized than they are today. A single model series spanned the whole range from urban regular service bus to touring coach. But the O 321 H was more than up to the task. On the one hand, there was the regular service bus with wide, inward-folding doors ahead of the rear axle, destination indicator box and a soberly functional interior. And on the other, the vehicle came as a comfortable and elegant coach with airy, glass-bordered roof, entry behind the rear axle, hinged doors, luggage nets and finished in a variety of creative, multi-colored liveries.

Despite the wide range of equipment versions, the history of the O 321 H began with a single model, 9.23 meters in length and with a wheelbase of 4.18 meters – what today would be a midi-bus. Two years after its introduction, Daimler-Benz went a stage further with a longer version of the bus, the O 321 HL. Both wheelbase and overall length were extended by just under 1.5 meters. Until that point the coach could seat a maximum of 37 passengers; now at 10.6 meters in length and with two extra rows of seats the O 321 HL could accommodate up to 45 passengers.

In both cases the power was provided by a pre-chamber diesel engine mounted at the rear in the direction of travel. The six-cylinder in-line unit from the OM 321 series had a 5.1-liter displacement and

delivered 110 hp. From 1962 the company responded to calls for greater output by offering the larger OM 322 5.7-liter in-line engine giving 126 hp. The power of both engines was transmitted by a fully-synchronized five-speed gearbox.

But it was not just length and technology that saw change: over the years the look of the Mercedes-Benz O 321 H was also revamped. While the early units were plain and unsophisticated in appearance, in time particularly the coaches went in for an ever-increasing abundance of chrome. This included not only the frame for the radiator grille, but also a broad molding below the front windshield, which continued along the sides and clearly marked the vehicle's waistline.

Thanks to a number of facelifts, the O 321 H also gained in stature over the years. The original flat front windshield was enlarged and extended further downwards from 1957 on. In 1961 it grew again in size, this time upwards, providing passengers with a better view. Then, in 1963, the O 321 H was given a new rear end with a large, one-piece screen. Standing room also improved, thanks to a raised roof in the mid-section. But by this time the bus was approaching the end of an illustrious career in Europe. Already the first highly specialized buses were beginning to take over from the O 321 H: companion models, the O 317 and O 322, were now purely regular service buses.

Throughout its long history the O 321 H also enjoyed an international career. The bus plant in Mannheim turned out more than 30,000 of these bestsellers, roughly two thirds of which were complete buses, and one third chassis to receive bodies. Many of these buses were destined for export to other European countries, Africa and Asia. In 1965 the plant also delivered 116 parts kits to Greece and four to Argentina. Deliveries to Brazil were of a different order altogether,

however: from 1957 to 1970 over 11,000 parts kits were shipped across the Atlantic. In total the then Daimler-Benz AG produced precisely 29,586 units of the Mercedes-Benz O 321 H / HL - a performance truly befitting a world champion.

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Strikingly compact and maneuverable: the O 322, purely an urban bus

- **Breaching the gap to the modern day and age**
- **Capacity of 100 passengers**
- **Innovative all-air suspension**

In the chain of great bus developments by Mercedes-Benz, the O 322 can be considered an important link between two outstanding vehicle generations. Taken by itself, the Mercedes-Benz O 322 built beginning in August 1960 may not have been the big success, with 959 units being produced between 1960 and 1964 – the Mercedes-Benz O 321 H and later on the O 302 outshone it, each with five-digit production figures. And a third successful bus also played a major role in this period: the regular-service bus Mercedes-Benz O 317.

But as link between the roundish buses of the 1950s and the up-to-date, spacious passenger haulers with rear-mounted engines, the O 322 had an important function. Around 1960, urban regular service buses frequently were still variants of large multifunctional model series including regular-service buses and touring coaches, as documented by the respective models of the Mercedes-Benz O 321 H beginning in 1954 and its successor, the O 302, beginning in 1965. In between, however, there were the specialists like the O 317 of 1958, a pure regular-service bus with a horizontal engine between the axles. One year later, at the Frankfurt International Motor Show in September Mercedes-Benz showed another urban bus, the O 322, which went into production in August 1960. With an overall length of just under ten meters and a wheelbase of 5.1 meters, the O 322 was designed as a decidedly compact and maneuverable bus. In the rear of the bus a vertically installed, lightweight in-line six-cylinder from the

300 engine series purred. Initially, its output was 110 hp, developed from a displacement of only 5.1 liters.

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Clearly structured body

The O 322 basically featured the same outer shape as the O 317. The large divided windshield, round roof edges with tight radii, and doors which closed flush with the outer wall determined the clear, modern lines of the body. The side windows, however, were made appreciably larger and were thus more elegant than the small windows of the O 317; the wheel arches no longer were flared. The clear-cut, angular face was matched by the design of the rear end. The Mercedes-Benz O 321 H, and later the O 302, would adopt this from the O 322. The new regular-service bus offered an astonishing amount of space: in normal use there was room for 50 standees in addition to 32 seated passengers. At rush hour the O 322 even was allowed to carry 100 passengers. They entered and exited through a two-part inward folding door at the front and a four-part inward folding door before the rear axle. At the front entrance the passengers profited from a wide door cutout made possible by the steep, high windshield.

Fine little feature: the bus stop brake

The technical credentials of the O 322 also were quite impressive. Mercedes-Benz relied on innovative all-air suspension without additional leaf springs, introduced two years earlier to large-scale bus manufacture in the O 317. For the first time, the work of the driver was facilitated by a small detail on the O 322 which every urban bus has today: the bus stop brake, with a small lever on the instrument panel, conveniently held the bus in place during a short stop. In addition, drivers profited from the maneuverability of the bus and excellent visibility. The turning circle was just 18.4 meters. The new

developments built into the O 322 included hydrostatic fan drive: the fan of the radiator was not always engaged, but cut in when coolant temperatures exceeded 84°C.

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In 1960 the Mercedes-Benz O 322 was a state-of-the-art bus which in its details pointed ways to the future. Still, demand kept within limits: as an additional regular-service bus variant it was hedged in between the two success models, O 321 H and O 317. The short career of the O 322 came to an end after just four years. Its successor was an urban bus edition of the famous O 302 series, whose career was launched in 1965. A few years later, in 1969, the history of urban regular-service buses was to take a completely different turn: series production of the highly specialized standard bus O 305 then commenced. It opened a new page of bus history which would extend down to the ultramodern Mercedes-Benz Citaro urban regular-service bus of the year 2000.

The last of the “one for all” buses: O 302

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- **A generously glazed cuboid**
- **Enormous range of variants**
- **Exports as far as the USA**

With specialization proliferating among trucks more than ever before in the 1960s, the new O 302 bus put on the market in 1965 gave it one more – extremely successful – try as a classic generalist. One for all – probably the aptest description of the Mercedes-Benz O 302. Urban regular-service bus, rural-service bus, touring coach – this bus with the three-pointed star was a jack of all trades. And it was the last of its kind before buses became specialized.

Launched in May 1965, the O 302 replaced the popular O 321 H, and the step from one to the other could hardly have been greater. The expectations made on the new O 302 were enormous considering that the O 321 H had scored worldwide success with over 18,000 units built in 13 years. While the predecessor’s rounded contours and small windows identified it as a design from the 1950s, giving the bus a slightly outdated appeal toward the end of its career, the O 302 had been designed in the austere automotive Bauhaus style of the 1960s. The curvatures of roof and back did little to deter from the basic cuboid shape with steeply angled front, generous glazing, slim window pillars, long side windows and large rear screen.

A typical child of the economic miracle period

Typical luxury features in the 1960s were the chrome surrounds of all windows. The O 302 was a product of the economic miracle period in Germany: people had gained new confidence and wanted to see and be seen.

Only the broad scuff plates and trim strips of the O 302 were still reminiscent of the 1950s. A bare sheet-metal band ran across the front end and connected it with the sidewalls. On many O 302 units, a broad strip or color band extended along the sides, from the front to the rear bumper, giving the bus a well integrated appearance.

Otherwise the O 302 with its clear and cool lines carried on the design trend that the Mercedes-Benz O 317 had established in 1958 (though still with small side windows). But whereas the O 317 with its convex grille looked rather grim, the O 302 with its horizontal grille and large rectangular headlamps had a much more conciliatory mien.

Only a narrow strip now divided the windshield

The O 302 was available with plane side windows or with curved glazing. The latter extended into the roof, thereby converting the bus into a classic panoramic vehicle. On this version, the rear door was adapted to the side contour by means of an additional window at the top. The panoramic glazing had first and foremost been designed for touring coaches but was also optionally available for the regular-service buses with their destination indicators. In the beginning, roof edge glazing could be had to supplement the plane side windows. The driver's workplace in the Mercedes-Benz O 302 was visually separated from the passenger compartment in that the lower edges of windshield and front door windows formed a single line that was clearly below the passenger compartment's window sills. In the versions with high, curved side windows, the roof was slightly raised in the area of the passenger compartment. The windshield now only was divided by a narrow vertical strip.

Diversity was one of the special hallmarks of the three-meter-high bus with its high floor: it was available with four wheelbase lengths

between 9.6 and 11.9 meters (the longest version joined the series in 1967). Equipment and seating versions also varied greatly, ranging from practical urban buses through to upmarket touring coaches. Hinged doors front and rear were available for the touring coach, two-part outward-folding doors front and rear for the country bus, and extra-wide inward-folding doors at the front and in the middle for the regular-service urban bus – the O 302 made use of every opportunity that its body afforded.

Characteristic of the O 317 is a horizontal underfloor engine arranged between the axles, while the O 302 draws on the advantages of the rear-mounted engine, much like the O 321 H. The O 302 was also the first bus with the three-pointed star to be fitted with a direct-injection diesel engine, in 1965, two years after its introduction in trucks, Until then, Mercedes-Benz had preferred pre-chamber combustion engines which boasted smoother running characteristics but also consumed more fuel.

230 hp available on request

Initially, buyers had to put up with the compact OM 352 six-cylinder in-line unit with a displacement of 5.7 liters and an output of 126 hp as standard-equipment engine in combination with a five-speed gearbox. The large twelve-row bus was powered by the OM 327 with a displacement of eight liters and an output of 150 hp, soon to be boosted to 160 hp. The more powerful engine was optionally available for the smaller O 302 versions. The twelve-meter bus was optionally available with the large 11.6 liter OM 355 with 230 hp – a more than adequate engine output for touring coaches as well. From 1969, the power output of all engines was raised.

In the beginning, the suspension of the three compact O 302 versions still included coil springs at the front and trapezoidal leaf springs at the rear as standard equipment. Air suspension all round was standard on the large thirteen-row bus and the urban buses right from the start and was incorporated in the standard equipment of the other O 302 versions from 1971.

The O 302 was the first touring coach from Mercedes-Benz to feature individual nozzle ventilation for every passenger seat. Fresh air is drawn in at the front, over the windshield. And it was also the first to be optionally available with air conditioning, mounted in a box above the rear end. In coaches without air conditioning, passengers were able to protect themselves against the sun by means of retractable blinds. At his still rather sparsely equipped workplace, the driver had a genuine instrument panel in front of him – a flat panel extending from one side to the other, with only one set of gauges consisting of speedometer, rev counter and instrument cluster being slightly tilted toward the driver.

