April 2021

# The All-new Toyota Mirai

Toyota's vision for a sustainable hydrogen society recognises the importance of hydrogen as a viable and plentiful source of carrying and storing energy. It has the potential to deliver zero carbon mobility, not just in road vehicles but equally in trains, ships and planes, and to generate power for industry, businesses and homes. It's also an efficient means of storing renewable energy and can be transported to where it's needed.

Toyota began development of hydrogen fuel cell electric vehicles in 1992, successfully introducing the Mirai saloon to world markets from 2014. This breakthrough achievement was founded on the company's world-leading experience in hybrid, the core technology for a wide range of different electrified vehicle powertrains.

The basic concept of hybrid power has successfully been adapted to produce hybrid electric (HEV), plug-in hybrid electric (PHEV), battery electric (BEV) and – starting with Mirai – fuel cell electric vehicles (FCEV). Each has qualities suited to different mobility requirements: for example, BEVs for shorter commutes and urban driving; HEVs and PHEVs for general and longer distance personal travel; and FCEVs for larger passenger cars, heavy-duty vehicles and public transport.

In 23 years of mass production, Toyota has sold more than 16 million hybrid vehicles worldwide, bringing the technology to the mainstream and helping save millions of tonnes of carbon emissions.

Now a new generation Mirai is being launched, a car that takes FCEV technology to a higher level and offers more emotional customer appeal in terms of dynamic, contemporary styling and more rewarding driving performance. A comprehensively redesigned fuel cell system, intelligent packaging and aerodynamic efficiency help extend the driving range to around 400 miles, with no emissions other than pure water.

## Increased hydrogen fuel cell system sales

The introduction of the new Mirai will see Toyota target increased market share, supported by an increase in its hydrogen fuel cell production. As stated in Toyota Motor Europe's Kenshiki Forum in December 2020 (see appendix below), the company expects global fuel

cell system sales to increase 10-fold in the short term.

Growth in the Mirai's sales will be supported by the new model's stronger performance and greater customer appeal, notably as a more affordable vehicle with a selling price reduced by around 24 per cent.

The practicality of hydrogen FCEV ownership will also steadily increase as markets improve their hydrogen infrastructure, the number of filling stations rises and Governments and local authorities introduce new incentives and regulations for cleaner mobility.

**Chief Engineer Yoshikazu Tanaka**

"Toyota Motor Corporation (Toyota) sees hydrogen as an effective fuel for the future. Our aim is to help address environmental and energy issues through mass production of fuel cell electric vehicles (FCEVs). These use hydrogen to operate, are very efficient, can travel long distances, have fast refuelling times and emit only water. They have enormous potential as environmentally friendly cars, or 'ultimate eco-cars'.

"In 2014, Toyota launched Mirai as the world's first commercial FCEV, hoping to contribute to the world by selling a car that it believed could become the driver of a hydrogen society for the next 100 years. To date, more than 10,000 have been sold worldwide. That first step helped open the doors to the hydrogen society and the FCEV market.

"However, because of slower than anticipated infrastructure development and resulting limits on the number of vehicles that can be introduced to the market, we are still only half-way to achieving widespread adoption of FCEVs. Additionally, customer feedback indicated the need for a longer cruising range and improved rear seat comfort. Thus, to increase the demand for FCEVs, we need a vehicle with better basic performance and appeal that encourages more customers to buy one, even if infrastructure constraints remain.

"We took all the customer feedback to heart and re-engineered Mirai from the ground up, with the goal of creating a vehicle people would be excited to own. The development concept was 'EDGE for a fun future'. This means new Mirai was developed with the goal of creating a vehicle full of appeal, with edgy individuality and an emotional dimension. The new Mirai comes with the latest and highest levels of safety features.

"We have worked to make a car that customers will want to drive all the time, a car that has

an emotional and attractive design and the kind of dynamic and responsive performance that can bring a smile to the driver's face. I want customers to say 'I chose the Mirai simply because I wanted this car – it just happens to be an FCEV.'

"I hope the new Mirai demonstrates sustainable and bright possibilities for the world and our children's future as it helps us achieve a hydrogen society."

**A New FCEV with Greater Emotional Appeal**

- Focus on a more emotional design, increasing Mirai's appeal beyond being an eco-car
- Exterior displays new aero proportions, with a low, wide and planted look
- Cabin design with a focused driver's cockpit and a warm, enfolding atmosphere featuring soft-touch materials and ambient lighting

One of the principal aims in the development of the new Mirai was to create a stronger emotional appeal, making it a car that people will be attracted to by its looks and the way it drives, as well its eco-performance. A more modern and striking design, use of Toyota's new GA-L platform and advances in FCEV technologies have made this possible.

**Exterior design**

Toyota's design mission focused on striking looks, moving away from the perception of Mirai's styling being dictated by its eco-car status. The aim was to create an emotional design that would appeal to customers, rather than relying on it being desirable because it is an FCEV with an eco-image. The concept was developed on the theme of "Silent Dynamism".