The history of the O 302 includes distinctive models. At the time, Daimler-Benz also exported buses to the USA, with the eye-catching stainless-steel paneling that was typical in the States. This paneling was optionally available for European O 302 units. The O 302 experienced a genuine highlight towards the end of its career: All teams competing in the 1974 World Cup in Germany traveled on O 302 coaches painted in their countries' colors.

The world's first hybrid bus

The O 302 also had a proper technical tidbit to offer in its day and age: In 1960, the world's first hybrid bus – an OE 302 – was presented at the Frankfurt International Motor Show. The “E” in the model

designation points to the additional electric drive. The conditions for a hybrid drive in the raised-floor O 302 bus are good because there is enough room under the floor for the equipment of a second drive system, including batteries. The direct-current traction motor had a continuous output of 115 kW (156 hp) and a peak output of 150 kW (205 hp) – power in abundance for an urban bus of the day.

The electricity for the traction motor was supplied by five battery blocks with 189 cells, a total operating voltage of 380 and a capacity of 91 kWh. A top speed of 70 km/h and a range of some 55 kilometers in regular service outline the limitations of the concept, as does the battery weight of 3.5 tons. For two-shift operation on a long regular-service day, the OE 302 was fitted with a 48 kW (65 hp) diesel engine adopted from the vans. This engine, transversely installed in the rear, was used to power the bus on the fringes of cities, operating in the optimum range at constant speed. An electric brake serves to recuperate energy.

More than 32,000 units built in eleven years

The versatile Mercedes-Benz O 302 was highly successful in many ways, also as a chassis. Renowned bodybuilders such as Ernst Auwärter, Drögmöller and Vetter tailored attractive bodies for the O 302 chassis. The O 302 was equally successful as an export item owing to its numerous variants – it was simply one for all! This had its effect on production figures: In the course of eleven years, Daimler-Benz built over 32,000 units, comprising chassis (a little over 50 percent) and complete vehicles – a world record. The successor, the O 303, reached a production volume that was higher still, but over a longer period.

The O 302 will remain clear record holder in annual output for the foreseeable future. The specialization of later years never permitted comparable unit volumes again.

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O 305 and O 307 establish a new era in bus manufacture

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- **Customers now have a say in design**
- **Lifecycle costs become focus of attention**
- **Standardization reaches the rural-service bus**

At the 1967 Frankfurt International Motor Show, the new O 305 urban bus was presented to the public for the first time; large-scale production began one year later. This ushered in a new era in bus manufacture at Daimler-Benz, with touring coaches and urban buses leading separate lives from then on.

As early as 1966, the designers at Daimler-Benz had submitted the draft of a special urban bus designed for one-man operation and featuring a low floor, high side windows, air suspension, compressed-air brakes and a rear-mounted engine. However, other people had put their heads together elsewhere at roughly the same time and come up with a similar concept: under the management of O.W.O. Schulz, technical director of Hamburger Hochbahn AG, a committee of the Association of Public Transport Companies (VÖV) set out to elaborate recommendations for the standardization of regular-service urban buses – and presented them at the association's annual convention in 1967.

They specified an eleven-meter long bus with rear-mounted engine and a low floor at a convenient height of 725 millimeters. They also suggested double inward-folding doors in front of the front axle and the rear axle, a standardized instrument panel and a central electrics compartment. The rear screen was to be made of a non-dazzling glass and side windows had to be generously dimensioned. And finally, the

interior compartment was to provide space for 41 seated and 61 standing passengers.

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The members of this committee represented some 70 percent of the German fleet of regular-service urban buses – a powerful argument for the Association’s demands and the reason why the O 305 had to put up with certain modifications shortly before its production startup.

At the time of the launch in 1967, the fathers of the concept would never have thought it possible that more than 16,000 units of the new O 305 urban bus would have come off the assembly lines by the time its career came to an end in 1985. Quite on the contrary, at the 1967 Frankfurt Motor Show, not only the new Mercedes-Benz bus but also its competitors from Büssing and Magirus were critically reviewed. Soon, the mocking reference to the “container on wheels” was passed around. Many contemporary witnesses felt that the new standardized regular-service bus with its rational rectangular shape was too drastic a break with the customary design that dated back to the 1950s and featured familiar elements such as chrome trim and chubby proportions.

But there was method in this apparent madness: the local public transportation operations had come under double pressure even in those days. They had to cut costs and at the same time improve the attractiveness of local public transportation, which was faced with growing competition from the ever more easily affordable passenger car. Passengers were to be attracted by the low floor with convenient entry, by high ride comfort afforded by air suspension and by an unmarred panoramic view through generously dimensioned windows.

Costs had come under scrutiny mainly in three respects: the standardized regular-service urban bus was to cut not only the vehicle

purchase price but also the cost of servicing and repairs. Cost-cutting was also at the forefront of the design for one-man operation, whose benefits were, however, initially disputed and bestowed a so-called one-man bonus of twelve percent on many drivers. The director of the public transit authorities of Heilbronn, for instance, drew up a calculation for the district council to prove that the changeover to one-man operation would be an expensive hobby since this would prolong the time the bus spent at stops, with adverse effects on turnaround speeds and an ultimately expensive demand for additional drivers and buses.

This calculation did not work out, as can easily be read off the extraordinarily successful history of the O 305. As early as 1970, the plant presented the prototype of a rural-service bus derived from the O 305, designated O 307, which complied with the local public transportation guidelines for a standardized rural-service bus. The new O 307 adopted the frame, major parts of the bodywork and the much acclaimed driver's workplace from the O 305 but differed from the latter in that it was 11.7 meters long (0.7 meters longer than the O 305) and had a 150 millimeter higher floor than the O 305.

The O 305, which had initially been available with the 8.7 liter six-cylinder OM 360/h engine with either 170 or 192 hp, in its turn inherited the eleven-liter OM 407/h engine, with up to 240 hp, from the O 307 in 1973. From 1973 the O 305 was additionally available with a new three-speed automatic transmission specially developed for the bus by Daimler-Benz and supplied ex factory with or without retarder. This automatic transmission, designated W 3 D 080, was so compact that it was particularly suitable for installation in what was a notoriously small rear-end compartment.

In 1977, the two-axle O 305 regular-service urban bus was joined by a three-axle articulated pusher bus derived from it, the O 305 G which was 17.3 meters long and designed for a gross weight of 26 tons. A very special version of this bus, the DUO O3 305 G D/E, designed for being alternately operated by electrical energy from overhead lines or by a diesel engine, remained in service in Esslingen in Swabia for many years before it was sold by the town's local public transit authorities in 1988.

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And finally, a fleet of 20 hybrid electric buses – the OE 305 – made a name for themselves by demonstrating the suitability of hybrid electric buses for everyday line service in cities. 13 of these buses did service in Stuttgart, the remaining seven in Wesel in North Rhine-Westphalia. In inner-city operation, these buses operated exclusively on electrical energy supplied by batteries; in the suburbs, by contrast, they operated in the diesel-electric mode, meaning that a low-pollutant and specially encapsulated diesel engine fed the batteries via a generator.

Despite its compliance with the urban bus guidelines defined in 1967, the O 305 was by no means a phenomenon that remained restricted to Germany. In several parts of the world, this bus, of which as many as 4,743 chassis versions were supplied, is still enjoying enormous popularity even today. Singapore, for instance, operated 200 units of the O 305. And as soon as the regulation to procure buses only from Commonwealth countries was abandoned in Hong Kong, the local Kowloon Motor Bus Company ordered an O 305 for testing in 1983. This bus with a 4.5 meter high double-decker body made by Alexander left such a good impression in what was still a British crown colony at the time that another 40 units were ordered – some of these are still in operation today, having made a name for themselves as particularly safe means of transportation. The O 305 buses in the streets of Hong

Kong hold a very special record: there has not been a single serious accident with these vehicles in all these years.

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From standard urban bus to standard rural-service bus

The drive for modernization which commenced in the mid-1960s was primarily due to the initiative of the transit operators. In addition to being strongly dependent on the satisfaction of their own customers, the passengers, the operators also hoped that the standardization of regular-service buses would produce financial savings, not least because of reduced costs for servicing, maintenance and replacement parts inventories.

But the manufacturers too did not always find it easy to adjust to the new concept, even though they made haste to meet the wishes of their customers. Until then they had all followed their own ideas with respect to dimensions, engines and appointments, and these were not always easy to reconcile with the new requirements.

The market leader Daimler-Benz had just presented the new O 302 model series in 1965. In view of the relatively low volumes for individual segments such as interurban services, the Mannheim plant planned to cater for the entire spectrum of operations, from the urban bus to the comfortable touring coach, with a single model series. However this model was far from meeting the requirements which the Association announced two years later.

Moreover, at the turn of the year 1967/68 a further working group consisting of representatives of the German railway and postal services, as well as associations of passenger transport operators and private sector railways was formed. This working group undertook the task of developing its own guidelines for a standard rural-service bus

along the lines of the standard urban service bus. It presented its recommendations in 1969. The following year Daimler-Benz presented a prototype at the “Rail and Road” exhibition in Essen, and series production of the O 307 standard rural-service bus commenced in February 1973.

Demanding specifications

Whereas the O 302 had been designed to cater for both urban and interurban operations, there was to be a major difference between the standard rural-service bus and the urban bus, for in 1967 the VÖV had specified a low floor height for urban buses to make it as easy as possible for passengers to enter and leave the vehicle. The rural-service bus, however, was to have a luggage compartment with a capacity of at least 2.5 cubic meters which could only be accommodated beneath the floor, between the axles. Moreover, with a length of 11.7 meters the rural-service bus was to be slightly longer than the 11-meter VÖV urban bus. Comfortable seat rows were to be provided for roughly half of the 102 passengers. Where the cockpit was concerned the working group followed the lead of the urban bus. The engine output was to be in the region of 200 hp.

It was therefore clear that city and intercity operations could not be combined in a single model series. Nonetheless Daimler-Benz did not miss the opportunity to include its own rationalization efforts in the design concept for the rural-service bus, and made sure that the greatest possible number of O 305 urban bus components were adopted in the O 307, which was presented in 1973. These included not only frame and body components, but also the highly praised, practical and clearly arranged cockpit.

Conversely, the urban bus adopted the 210 hp six-cylinder OM 407h engine from the O 307 in 1973, replacing the original OM 360h which had an output of only 192 hp. This eleven-liter engine was installed horizontally at the rear, with a 180 hp low-emission variant also available on request. In 1973 Daimler-Benz also introduced a sound-insulated version, the “whispering bus.” To quote a press release: “The engine encapsulation system reduces engine noise to such an extent that the engine of a passing bus can scarcely be heard.”

The O 307 was able to seat 53 passengers in 14 seat rows, with standing room for 48 more. At 879 millimeters the floor level was 150 millimeters higher than in the O 305. The double rear door was 1200 millimeters wide, as in the urban bus, however at the front the O 307 made do with an entry width of 730 millimeters. With a capacity of approx. three cubic meters the luggage compartment even exceeded the requirement of the working group.

Comfort was ensured by air suspension as standard, as in the O 305, while large side windows enhanced the panorama window character. At the front end the two ventilation louvers on both sides of the destination indicator were immediately noticeable. In conjunction with the roof vents, two slim quarterlights in the last pair of windows and a generous heating system, these provided a pleasant interior atmosphere at any time of the year.

The cockpit was practically identical to that of the O 305: a hydraulically damped driver's seat with longitudinal and height adjustment ensured comfortable access to the clearly arranged instruments and controls. Power steering assisted by a steering damper, as well as a turning circle of only 22.3 meters, made slow-speed maneuvers easier in bus stop bays and narrow areas.

Power was transferred to the rear planetary hub reduction axle by either a synchronized five-speed manual transmission or a three-speed automatic transmission. In both cases the gear gradations and the performance characteristics of the engine provided both respectable acceleration and a low level of vibrations at low engine speeds. In fourth gear the speed could be reduced to almost 20 km/h without any significant vibrations occurring.

One thing had changed versus the O 305, however: the prototype of the urban bus had already attracted criticism with its unusual, very deep windshield which curved outward like a sail. Accordingly Daimler-Benz modified the windshield and improved the aerodynamics at the same time. In the O 307 the windshield was also rounded off at the edges, significantly reducing the air resistance to a Cd figure of 0.42.

The requirements of the transit operators for a vehicle with a long operating life and easy maintenance were not only met by the well-proven quality of the engine, the robust suspension and strong body components. The engine compartment and fuel tank, batteries, auxiliary heater and electrical system were also easily accessible via large external maintenance flaps.

In one respect this standardization of urban and rural-service buses did not quite meet the expectations of the transit operators, for although the ongoing costs for servicing and maintenance were significantly reduced, the purchase price increased. Whereas Daimler-Benz had offered the O 302 for DM 65,000 to 88,000 in 1966, the O 307 started at no less than DM 140,000, even rising to DM 290,000 by 1984.

Quality simply has its price, and this was recognized by Daimler-Benz customers. Up to 1984 they ordered 3,985 units of the O 307, making

it one of the best-selling rural-service buses of the 1970s. In doing so Page 41
the customers confirmed the verdict already reached by the specialist
world: at the 1973 International Bus Week in Nice the O 307 was
immediately awarded the “Grand Prix Louis Bolandard” for technical
excellence.

The O 303: modular buses

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- **Functional cubic design**
- **Six wheelbases, seven lengths**
- **Power from large-displacement V-engines**

The bus of the Mercedes-Benz O 302 model series, with its clear-cut lines, proved to be a big hit for a full decade, even clearly topping the big successes of its predecessor, the O 321 H. So what could be more sensible in developing a successor than to perpetuate this success? It was not only the name, O 303, that pointed to the strong affinity between the two bus generations at the launch in 1974. The looks of the O 303 also clearly built upon the predecessor.

The front end adopted the clear-cut design of the predecessor. The border around the star and the again rectangular headlamps were even a bit more straightforward (as time went on the border was dropped and replaced in 1982 by an embossed plastic part); a swage line pressed into the sheet metal took the place of the shiny decorative band running across the front end and framed the turn signal lamps. The windshield rose almost perpendicularly, its lower front edge again forming a line with the window of the door. During the first years a narrow vertical strip still divided the windshield.

The front end together with the driver's area was again set off a bit at the top; the bumper was no longer attached to the body but formed a single unit with the front apron. And the curved, double glazed side windows (now without a chrome frame; depending on the paint color the window guides often were painted a discreetly contrasting dark color) extended into the roof area on all variants. The center or rear door again had an additional window at the top.

Whereas the plump rear end of the O 302 with the quarter windows before it was reminiscent of the design idiom of the 1950s, the rear end of the O 303 rose up almost straight as a ramrod. A functional and cubical shape characterized the O 303 – with the exception of the roof edge, curved to afford passengers a good view. If we compare it with the cars of those years, it was more Stroke Eight and W 123 than S-Class – a precondition for a long lifecycle.

Concentration on interurban, combination and touring service

Just like the trucks of this period the new O 303 bus made use of a modular system. The O 303 can be regarded as the prototype of this rational construction method. With six wheelbases and even seven lengths the bus covered all conceivable size variants from 8.7 to 12.0 meters – there were never more, and there probably never will be more. From nine to 15 seat rows, there was everything that bus companies in Germany and abroad might be able to use. However, the O 303 concentrated on interurban, combination and touring service – urban buses long since were the domain of the O 305 standard bus. For rural service there was the O 307 derived from it. It satisfied the modest demands on looks and comfort.

The Mercedes-Benz O 303, in contrast, was just the right bus for the private coach operator: interurban service during the week, excursions on weekends were the work cut out for the O 303 in its simpler variants for combination service. For pure touring service the upscale editions with high floors and correspondingly large luggage compartments in their bellies, like the O 303 RHH, later RHS, were responsible. And with the short variants O 303/9 and O 303/10, for the first time Mercedes-Benz offered a handsome club bus for small groups taking exclusive tours.

But precisely private coach operators missed another important variant during the O 303's first years: the sales range lacked a long-haul high decker for long-distance travel to tourist destinations. These coaches – recognizable by a central entrance whose door does not extend beyond the window sills because the body is so tall – were available from all renowned touring coach manufacturers in the 1970s. They had much stowage space, and for travel to faraway places they, of course, also had compact galleys and toilets. Mercedes-Benz didn't supply high deckers until 1979, when the two longest variants of the O 303, the 14 RHD and 15 RHD were launched. They measured 3.4 meters tall, whereas the other variants – like the predecessor, the O 302 – rose to a height of just over three meters.

A close affinity of the engines to those of the trucks from Mercedes-Benz was one feature of the modular system of the new O 303. Here the O 303 profited at its premiere from the “New Generation (NG)” that had been presented just a year earlier. Whereas the O 302 was driven by relatively weak in-line six-cylinder engines with power in rather short measure, large-displacement V-engines now saw use in both buses and trucks. In the first few years these were naturally aspirated engines, without exception; Mercedes-Benz didn't rely on turbodiesel engines until the second half of the long life of the O 303.

Installed in the rear end of the compact variants of the O 303 with lengths up to 10.6 meters were compact V6 engines with a displacement of 9.6 liters; 12.6 liter V8 powerplants and even the 16 liter V10 usually powered the two longer editions. Concurrent with the launch of the RHD high-decker and the introduction of the undivided windshield, a new engine generation arrived on the scene in 1979. The V6 now got 159 kW (216 hp) out of a displacement of eleven liters; a V8 with 14.6 liters displacement and 206 kW (280 hp) now powered

the medium-sized and larger variants. A turbocharged V6 with 184 kW (250 hp) and a turbocharged V8 (243 kW/330 PS) finally arrived in the mid-1980s. In the outgoing 1980s engine power was increased again; the strongest variant then developed 260 kW (354 hp). Page 45

Connecting rod journals are moved to improve the smoothness of the V6

While the V8 was both beefy and smooth and enjoyed great popularity, the V6 never really reached the hearts of bus companies and drivers: the rough running characteristics just didn't seem to go together with comfort-enhanced coaches. Further development of the six-cylinder in the course of the eighties – the connecting rod journals were moved to obtain more even firing intervals – then corrected this impression.

The powertrain employed five- and six-speed transmissions or an optional automatic transmission. From 1987 on Mercedes-Benz also offered the semiautomatic electronic/pneumatic gearshift system EPS (=electronic power shift). This early stage of today's automated gearshift systems still had a clutch pedal, but on the right side of the driver's seat a joystick replaced the conventional gearshift lever with its long shift travel. Now a tap was all that was needed to shift.

As with the engines, Mercedes also took a conservative approach to the suspension of the O 303: air suspension was an obvious choice for the O 303, but the bus – “same as ever” – had a rigid front axle, with drum brakes on all wheels. As before, the design of the bus was based on a self-supporting frame-floor system. On the other hand, in 1985 Mercedes-Benz created quite a stir when it became the first bus manufacturer to have an anti-lock braking system. Retarders additionally were available as special equipment.

Compared with the unsophisticated driver's position of the O 302, the O 303 had a veritable cockpit. The large surface of the instrument panel was curved, but the instrument setup – a large speedometer and instrument cluster and a smaller rev counter in between – was rather conventional.

The Mercedes-Benz O 303 reached the end of its days with a manageable but very versatile range of coaches. The variants KHP-A and KHP-L, with six lengths, covered the interurban lines and combination service sector. The RHS could be had in two short variants as a club bus; the two lengthier variants served as raised-floor touring coaches. The RHD high decker was available in two lengths. And there were editions of the O 303 alternatively with rear or center door for the passengers and different seats.

Up to date 18 long years

The O 303 as a reliable and conservative vehicle was perfectly welcome to coach operators: with lavishly equipped special models with paint jobs somewhere in between elegant and smart, the Mercedes-Benz O 303 was kept alive and fresh over a lifetime that must be some kind of a record. In 1992, after 18 long years, it finally went into well-deserved retirement. Actually, for this derivative of the O 302 this was enough for two bus lives. Even more than a dozen years later one still comes across very well preserved O 303 coaches on roads and in bus parking areas. And while at the end of its long career the signs of ageing definitely were perceptible, as an oldie approaching classic status it now cuts a very sympathetic figure.

The countable result at the end of a long career was even a new world record: 38,018 buses, about two thirds completely built-up buses and one third chassis, came into the bus world in almost two decades.

Versatile concept: the quick-change artist O 405

Page 47

- **Commuter comfort on a new basis**
- **Trailblazer for alternative drive systems**
- **Continuous expansion into an extended family of buses**

In the late 1970s, the standard regular-service urban bus Mercedes-Benz O 305 and its sisters, the O 305 G and O 307, had reached a tremendous level of maturity. On the other hand, the time had come to develop a successor. The premier comfort feature of urban buses, with passengers frequently boarding and alighting after short trips, is a low bus floor and convenient entrance. This not only applies to passengers whose mobility is impeded; for all other passengers too it means rapid and safe entry and exit.

“S 80” was the prototype of a new generation of Mercedes-Benz urban buses which went into trial operation in 1980. Its technology and equipment were defined by a committee of the Association of Public Transport Companies (VÖV, today the Association of German Transport Operators (VDV), in which operators and manufacturers jointly worked out a uniform concept for standardized buses in a specifications book. However, the new buses were ahead of their time: The low-profile tires caused problems because they got too hot. As a result, not only was tire mileage reduced, but brake service life too.

Based on this experience, the demands on the new standard regular-service urban bus were reduced. The tires were made bigger, but two steps instead of the previous three of the first generation made entering the new buses much more comfortable. The look of the new Mercedes-Benz O 405 standard regular-service urban bus of 1983 was close to that of the S 80. Characteristic features: the cubically

designed 11.5 meter long body with generous glazing and the big destination indicator box over the windshield, plus a striking U-shaped bumper which enclosed the rectangular headlamps. Headroom and the lines of sight were considerably enlarged; inside, the O 405 seemed much more spacious than its predecessor. An improved heating and ventilation system gave the interior the right temperature. Initially, engine output started at 150 kW (204 hp) delivered by a horizontally installed in-line six-cylinder at the rear of the bus.

NAW contributes a special midi version

One year later the compact midibus Mercedes-Benz O 402, optically a shortened O 405, rounded off the urban bus range at its lower end with 50 seats for passengers. The chassis came from the Swiss affiliate NAW Nutzfahrzeuggesellschaft Arbon & Wetzikon, successor to the tradition-steeped Swiss commercial vehicle makers Saurer and FBW. Also in 1985, an Italian bodybuilder produced the compact Mercedes-Benz O 301 touring coach for Daimler-Benz on the basis of the NAW chassis. It closed the gap between the O 309 and the O 303. However, neither midibus was destined to have a long life.

1985 was a vintage year for innovations in the regular-service buses with the star. The O 405 got a big brother, the articulated pusher bus O 405 G. As it did with the previous bus series, Daimler-Benz presented a standard rural-service bus, just under 12 meters in length, designating it the O 407. Visually and technically a derivative of the urban bus O 405, it differed from the O 405 among others things in having a one-piece windshield and a higher floor with a luggage compartment underneath as well as a single-wing door at the front. One hundred years after the invention of the automobile by Gottlieb Daimler and Carl Benz, the company's buses, with the O 303 and O 405 as mainstay, presented themselves in the very best shape.

Further variants of the Mercedes-Benz O 405 debuted just a year later. They included the O 405 T trolleybus and, as test object, the O 405 GTD dual-powered bus, an articulated bus with a diesel-electric drive. Innovative power was demonstrated again in 1989. At the Frankfurt International Motor Show two new buses simultaneously celebrated premieres. The low-floor urban bus O 405 N featuring front and central entrances with no stairs and a low floor all the way to the rear axle rang in a new era of comfort in public transit. Between regular-service bus and touring coach, Daimler-Benz positioned the O 408. This combination service bus was suitable for regular service and excursion use and consequently was a bus for daily operation around the clock. It was based on the O 407 and had that bus's angular face and massive U-shaped bumper, but also had a large, curved, undivided windshield with the destination indicator box inside. Also, the side windows extended up to the roof. There was a fully glazed single-wing door at the front and a double door in the middle. Excursion seats with high backrests, on raised platforms, and luggage racks identified the O 408 as suitable for excursions. A powertrain with up to 220 kW (299 hp) and a six-speed transmission also showed this to be an excursion bus. For regular service use, 184 kW (250 hp) and five speeds would make do if necessary.

Daimler-Benz completed the range of regular-service buses in 1992 with the low-floor articulated bus O 405 GN and two years later with another low-floor bus, the O 405 NÜ for rural service.

In the 1990s the topic of alternative drive systems again gained importance. At the beginning of the decade tests were conducted with hydrogen drive. In 1994 Daimler-Benz presented Europe's first natural gas-powered low-floor urban bus, the O 405 GNG articulated. Parallel

to this there was the O 405 NG solo urban bus and the rural-service bus O 405 ÜNG. A total of 15 gas-fired buses were tested in practical operation nationwide at transit companies.

Typical for the gas-powered buses was a box-like hump on the roof. It contained the gas cylinders, whose contents were compressed to a pressure of 200 bar. The specially designed steel cylinders wrapped in aramid fiber can even withstand 500 bar. The engine was based on the horizontal in-line six-cylinder OM 447 hA, a conventional turbocharged diesel engine that was converted to a spark-ignition engine. The power was regulated by means of a throttle valve. The big advantage of the natural gas-powered vehicles: they did more than twice as well as required by the future Euro 2 emission standard, two years before this standard went into effect. The range of the new natural gas-fired buses was about 300 kilometers.

That same year the prototype of the O 405 GNTD dual-powered articulated bus premiered: this low-floor articulated bus had a diesel engine and an electric wheel hub drive. It could also be designed as a trolleybus. The diesel engine was fitted in an unusual position in this dual-powered bus: transversely, at the rear. This way it made room for a door with a low-floor entrance behind the rear axle. The unaccustomed position was possible because the GNTD made do without a transmission and differential: The energy produced by the diesel engine via a generator (or, alternatively, fed in from the electricity grid) was transmitted to two each air-cooled wheel hub motors on the center and rear axles. Together these motors developed 300 kW and simultaneously serve as generator brake and thus as a service brake.

Numerous new developments shared the limelight at the 1996 International Commercial Vehicle Show in Hanover. At a mature age,

the O 405 the gradually was developing into a large family. There was the O 405 NÜL, a long, two-axle version of the low-floor rural-service bus, with two axles and a length of 13.4 meters. It showed what was possible, anticipating future permissible dimensions. A step in the opposite direction was the short urban bus O 405 NK: at 10.4 meters overall length it could be classed as a midi. And it already could be had with a natural gas-fired engine. For buses which operate on biodiesel, Mercedes-Benz made 500 oxidation catalysts available as part of a large-scale test. A combination bus for rural service and excursion work supplemented the O 405/407 family and took the place of the rather stern looking O 408: The O 550 Integro was the first new bus from the still young EvoBus combine. And it was the first bus from Mercedes-Benz that bore a name.

The fuel cell premieres in the regular-service bus

In 1997 the new developments continued to appear in quick succession. NEBUS was the name of a Mercedes-Benz O 405 with a novel type of drive system: it was the world's first fuel cell-powered bus suited for regular service. It pointed new ways to an environmentally friendly future. The NEBUS emitted no exhaust gases; only water issued from the exhaust pipe. NEBUS stands for "New Electric Bus," but could also mean "No Emission Bus." The fuel of the revolutionary vehicle was hydrogen which was stored in cylinders on the roof, the same as in the gas buses. The rear end of the bus accommodated ten fuel cell stacks, each with a power output of 25 kW. In an electrochemical reaction they converted hydrogen into electricity, which in turn drove the wheel hub motors. The new bus was extremely quiet in operation; acceleration was very dynamic. The local exhaust emissions consisted exclusively of harmless water vapor.

NEBUS was both climax and end of the development of the O 405, whose exceedingly successful career gradually was coming to a close after more than a dozen years. Born as a second-generation standard bus, the O 405 had gone through an almost incredible evolution: it embarked upon a second career as a low-floor bus, and in the process even surpassed the initially planned S 80 for passenger friendliness. Numerous variants grew out of its original specifications book; with different drive systems, including even the fuel cell, it pointed a way far into the future.

The great success of the O 405 can best be measured in figures: around 12,000 solo buses, more than 3700 articulated buses, about 5000 rural-service units including the O 407 and O 408 add up to the impressive figure of 20,488 regular-service buses from a single family. With that the O 405 set a tremendously high standard by which its successor would be measured. But the successor stands a chance of outdoing even the O 405, for in the Citaro, in 1997 Mercedes-Benz presented a revolutionary concept for regular-service buses.

A hard act to follow for the O 404

Page 53

- **New face and luxury concept**
- **Draft-free heating concept for optimum comfort**
- **Very close to a passenger car**

In early autumn 1991 the bus world suddenly seemed to spin faster. After 17 years the long career of the internationally best-selling Mercedes-Benz O 303 was approaching its end. A touring coach after the O 303? Hard to imagine. But in the new O 404 Mercedes-Benz unveiled a touring coach the like of which the world had never seen.

Technically and visually the new O 404 was a clean break with its predecessor, which in many respects still went back to the O 302. The O 404 boasted an all-new face, with tapered headlamps merging into the side turn signal repeaters. A radiator emblem linked up the two headlamps and spilled over slightly into the bumper, loosening the rigid forms of its predecessor. The large, steeply-raked windscreen blended harmoniously into the roof since the fresh air intake for the roof ventilation was moved further towards the rear. Borrowing a stylistic feature from its predecessor, the roof dipped down slightly to the front – although without the visible step of old.

The sides of the touring coach also had a totally new look to them. The first side window was drawn further downwards; the window guides were now virtually invisible. As on the outgoing model, the top of the side windows once again curved slightly into the roof. One of the special features of the new touring coach was its body paneling with deep-drawn parts, made necessary by the visual trick of the “facette.” This paneling lent structure to the side walls and took away their two-dimensionality. On the higher-specification variants, the large luggage compartment doors opened upwards in a parallelogram form. The

entire body was designed for long-term durability: cathodic primer coating provided a reliable layer of anti-corrosion protection for the frame and paneling.

Streamlined range, concentration on touring use

The new model family was a lot more focused than its predecessor, with the emphasis limited to a much greater extent on use as a touring coach. The O 404 range consisted of three lengths – 9.2, 10.7 and 12.0 meters – and three height options: 3.3 meters (RH), 3.5 (RHD) and 3.75 meters (SHD). This allowed the O 404 to cover all the major areas of use for coaches, from short excursions to long-distance touring, including combination services, although it generally enjoyed a loftier positioning than the outgoing O 303. Further evidence of this arrived in the shape of an additional model which Mercedes-Benz unveiled to explore the potential for the brand in another dimension of travel. A double-decker variant of the O 404 was presented at the International Commercial Vehicle Show in 1992. Mercedes-Benz commissioned Heilbronn-based body manufacturing specialist Drögmöller to build the body for the coach, as the production lines at the Mannheim plant in the early 1990s were not equipped to handle vehicles of this size. However, public reaction was distinctly underwhelming and the double-decker remained a prototype.

It was all change as well underneath the impressively sculptured skin of the Mercedes-Benz O 404. The three equipment classes – Comfort, Luxury and Super-luxury – were designed with different uses in mind. The heating concept was certainly luxurious, not to mention unique. The engineers focused their efforts on the heat emitted by the floor and sidewalls of the coach and even introduced heated window sills to help create a constant and draft-free interior climate and a welcoming

sense of warmth and comfort. The days of fan-blown heating in touring coaches were over. Page 55

Cockpit entirely redesigned

Drivers had a completely newly designed cockpit at their disposal. Gone was the familiar instrument cluster from the O 303 and its predecessor, now the instruments and auxiliary displays fanned out under individual glass covers. Numerous stowage compartments accommodated all sorts of odds and ends and the refrigerator was positioned at the bottom of the center console. A driver's door was fitted as standard alongside other items offering extra refinement, such as an electrically adjustable rear-view mirror.

The chassis also bore some extravagance hallmarks. It had taken a long time for independent wheel suspension to make its debut in a Mercedes-Benz coach, but it was worth the wait. The construction was largely identical in principle to the multi-link independent suspension used in the brand's passenger cars. And that meant a combination of unbeatable active safety and outstanding comfort.

The new model also had an incredibly large wheel angle of a maximum 56 degrees with a correspondingly small turning circle – the O 404 was astonishingly maneuverable. The anti-lock braking system and acceleration skid control were both fitted as standard, as was an engine brake with constantly open throttle valve and a retarder. With the exception of the Comfort trim variant, all the O 404 models came with disk brakes all round.

Mounted in the rear of the Mercedes-Benz O 404 was a new generation of powerplants. V6 and V8 engines covered an extremely broad output range from 151 kW (205 hp) to 370 kW (503 hp). The most powerful unit of the lot was reserved for the double-decker model, which was still at the prototype stage. All the engines originated from the company's LEV (Low Emission Vehicle) family and already met the exhaust emissions stipulations due to come into force in 1993. The V6 power units represented the focal point of the engine range and delivered up to 250 kW (340 hp) – respectable engine power for a long-distance high decker in the early years of the O 404. Power transfer was the job of the brand's own newly developed six-speed manual transmission.

The sophisticated technology at work in the Mercedes-Benz O 404 elevated it above the ranks of mere coaches into something more akin to a passenger car, a kind of super-sized MPV. This would actually turn out to be a handicap to the O 404 through its life, with series production struggling to get off the ground on account of the coach's complex design (the O 303 continued to roll off the assembly lines until the middle of 1992). Added to which, the extraordinarily sophisticated and advanced engineering of the O 404 propelled it into different market segments from its predecessor – whose popularity it could consequently never match, even though Mercedes-Benz had used various measures to adapt the high-end touring coach to what the public wanted.

Drum brakes had been banished even before the O 404 went into series production, as they had been replaced by high-safety disk brakes on all models. Similarly, the seriously extensive engine range was also slimmed down, with 290-hp and 340-hp variants, and a V8

developing 382 horsepower, considered ample choice. The LEV engines designed to meet the Euro 1 exhaust emission standard may not have been particularly economical, but that all changed a few years later with the arrival of the Euro 2 power units. To the delight of coach specialists, large-capacity rear-mounted V8 engines with 14.6-liter displacement were back on the menu – the compact 12.8-liter V8 favored in the early days of the O 404 had fallen short of the mark.

And that wasn't the end of the changes for the O 404 – far from it, in fact. A new addition to the range of variants – the Advantage – came with reduced trim levels and took the coach down a notch in the price stakes. With new and larger exterior mirrors, a ribbed front molding in place of the original stainless steel plate, and turn signal repeaters in white instead of orange, the O 404 hit its best form – both technically and stylistically – as it entered the mid-1990s. It remained in production until 1999, before being succeeded by a totally new breed of touring coach: the Mercedes-Benz Travego. Before it was pulled from the range, however, Mercedes-Benz had cleverly added a couple of siblings to the O 404. Built in Turkey, the reasonably-priced O 340 and O 350 high deckers – which later morphed into the Turismo – turned out to be an almost accidental runaway success and heralded the dawn of a new era.

A first bus from the Bosphorus: the O 340 or the Turismo-to-be

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- **Reasonably price alternative to the O 404**
- **Successor O 350 with classy chassis**
- **Turismo best-selling touring coach in Europe**

It almost went incognito at its premiere at the 1992 Hanover International Motor Show: among the many buses with the three-pointed star, spearheaded by the still new top-of-the-line touring coach O 404, two high deckers demonstrated the international presence of the buses from Mercedes-Benz. One was the O 371, of Brazilian origin; the other was the O 340 from Turkey. While the Brazilian with its width of 2.6 meters (and for many other reasons) could not be transplanted to Europe, it was an entirely different story with the O 340: with this vehicle Mercedes-Benz prepared the public for a reasonably priced touring coach which was to be a companion to the elegant O 404, which played in a different league with its super technology, not least of all financially. In Europe, buses from Turkey were something new at that time. But Turkey had amassed considerable experience in bus manufacture: the history of the factory there dates back to 1967 when it began producing the O 302 that had been launched a few years earlier.

The O 340 was very different from its cultivated colleague, the O 404. The plain and unpretentious body concealed very familiar technology: the chassis of the O 303 with rigid axles and drum brakes, well-trying, robust and indestructible. Mercedes-Benz dispensed with ornaments like facets, pressed sheet metal parts, an integral air conditioning system, anti-corrosion protection by cathodic dip priming, and an expensively designed driver's position – all constituent parts of the O 404. The body was smooth-surfaced, the face a little on the

nondescript side. Only the big star attested to the brand. On the other hand, the bus had indisputable merits. In the rear of the bus, the 280 kW (381 hp) V8 engine from the current range did its work, the interior was warmed by a hot water heater with convectors – and the price was extremely reasonable. Page 59

Low-cost production in Turkey

The idea behind the concept: dispense with the top-notch technology and top-notch appointments of the O 404, produce at low cost in Turkey. It was planned that the bus not only would ply the major Turkish long-distance bus routes, but also open up new markets which Mercedes-Benz no longer could reach with its expensive production in Germany. A broad range wasn't necessary for that purpose: a standard high decker, twelve meters long, 3.5 meters high, two axles, was entirely satisfactory.

The planning game quickly became reality: forthwith the O 340 supplemented the sophisticated O 404. But just two years after the first show appearance it became clear that the O 340 was merely a herald of things to come. At the 1994 Hanover show its successor, the O 350, already took the stage. This was a very different bus: out went the engineering of the O 303, in came the foundation of the classy O 404, including disk brakes on all wheels, the splendid independent wheel suspension of the front axle, and the instrument panel.

Tapered C-pillar and striking design

However, the bus made an almost exalted impression. The design was very emotional, much different from that of the plain predecessor or the elegant O 404. Particularly the tapered C-pillar made it unmistakable. A wide lateral swage line running the length of the sides

structured the side walls; expensive pressed sheet metal parts were nowhere to be found; the air conditioning unit crowned the rear end. The interior appeared plain and functional, with no frills at all. But the bus was comprehensively equipped. The usual long lists of extras were not the thing of the O 350. And it was only available in one twelve meter long variant with a V8 engine developing 280 kW (381 hp).

Four years after its premiere the O 350, up to then only available as an RHD high decker, got a sister: the O 350 SHD augmented the offer. This super high decker had grown in height by just under 30 centimeters; this meant eleven square meters of luggage space instead of 9.5 as in the RHD. And it was nicknamed Tourismo. Otherwise it, too, featured a gratifyingly complete range of equipment.

To the new name a thoroughly revised coach was added one year later. The Tourismo began the second half of its life. The letter and number designation O 350 disappeared. The distinctive arrow was now optically extended with a molding into the front door. The new face with the striking panel in its center and round headlamps shone more powerfully; the driver now looked into larger exterior mirrors. The interior was completely redesigned: Almond-shaped, dimmable multifunction lights in the ceiling, instead of the previous light strips, gave the Tourismo a look all its own. New service sets and seats of the most recent generation graced the bus. As before, the Tourismo was only available from Turkish production, as completely equipped RHD and SSHD models.

Five years down the road, the Tourismo celebrated its tenth anniversary – and a very rare jubilee for a touring coach: 10,000 units now rolled on the highways; it had long since become Europe's best-selling touring coach. Mercedes-Benz commemorated the success of

the Tourismo with a special “Edition 10,000” series – 70 Tourismo RHD coaches with very lavish appointments.

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Engineering optimized, weight reduced

Parallel to this the Tourismo was technically enhanced. A new manual six-speed transmission made its arrival, plus a rear axle from the Travego, the successor to the O 404 (still providing the platform for the Tourismo). In the passenger compartment the carry-on luggage racks were freed of the components of the air conditioning system. Anti-corrosion treatment in a newly installed cathaphoretic dip bath promised a long service life.

Equally important, at least, was weight reduction. Though the Tourismo never had been a heavyweight, the engineers cut its weight for the 2005 model year by fully half a ton. Aluminum found use as material for the air vessel and tank, and also for the floor of the luggage compartment, in the form of a sandwich construction in place of plywood. Glazing and wheels were made lighter; the bunk for the driver was prepared for installation, but not already fully installed.

The outside armrests and the litter bin per seat row were dropped; even the folding tables were made lighter. The result is that coach operators can order three-star seats for 49 passengers with a clear conscience – many owners of other twelve meter long high decker touring coaches on two axles must fear having their buses weighed. With these assets, the Tourismo qualifies itself as a genuine long-running success and a practical touring coach. Although it does not have the inexhaustible variety of the O 303 range, it does remind one a great deal of that classic.

Buses under a new umbrella: the EvoBus era begins

Page 62

- **Forward-pointing technology for the Citaro urban bus**
- **Made-to-measure Cito midibus**
- **The Travego follows the O 404**

The 1990s brought a great many changes in the brand landscape among Europe's bus and coach manufacturers. As the year 1994 progressed, the signs of what would come to pass in early 1995, 100 years since Carl Benz invented the bus, became increasingly clearer: the then Daimler-Benz AG would take over the Setra brand, spin off the Mercedes-Benz Bus and Coach unit and join the two brands to create the subsidiary EvoBus GmbH.

Behind this move was the search for a new approach to the business. In the existing constellation, for years the buses and coaches with the star had been unable to put themselves on an economically sound basis. And since the first-rate brand Setra of Karl Kässbohrer Fahrzeugwerke was not doing too well either, the probably once-in-a-lifetime opportunity resulted to bring the two tradition-steeped companies together under one roof: contribute the different strengths of each brand, attack the weaknesses of each brand – that could lead to success.

And so it was. After a relatively short time EvoBus moved into the black and was doing certain things differently than both the group in Stuttgart and the former family-owned company in Ulm. Part of what was different were the synergies which began with a well-thought-out production system: manufacture of the bodyshell for all buses of both brands, including cataphoretic dip priming, at the Mannheim factory; transfer by rail directly from Mannheim to Neu-Ulm, to the plant which was newly built at the start of the 90s. Final assembly and painting

there – and there’s your bus. Ten years after the establishment of EvoBus, only the Citaro was being manufactured entirely in Mannheim; only the variants for France were produced at the French plant in Ligny.

The bus plants in Turkey played a role of their own. They were a part of the group, and buses and coaches were built there both for the home market and for the surrounding countries, including the Turismo for Western Europe. Another factory in the Czech Republic supplied bodyshell parts. Mercedes-Benz chassis for touring coaches meanwhile are produced in Spain and shipped out to the entire world from there.

Synergies also related to the products. The promise stood to preserve the brand identity of Mercedes-Benz and Setra. For this reason the buses each have their own distinctive appearance, and technically and in the area of appointments and product lineup they have their own distinctive profile. But where the design of major components, electronics or safety components is concerned: these are areas in which quality, function and therefore development and testing effort and expense play a big role. Things like this can be produced for both brands together. Safety, for example, is indivisible.

The first new bus created under the EvoBus umbrella was the O 550/Integro rural-service bus in 1996, the first bus with the star that bore a name in addition to the bare design designation. It had a high percentage of Setra in it and was based on the S 315 UL from the current MultiClass. With the Integro, Mercedes-Benz quickly filled a gap in its range: in the mid-1990s a rural-service and excursion bus with fresh looks which presented a contrast to the stern and square-faced standard buses was lacking. Like many a compromise, the Integro turned out to be a long-running success.

With time it matured into an entire family, with a long variant exceeding twelve meters in length, and a raised-floor bus which could better address the requirements on a bus used to a large extent for excursion or even touring service.

In 2006 Mercedes-Benz finally completely redesigned the Integro. With three different lengths on two axles (Integro and Integro M) the two-door specialist now covers the entire spectrum from short regular-service routes in suburbia to long-distance interurban use.

The customer can choose from a large number of special equipment items and spec out the vehicle precisely for his purposes. The facelift also brought a 140 millimeter extension to the front end, which is to the advantage of the driver's area and the entrance as well as the optionally available tour guide's seat. Altogether, the new exterior width of 2.55 meters makes for even greater spaciousness.

As to the engines, SCR units complying with Euro 4 and Euro 5 made their arrival. As standard, Mercedes delivers the Integro with the horizontally installed in-line six-cylinder OM 457 hLA developing 299 hp. On request, a variant with 354 hp also is available; it is standard equipment for the three-axle Integro L (15 meters long).

The name Integro was agenda in two respects: the new bus integrated rural-service bus and excursion bus in one model. And it was a symbol of the integration of the Mercedes-Benz Bus and Coach unit and Setra. Endowed with many Setra genes, the Mercedes-Benz Integro did not stand for an entirely new bus from the new company, EvoBus. Mercedes-Benz would present that a year later.

The Citaro arrives with forward-pointing technology

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Its very first appearance in 1997 at the UITP Congress in Stuttgart caused quite a stir: seldom was a new urban regular-service bus the subject of so much interest and attention as the prototype of the Mercedes-Benz Citaro at the world congress of public transport operators. The Citaro as a completely new design with forward-pointing technology, and looks which were no less extraordinary, and as a complete in-house development, rang in the end of the conventional standard urban regular-service bus as built successfully by Mercedes-Benz in the form of the O 305 and O 405 for more than 30 years.

The courage to make a fresh start with the Mercedes-Benz Citaro and many ideas of one's own went down outstandingly well with transport operators and passengers. So well that the Citaro celebrated a rare jubilee in autumn 2004: at the FIAA bus and coach show in Madrid in October 2004 the 10,000th bus of the model series was handed over to a customer. The Citaro was thus sticking hard on the heels of its square-jawed predecessor, the O 405.

Indisputably, the Mercedes-Benz Citaro is a milestone in bus development. In 1997 it surprised people with a unique concept for passengers and operators. Since the premiere of the Citaro, passengers can take pleasure in the thorough implementation of a passenger-friendly low-floor technology, in a bright and friendly interior with much headroom, best visibility, effective climate control, side impact protection, optionally available electrically powered pivot-and-slide doors, and an equally sensitive and effective Electronic Braking System (EBS) with disk brakes all around.

The operators, on the other hand, profited from the start from engines which were as economical as they were powerful; from the flexibly programmable control system (FPS), an electronic system based on a CAN databus; which substitutes for kilometers of cable and thousands of trouble-prone electronic parts; from a design which lends itself to easy maintenance and cleaning; from the cantilever-type wall-side seat supports without inconvenient legs; from the full utilization for interior space of the length limit of twelve meters for solo buses which existed then and the maximum permissible width of 2.55 meters; as well as from the modular element design as prerequisite for numerous variants.

The developers and designers packaged this and much more in a beautifully shaped and practically designed body, carefully and consistently styled, from the shape of the headlamps, characteristic of the brand, with white turn signal glass, to the curved, color-contrasted A-pillar with the harmonious transition to the roof and the large windshield with integral destination indicator, through to the rear window, which incorporates the bus number indicator and raised tail lights and turn signal lamps. In short: an urban bus all of a piece, a trailblazer, technically and visually.

After the market launch in 1998 the new Mercedes-Benz Citaro quickly gained acceptance in Germany and throughout Europe. In the startup year it already reached a production figure of 341 units for ten European countries from Norway to Spain. At the beginning of the year 2000 Mercedes-Benz delivered the 1000th Citaro. The rapidly rising output figures were attributable among other things to the effective modular system: The twelve meter long solo bus soon was joined by the articulated bus, the rural-service variant Citaro Ü and a first chassis. Additional variants joined the fold in rapid succession. By

then well over 2000 Citaro were leaving production in Mannheim each year, with prospects for more. Page 67

The technical evolution of the Citaro progressed no less quickly. In the spirit of continuous product improvement, during the past years numerous improvements have entered into the series. The first were details that further enhanced the ease of servicing and repair. Examples of this are the separate maintenance flap, which permits convenient daily visual checking of the fluid levels, and the radiator flap with enlarged air intake surface, redesigned for easier maintenance. Further new features included improved access to the engine compartment through a fold-open rear panel, the intercooler that could be swung out for easy cleaning, and much more.

Numerous improvements in the interior

Numerous improvements also were made to the interior, ranging from a new cover for the radiators in the side walls to further seating variants. A more variable design of the bus was also possible. For instance, an engine mounted longitudinally on the left side of the bus, as an optional extra, permitted creating both solo and articulated buses with a low floor extending all the way to the rear.

In the same way, over the years the economy of the Citaro also could be further improved. The shift strategy of the ZF automatic transmission meanwhile had been refined; five shift programs were available. Compressed air tanks made of aluminum instead of steel cut weight. A new brake management system permitted even more sensitive deceleration. The destination display is extremely flat, very readable, easy to operate and service. It is no secret that the entirely new Citaro with its comprehensive equipment initially posed problems to production. But these difficulties were overcome many years ago.

The Mercedes-Benz Citaro long since had grown into an extensive family of models which served the entire public transit spectrum with buses of twelve meters length and more. It now comprised not only the Citaro low-floor urban bus and the rural-service variant Citaro Ü, each twelve meters in length, but the 13 meter long rural-service bus Citaro MÜ as well, the 15 meter long three-axle Citaro L and Citaro LÜ plus the low-floor articulated buses Citaro G and Citaro GÜ, each measuring 18 meters in length. The letter “Ü” always indicates the rural-service variant.

The OC 500 LE urban bus chassis from the Sámano plant in Spain supplements this range. Characteristic of this chassis is the low floor, and a front entrance with no steps which the low floor makes possible. The two-axle, air-sprung chassis takes bodies up to 13.5 meters in length.

In the meantime the Citaro even got a little brother, the Cito. Introduced at the International Commercial Vehicle Show in Hanover in 1998, it surprised the public with a tailor-made midibus concept: alternatively eight, nine or ten meters length and 45 to 65 seats were the key specifications. The Cito had unusual design features: One was a self-supporting aluminum frame with a roof and floor made of aluminum and walls made of plastic. Another was a diesel-electric drive, combined into a compact power pack extending to the roof at the rear of the bus. The Cito impressed people with new solutions and, technically, was far ahead of its time. Perhaps even too far ahead. At any rate, the market responded coolly to the innovative bus. Five years after launching the Cito Mercedes-Benz withdrew it again.

The conventional drive system of the Citaro was more successful. The diesel engines of the Citaro comprised two different series, all six-cylinder in-line engines. The displacement was 6.4 and twelve liters.

Outputs ranged from 185 kW (252 hp) and 1100 Nm torque to 260 kW (354 hp) and 1600 Nm. Both engine series are identical in design except for a few adapters. Fuel was injected by the pump-line-nozzle system, which permits high injection pressures and is economical in operation as a result. A fully electronic engine management system further cut consumption. With this technology, the Citaro profited from the development of the Mercedes-Benz Actros heavy-duty truck presented one year earlier, the first vehicle to show such technology.

The diesel engines of the Mercedes-Benz Citaro optionally could be combined with a CRT system (combination of oxidation catalyst and particulate filter). Automatic transmissions from ZF and Voith were available.

Today, diesel engines whose exhaust gases are treated by the SCR (Selective Catalytic Reduction) system are used to comply with the Euro 4 und Euro 5 emission standards. This technology further cuts pollutant emissions substantially, while on the other hand creating prerequisites for possibly reducing fuel consumption still more.

Natural gas engine on request

Optionally, the Citaro also can be had with a natural gas-fired engine which meets the Euro 4 standard. The OM 447 hLAG is available with outputs of 185 kW (252 hp) and 240 kW (326 hp) and with optional EEV certification. This variant even does distinctly better than required by the Euro 5 standard that takes effect in 2008/2009. Together with low noise emissions and the eco-friendly manufacturing methods of the Mannheim factory, this created the prerequisites for awarding the “Blue Angel” symbol for environmentally friendly products to the

natural gas-powered buses of Regionalbus GmbH in Mühlhausen, Thuringia.

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The Citaro even operates entirely emission-free with the fuel cell drive, in which fuel cells convert the energy contained in hydrogen into electrical energy which in turn drives an electric traction motor. A large-scale test lasting two years was undertaken in ten major European cities with 30 fuel-cell-powered Citaro; another test began in Australia; in China a further practical test followed with three buses. Development of the new drive system, which already was initiated in 1997 with the NEBUS on the basis of the O 405, thus smoothly continued with the Citaro.

As well as making it possible to install a range of drive systems, the modular design of the Citaro and the tremendous flexibility within the manufacturing process that results from this also provide the ideal basis for producing all manner of special versions. Articulated Citaro GÜ buses are being operated by Regiobus GmbH in Mittweida, Saxony as “road trains”. The buses were brought in to replace a discontinued rail link and boast a somewhat unusual specification. Passengers sit on coach-style seats which are arranged face-to-face, and on-board facilities include a bistro area, a toilet and space for carrying bicycles. At night, an ingenious illumination system transforms the ceiling into a canopy of stars. In Poland, a Citaro is traveling around from town to town as a mobile energy advice center, while both Hamburg and Munich have Citaro vehicles on standby as large-capacity rescue vehicles for treating the injured following a major incident. Meanwhile, the 101 Citaro models which were given an unmistakable interior and exterior makeover by design specialist James Irvine and then put into service for the World Expo in Hanover in 2000 still turn heads in the city with their special Üstra styling.

The Mercedes-Benz Bus and Coach unit even will customize the Citaro Page 71 for any customer. It doesn't have to be an independent body with completely individualized interior appointments. In addition to special technical equipment, customization services include individual advice on interior and exterior design issues from the experts of the design studio in Mannheim. At the studio, the customer and the design consultant jointly plan the paintwork on powerful computers with large 130 x 100 cm monitors.

The interior of the Citaro is even designed step by step on a virtual round through the bus in a realistic 3-D animation. The viewers go through all conceivable seating variants and assess them from all angles. Afterwards the fabrics are selected. Seat layout, seatbacks, side wall paneling, grab rails, the rails of the roof edges, stop request buttons and floor coverings can be combined again and again and optimally color-matched.

Just as up-to-date as the process for choosing colors and fabrics is the production of the Citaro. The bodies-in-white are manufactured in the Bodyshell Center of the Mannheim bus factory and cataphoretically dip-primed there for complete anti-corrosion protection. Group work and a synthesis between technology and manual labor characterize the production process. The entire structure of the bus body-in-white is computer-calculated. The modular design of the Citaro simplifies bodyshell making: A factory in Holysov, Czech Republic, supplies complete floor assembly segments. The bodies-in-white are completed in the assembly bays of Mannheim and the French assembly plant Ligny-en-Barois.

The Citaro entered model year 2005 with a large number of modifications due to the entry into force of the EU directive 2001/85/EC. This directive takes the interests mainly of passengers

with restricted mobility into account. The Mercedes-Benz Citaro comes under Class I (urban bus use) and Class II (rural-service use) of the directive. Owing to these regulations, in future the Citaro would have a kneeling function, a revised wheelchair area across from the center door, and a newly designed ramp as standard. Other changes concern external emergency valves and pushbutton switches with a door opening function inside and outside for the double-width center door as well as the number and design of the accommodations for disabled persons and the access to them.

In Germany the Citaro has acquired a clear position of market leadership. At the same it has posted international successes: Of the now more than 17,000 Citaro buses manufactured, around half were exported – a remarkable figure for a market which up until then was nationally dominated in many cases. Among the countries receiving delivery, France ranks ahead of Spain, Italy, Switzerland and the United Kingdom. Major orders included 450 solo and articulated buses for Istanbul, 300 solo buses for Rom and 167 solo and articulated buses for Berlin. The Citaro travels the streets of many great cities of Europe, but not only there: eight units even operate on the French island of La Reunion in the Indian Ocean.

2006 was a year of renewal also for the Citaro. The Citaro K as a compact and especially maneuverable variant with a length of 10.5 meters complemented the range. The Citaro also got a new face. The features included an arched insert suggesting a radiator grille between the headlamps as well as turned turn signal housings with clear glass covers. And the three-dimensionality of the rear end of the Citaro was given stronger emphasis. The V-shaped rear window extends up into the roof. The engine compartment flap ends in a vent at the top. Including the new tail lights, the design idiom is a superb match for the design of the group's new touring coaches and rural-service buses.

The important technical modifications to the Citaro in 2006 – it also operates as a hybrid bus (Citaro G BlueTec Hybrid) since 2007 – were: independent front wheel suspension and an improved air suspension system. Additionally, an optional electronic roll and pitch control is available for the articulated variants.

New start for the touring coach: the Travego

But now back to the 1990s, when the stage was being set for a new touring coach too. Some important decisions were decided by external factors. The new emission standard Euro 3, new linear measures appreciably beyond the classic twelve meters, 2.55 meters width instead of 2.50 – in the late 1990s there was a flurry of amendments to laws which forced the bus manufacturers to take action. Wolfgang Presinger, just appointed brand spokesman for the Mercedes-Benz Bus and Coach unit then: “We then finally made up our minds to go for broke, telling ourselves: Euro 3, the new overall lengths and the greater width have given rise to a trend which we want to actively shape. That’s why we’re going for a new vehicle.”

This vehicle was called the Mercedes-Benz Travego and superseded the O 404, which could have been adapted to the aforementioned requirements only at great effort and cost. And that is why, after only eight years and around 4500 units, the O 404 faced its end.

The successor was internally coded the O 580 for development purposes, but in the meantime buses with the star were carrying names: Travego, that contains the idea of travel; the word go stands for dynamism; the letter o at the end of this made-up word fit the model families Integro and Citaro.

On the surface, visual reminders of the predecessor were desirable: The driver's window on the left and the passenger door on the right lead into a functional strip extending on to the rear along the bottom of the bus, much as in the O 404. But in the Travego the strip incorporated the handles of the luggage compartment doors and the side marker lamps. The friendly looking face with the ribbed radiator grille in the middle also recalled the predecessor, producing intentional identification effects. Chief designer Wolfgang Papke: "The Travego embodies innovation and tradition. And the Mercedes-Benz brand stands for these attributes." Curved headlamps, the three-dimensionally arched windshield extending well into the roof area, plus the steeply sloped wheel arch over the rear axle: the Mercedes-Benz Travego exuded dynamism.

The lines of the Travego are worth a closer look: The exterior mirrors grow organically out of the tops of the front side windows instead of being attached to the A-pillar at the front. The B-pillar, also referred to as "character line," sweeps upward to the roof and breaks up the large surfaces. At the same time, the line of the pillar takes up the contour of the air conditioner, which because of this does not seem out of place even though it is mounted in the middle of the roof of the Travego. The edge of the roof is designed as a weather strip; the side windows are flush bonded and fitted so that together with the smooth side wall they conduce to easy cleaning and easy covering with decorative designs. The rear window and engine compartment flap are trapezoidal in shape, like a muscular back.

Initially the Travego lineup consisted of three models: The Travego 15 RH raised-floor bus was twelve meters long, rolled on two axles and was 3.44 meters tall. The Travego 15 RHD high-decker towered to 3.71 meters and also had two axles. The flagship was the three-axle Travego 17 RHD high-decker. It attained a length of 13.85

meters. The flexibility of the concept proved itself in 2003 when another high-decker, the 12.8 meter long Travego 16 RHD, was added to the range.

No matter which Travego the driver steers, the cockpit of the new touring coach is perfectly tailored to him. Ergonomically ideal, the entirely new workplace for the driver has been made semicircular; all controls are within easy reach; the steering wheel is unusually compact in diameter. In the middle of his instrument panel the driver no longer looks at a collection of dials, but at an oval display with a large rev counter and speedometer; in between them is a display on which further indicators can be freely programmed and where warning indicators are shown if required.

Shifting by joystick

Instead of the endlessly long shift lever next to the driver's seat, which drivers had been used to for decades, a short joystick as shift lever knob now grew out of the right side of the semicircular instrument panel. There'd never been one in a bus before. With the joystick the transmission could be operated by a tap of the hand. Richard Averbeck, Travego project manager and future General Manager Engineering at EvoBus: "We wanted to get away from the big sticks with their long shift travel and high shift forces. Changing gears like in a car was our objective." And it was achieved. To top it all off, the driver's area was pleasantly spacious and had many places to put things. The tour guide's seat was even electrically adjustable.

"The coach must look attractive from the outside. Inside it must exude coziness," said Travego designer Wolfgang Papke. And so the passenger compartment of the Travego also shone in new splendor. Compared with the predecessor: lower window sills, 2.10 meters

headroom, full utilization of the width of 2.55 meters and thus 75 millimeters more interior width than in the O 404 – the Travego made a tremendously airy and spacious impression, unmatched by any other touring coach. Newly designed seats featuring one-button operation, folding tables with integral fold-out cup holder, larger luggage racks, almost sculpted service units over each double seat – the passengers of a Mercedes-Benz Travego noticed from the many details that they were taking a seat in a special touring coach. A part of the story are the three design and equipment lines Function, Fashion and Flair, which can be told apart by different decorative designs, fabrics and details such as inserts in the grab handles of the seats. Though the Travego made do without the extremely complex heating system of its predecessor, passengers still could enjoy cozy warmth, the product of a hot water heater with its convectors, enhanced by so-called axial fans as an optional extra. Given the high standard of the Travego, air conditioning was included anyway.

The control of the complete equipment from drivetrain to air conditioner was handled by FPS, the flexibly programmable control system. Five electronic control circuits took the place of several kilometers of cable and various trouble-prone plug connections. This technology had its premiere in a bus two years earlier in the new Mercedes-Benz Citaro urban regular-service.

The driver felt all warm inside not only because of the separate temperature control for his workplace, but also because of the engines. The days of the V-engines in touring coaches were almost over; the designers now banked again on in-line six cylinders. Depending on the model they are installed either horizontally or vertically. The twelve liter in-line six cylinder engine OM 457 with fully electronic control system, four-valve-per-cylinder technology and pump-line-nozzle injection developed 260 kW (354 hp), 300 kW

(408 hp) or 310 kW (422 hp). If the buyer set store by more power or the special flair of a V8, he could purchase the Travego with the OM 502 LA. This engine was good for 300 kW (408 hp), 320 kW (435 hp) or even 350 kW (476 hp). For transmissions, there was a choice of Mercedes-Benz six-speed manual transmissions with control cables and pneumatic assistance or, coming a little later, the ZF AS-Tronic automated manual transmission.

The running gear reliably transferred the power of the engines to the road. The rear axle was an in-house product, first the cast-iron HO8 axle, later the lighter HO6 formed axle made of sheet steel. Up front, instead of an in-house design a ZF axle with twin control arms was used. Its big advantage: the inner turning angle was 58 degrees, which guaranteed an optimally small turning circle. The three-axle coaches had either a self-steer trailing axle or a third actively steered axle, which ensured extreme maneuverability, for example, for reversing.

Electronically controlled disk brakes on all axles

Disk brakes all around can be found on any new bus from Mercedes-Benz, and now also the Electronic Braking System EBS, seen for the first time on an Actros heavy-duty truck three years prior to the Travego premiere. This brake system stands for rapid response, sensitivity, and even wear patterns on all wheels – high grip can be taken for granted, just as can the sturdy framework with reinforcements stretching across the roof and down the sides, which Mercedes-Benz had introduced two years before the Travego in the then new Citaro. So there's no question whether the Travego passed the ECE R 66 rollover test: this has long been the standard at Mercedes-Benz.

However, safety is a continuous process and never complete, particularly for Mercedes-Benz. For instance, the first bus to be seen with the ESP electronic stability program was a Travego, at the Hanover commercial vehicle show in 2000. Within the bounds of what is physically possible, through selective braking intervention ESP prevents vehicle oversteer or understeer and can thus make good driver error and avert the development of dangerous situations. From 2002 on, ESP was optionally available for the Travego; from autumn 2003 it was part of the standard equipment – a premiere for buses, as was the standard-fit Brake Assist beginning in 2002.

At the 2004 Hanover commercial vehicle show, in a very near-series innovation study of the Travego, Mercedes-Benz demonstrated the current state of the art in safety technology along with three more new safety systems: the autonomous intelligent cruise control (ART), the Lane Assistant system and the continuous braking limiter. All three systems currently are fitted in the Travego, whose second generation was presented by the group in 2006.

Improvements in detail

This new Mercedes-Benz Travego utilizes the unchanged foundations of the first generation, but surpasses them on all major points: in safety and comfort for passengers and driver, in looks and equipment, and in the environmental friendliness and economic efficiency of the new Euro 4 engines, the Travego sets the new standard for high-quality touring coaches.

Three high-deck touring coaches in the lineup for Western Europe

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The new Mercedes-Benz Travego lineup features three high-deck touring coaches: the Travego (max. 15 seat rows, length of 12.14 m, two axles), Travego M (max. 16 seat rows, length of 12.96 m, three axles) and Travego L (max. 17 seat rows, length of 13.99 m, three axles). The overall height of all three variants is 3.71 m.

Sharper profile

While the new Mercedes-Benz Travego has a visual affinity with the preceding model, its lines show a clear evolution and refinement. The new model is elegant and at the same time masculine and progressive in appearance. For example the “face” of the coach below the familiar deep and inviting windscreen is now more sculpted, while the new front panel with air intake presents a three-dimensional appearance, has a curved upper edge and is visually more distinctive. All this, together the Mercedes star proudly displayed on a sculpted plinth, makes the front-end design reminiscent of a Mercedes-Benz passenger car. The new and larger variable-focus reflector headlamps with clear polycarbonate lenses display a prominent kink, while the turn signals are now integrated in the all-glass housing. The new-look bumper and the stylistic integration of the fog lamps emphasize the dynamism at the heart of the new touring coach.

The side view of the new Travego has also been given new emphasis. Now even more prominent than before, the three-dimensional character line created by the B-pillar grows powerfully out of the vehicle body. At its lower end, it sweeps dynamically around into the front entrance door, where a wedge-shaped element forms a visual link between the front and side of the vehicle. At its upper end, the

B-pillar sweeps back elegantly above the first two side windows without impairing the passengers' view in the slightest, before seamlessly merging into the trim panel of the fluently integrated roof-mounted air conditioning system. Its paneling wraps round the roof edge and blends smoothly into the side wall.

To give passengers in the new Travego's rearmost row of seats a better view, the rear edges of the rear side windows are now steeper and sturdier-looking, rather than rounded as previously. The new LED side marker lights are designed to last the life of the vehicle, with no bulbs to replace. These enhancements make the new Mercedes-Benz Travego appear more powerful but also more elegant, as well as ensuring stylistic unity. They also ensure an evolutionary continuation of the design language of the previous model.

New-look rear section

The rear end of the Travego too has been enhanced in several key areas. Particularly noticeable are the rounded, three-dimensional tail lights which wrap round into the sides of the vehicle. Each unit has three integrated, light-colored covers for the indicators and the reversing lights. Here too, the appearance is reminiscent of a Mercedes-Benz passenger car, due to the use of typical Mercedes-Benz design themes. Passive lighting segments link the tail lights with the now flat engine compartment flap whose upper section features a newly designed ventilation grille. As well as looking good, the grille is effective at preventing dirt or rainwater from entering the engine compartment. Moving further upwards, new recesses in the rear wall echo the shape of the ventilation grille, and break up the appearance of the surface.

In the rear window, the enlarged Mercedes star is now more prominent and protrudes upwards into the glass area. The engine compartment flap, rear wall and corners of the bumper are more powerfully curved at the sides. Overall the second-generation Travego has a harmonious appearance, exudes typical Mercedes-Benz dynamism and is easily recognizable.

Like its predecessor, the new Travego high-deck touring coach has a body incorporating tried-and-tested reinforcements stretching across the roof and down the sides, thus creating the basis for maximum strength and safety. Design modifications have been made on the left-hand side where the Travego (15 RHD) and Travego M (16 RHD) models now have two instead of three luggage compartment doors to make the driver's life easier. The Travego L (17 RHD) now has three such doors instead of four.

Extended front

Although the wheelbase length remains unchanged, the front end of the new Travego has been extended by 140 mm to provide extra space for the driver and the tour guide as well as a wider entrance for the passengers. At the same time, the developers were able to increase the angle of approach so as to ensure improved handling and maneuverability. And despite the slight increase in overall length and the measures implemented to ensure compliance with the Euro 4 emissions standard, the new Travego weighs less than its predecessor. In the three-star maximum seating versions, including on-board toilet but not including the driver and tour guide seats, the passenger seating capacity is 49 (Travego), 53 (Travego M) and 57 (Travego L).

While the Mercedes-Benz Travego has always provided an exemplary level of safety, the new Travego marks another major step forwards. The extensive standard equipment package now includes the continuous braking limiter – a control system which makes life considerably easier for the driver by preventing the vehicle from accelerating over the speed limit when driving downhill. At first the coach is braked automatically by the retarder, then – after a signal has warned the driver to take action – by the service brakes, thus preventing the vehicle from exceeding statutory speed limits on long motorway descents, for example. Furthermore, the cooling power of the engine has been increased to ensure better dissipation of the heat energy generated by braking and, therefore, extremely stable retarder operation during long periods of braking.

The exemplary standard-fitted safety equipment of the Mercedes-Benz Travego also features the familiar fade-resistant braking system incorporating disc brakes all around, the Electronic Braking System (EBS), Brake Assist (BA), acceleration skid control (ASR), the retarder and, perhaps most importantly of all, the Electronic Stability Program (ESP). The standard-fitted Voith retarder can be operated via a five-stage steering column stalk (standard). However, to reduce service brake wear, the “retarder integration” function also allows the retarder to be activated via the foot brake pedal.

Large H7 halogen headlamps with a high light output are also standard. Powerful Litronic gas discharge headlamps, similar to the xenon headlamps used on cars, are available as an option. Other standard features include fog lamps, a highly efficient system of mirrors providing excellent all-round visibility, the high-strength skeleton with reinforcements stretching across the roof and down the

sides, and passenger seats with impact surfaces on the backrests. All this is as much an integral part of the new Mercedes-Benz Travego as the comfort and safety-oriented chassis and suspension. Page 83

New assistance systems

Available as an option for the new Travego for the first time, the autonomous intelligent cruise control (ART) automatically maintains a preprogrammed safe following distance from vehicles in front. For example, if the coach starts to approach a slower-moving vehicle ahead or if a slower-moving vehicle cuts across in front of the coach, the retarder and service brakes are activated automatically to slow the coach down and reestablish the preset safe following distance. The deceleration is limited to 20 percent of the maximum available braking power. When there is no longer an “obstruction,” the coach is automatically accelerated back up to the speed previously set using the cruise control function. Although the proximity control system is primarily designed to assist drivers in motorway traffic, it is also helpful on other extra-urban roads and, since it is effective from a speed of 15 km/h, in towns.

A further option, the Lane Assistant, is now available for all new Travego models. A camera system monitors the lane markings and detects when there is a danger of the vehicle leaving its lane. If this happens, the relevant side of the driver’s seat starts to vibrate in order to warn the driver.

Further enhanced driver’s workplace

The developers have also enhanced several aspects of the Travego interior. For instance, the front end has been extended by 140 mm to give the driver more space and provide an extended driver’s seat

adjustment range. Furthermore, there is now space for a large bag behind the driver's seat. On the left-hand side, the practical, multi-compartment driver's locker has been redesigned. And the parking brake lever has been moved to a new, easier-to-reach position. A further plus is the easier-to-use joystick shift lever and the enhanced Servoshift system, which enables the driver to change gear even more smoothly and precisely than before.

The already exemplary, ergonomic design of the instrument panel in the preceding model has been further improved upon in the new Travego. Now a soft coating which is pleasant to the touch covers the surface of the instrument panel while the previous monochrome display in the instrument cluster has been replaced by a new, high-contrast and easy-to-read color display on the instrument cluster. The standard-specification "Flair" design and equipment line includes a wood-trimmed leather steering wheel while the optional "Fashion" design and equipment line features a leather steering wheel with a fine multi-point surface texture.

Both the tour guide's area and the entrance benefit from an extra 70 mm thanks to the longer front end of the new Travego. Passengers now board the bus via extremely wide, flat steps. Meanwhile, the new-look tour guide's seat also features an electrically adjustable backrest and seat cushion as an option.

Video system with DVD player and flat-screen monitors

The roof area above the driver and tour guide area has been completely redesigned and restyled to give it an open, inviting look, with enlarged and lockable compartments on the left and right. This new design necessitated the use of flat-screen monitors instead of the previously installed tube-type units for the video system in the new

Travego. Optionally, the front monitor is available in electrically retractable version to give the passengers an even better view. Standard equipment also includes a DVD player.

Upon boarding the coach, passengers are immediately met by the “Mercedes-Benz” brand lettering which, like the “Travego” lettering, is to be found inside on the left and right above the driver’s and tour guide’s seats. Since one of the main aims is to make passengers on board the Travego feel at home, generous dimensions have been maintained, with an exterior width of 2.55 m, generous standing height of 2.10 m and, as a result, an airy and spacious feeling. Differences passengers will notice on board the new Travego include the modified service units beneath the air ducts, whose redesign results in a more integrated appearance. The control buttons, now including illuminated inductive switches for the reading lights and service call function, are now logically integrated right next to the reading lights. Each of the adjustable air outlets is controlled by a thumbwheel.

Another new feature is the lighting concept for the Travego passenger compartment, now centered around ceiling-mounted fluorescent tubes running alongside the luggage racks. The tubes have two light settings and are of particular benefit to coach operators as they have an extremely long service life. The discreet ambient lighting, also new, includes offset lighting for anti-glare illumination of the center aisle below seat level. Furthermore, passengers occupying the rearmost seat row in the new Travego enjoy a better view as the side windows no longer feature a rounded rear edge but, instead, extend back as far as the corner pillar.

Stronger air conditioner

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In particularly hot regions, passengers on board the Travego will feel the benefit of a more powerful roof-mounted air conditioning system. The most powerful of the systems available now has a maximum cooling capacity of 39 kW. Further new developments include an air conditioning system with a cooling output of 35 kW. Both new systems have eight evaporator fans to ensure a high airflow rate. Customers therefore now have the choice of an air conditioning system with a cooling capacity of 32 kW, 35 kW or 39 kW, depending on the coach model and where it is to be put into service. Features the new model shares with its predecessor include the tried-and-tested hot water convector heater, with the option of axial fans for increased output.

The general upgrading of the Travego also extends to the robust luggage compartment floor covering and the luggage compartment doors which are now lined on the inside. Next to the center door is a spacious multipurpose area which can be accessed from the center entrance area by pulling back a retractable cover and serves either as an additional stowage compartment or as the basis for the optionally available driver's rest area.

Torque and power increased

To prepare for the imminent introduction of the Euro 4 emissions standard, the engine lineup for the new Mercedes-Benz Travego has been revised and enhanced significantly. As before, the range includes the OM 457 LA six-cylinder in-line engine with a displacement of twelve liters and the V8 powerplant from the OM 502 LA series. However, the previous entry-level engine, the 260 kW (354 hp) version

of the OM 457 LA, has been replaced by the next most powerful version, which offers a significant increase in performance.

The new base engine for the Travego now develops 315 kW (428 hp). Even more important than the increase in rated output is the substantial boost in torque. Instead of 1900 Nm, the six-cylinder powerplant now delivers an impressive peak torque of 2100 Nm. Thanks to this new, powerful base engine, the performance of the Mercedes-Benz Travego more than lives up to the expectations created by its highly dynamic appearance, under all conditions.

The top-of-the-range OM 502 LA V8 engine – with an unchanged displacement of 15.9 liters and output of 350 kW (476 hp) – also has a maximum torque of 2100 Nm. This engine is available as an option for the three-axle Travego M and Travego L.

Servoshift further refined

All of the engines have their air intake on the left above the drive axle, in a zone located well away from where the dirt is swirled up by the rear wheels. This means that the air cleaners have a long service life. In all models, the standard transmission is the Mercedes-Benz GO 210 six-speed manual transmission which, as before, is operated by a joystick mounted on the instrument panel. Thanks to the enhanced Servoshift system, this transmission now ensures even smoother and more precise gear changes than before. Optionally, the Travego can be specified with the ZF AS-Tronic automated manual transmission with 12 forward speeds. Like the outgoing model, the new Travego is fitted with the tried-and-tested Mercedes-Benz HO6 drive axle.

The new Mercedes-Benz Travego features an enhanced electronic system that is again based on the successful flexibly programmable control system (FPS). Even though the number of control units has been cut from six to five, in order to reduce the complexity of the system, functionality has been extended.

The Mercedes-Benz Bus and Coach unit decided to use a conventional electronic control unit with fuses and relays for numerous comfort and convenience systems on board the new Travego, including the sunblinds, power windows, audio/video systems and the galley. The priorities were to allow easy repairs throughout Europe and neighboring countries as well as to facilitate retrofits. By way of example, it is now possible to fit a trailer coupling including a socket without having to worry about downloading extra software, as was previously the case. All in all, the combination of flexibly programmable control system and conventional electronic control proves to be an extremely practical solution.

Further information from Daimler is available on the internet at:

www.media.daimler.com

About Daimler

Daimler AG, Stuttgart, with its businesses Mercedes-Benz Cars, Daimler Trucks, Daimler Financial Services, Mercedes-Benz Vans and Daimler Buses, is a globally leading producer of premium passenger cars and the largest manufacturer of commercial vehicles in the world. The Daimler Financial Services division has a broad offering of financial services, including vehicle financing, leasing, insurance and fleet management.

Daimler sells its products in nearly all the countries of the world and has production facilities on five continents. The company's founders, Gottlieb Daimler and Carl Benz, continued to make automotive history following their invention of the automobile in 1886. As an automotive pioneer, Daimler and its employees willingly accept an obligation to act

responsibly towards society and the environment and to shape the future of safe and sustainable mobility with groundbreaking technologies and high-quality products. The current brand portfolio includes the world's most valuable automobile brand, Mercedes-Benz, as well as smart, AMG, Maybach, Freightliner, Sterling, Western Star, Mitsubishi Fuso, Setra, Orion and Thomas Built Buses. The company is listed on the stock exchanges in Frankfurt, New York and Stuttgart (stock exchange abbreviation DAI). In 2007, the Group sold 2.1 million vehicles and employed a workforce of over 270,000 people; revenue totaled €99.4 billion and EBIT amounted to €8.7 billion. Daimler is an automotive Group with a commitment to excellence, and aims to achieve sustainable growth and industry-leading profitability.

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