For the exterior there were three objectives:

- New aero proportions: a lower, wider rear-wheel drive platform and the use of larger diameter tyres.
- Wide front and rear stance with a low centre of gravity: a stance expressing stability and a solid grip of the road, with a nose that sits lower than headlamps. A low centre of gravity is emphasised by an under-bumper moulding and other exterior elements.
- From line-featured to mass-featured design: instead of using character lines to express individuality, the shaping of the bodywork itself conveys a sense of beauty with transitional surfaces and contrasting shadows.

At the front of the car, the new Mirai displays solid proportions that emphasise its well-planted stance. The low-set look is also communicated by a bright moulding along the bottom edge of the trapezoidal lower grille and the positioning of the central Toyota emblem lower than the line of the LED headlights.

The front lighting is arranged in a two-tier design. On the upper tier, long and sharply formed headlight units – the largest yet featured on a Toyota car – flow into the sides of the vehicle; on the lower tier the long and slim turn indicator lights emphasise the car's width. The daytime running lights are arranged in an "L" shape and extend into the front wings, while the main headlight units have a bright plated surround that makes Mirai easy to recognise, even from a distance.

According to model grade, the car is fitted with twin-lens bi-LEDs with an Adaptive High-beam System (AHS), or single lens bi-LEDS with Automatic High Beam function (AHB). Both units feature jet black extensions.

In side view, the silhouette flows seamlessly into the rear spoiler integrated in the boot lid. The dynamic flow of the design moves forward from the rear wheels, while the cylinder-shape cross-section of the doors narrows towards the front of the vehicle. The sculpted shapes and cross-sections emphasise a sense of motion.

Design and Design Plus Pack models are fitted with 19-inch wheels in a five-double-spoke design with a silver finish. The Design Premium Pack model has 20-inch black-painted rims with a turbine design.

The integrated boot lid spoiler creates a clear definition between the upper and lower sections of the car's rear end, avoiding a high-waisted look. The sense of the car sitting low to the ground is further emphasised by the dark trapezoidal lower bumper section, the arched angles of which are echoed in the lines extending from the lower rear corners to the horizontal rear light clusters.

The light units extend from left and right across the rear of the vehicle, meeting at the central Toyota badge. Their slim shape is emphasised by a dark finish for the lower turn indicator and reversing lights.

The exterior colour choices include a new multi-layered paint option, Force Blue, which

produces contrasting depth of vividness and shadow across the bodywork.

A small detail reflects the new styling approach – the middle of the R in the Mirai badge has a sharp rather than a rounded angle.

**Interior design**

Mirai's cabin features a new concept that makes use of advanced components and expansive outlines that wrap around each occupant. Information sources and controls are brought together centrally in the instrument cluster in a layout optimised for operation.

The design team has challenged the sense that "advanced" should mean cold or clinical in design, using a combination of soft leathers, materials and metal textures to express the new Mirai's relaxing and more fun-to-drive character.

The cabin is an open space but focuses the attention with a design continuity that unifies the 12.3-inch multimedia screen with the driver's instrument display. The elements are set adjacent to each other and on the same level, making it effortless for the driver to take in information at a glance. The effect is heightened by the colour head-up display featured in the Design Premium Pack model.

Design coherency is reflected in control switches being kept small and having a uniform size and shape, with a concave surface that makes them simple to locate by touch alone. For ease of operation, they are grouped in different zones according to their function. For heating and ventilation, the number of switches has been reduced and these are arranged in a slim, horizontal control panel in the centre console, with additional functions accessed using the multimedia display screen.

The high-definition multi-information screen can be toggled into separate sections for concurrent display of the navigation map and function controls, to the left or right side. It can be operated using familiar smartphone-style touch controls, such as flick, swipe and pinch to zoom in or out.

The driver's seat is designed to give the sense of being enveloped, while for the front passenger the environment is more open. The clean and uncluttered surface of the instrument panel extends the width of the passenger side of the cabin and is finished with a

soft, leather-like covering. The upper panel surface has a perforated finish around the screen air vents and audio speakers. This textured motif is repeated elsewhere in the cabin.

The front edge of the instrument panel is accentuated by a high-quality silver trim line that contrasts with the soft padded surface. This flows in an unbroken line along the top of the slim, horizontally arranged air vents, before running down the far edge of the centre console.

The three-spoke steering wheel is trimmed in black leather and has auxiliary switches clustered in three groups for infotainment, driving assistance (Dynamic Radar Cruise Control, Lane Tracing Assist) and audio/phone.

On the Design grade model, the seats are upholstered in black fabric, while black synthetic leather is used in the Design Plus Pack; both come with a matching black instrument panel finish. The Design Premium Pack grade features black semi-aniline leather.

**Chassis and Fuel Cell System**

- New Mirai constructed on Toyota's GA-L rear-wheel drive platform
- A five-seat model, longer, wider, lower and with a longer wheelbase
- Fuel cell stack more compact, lighter in weight and more powerful, relocated to the car's front compartment
- New lithium-ion battery with higher energy density
- Repackaging of components allows for three high-pressure hydrogen tanks to be used, increasing fuel capacity and driving range

**New Toyota GA-L platform**

By using its modular GA-L platform, Toyota has been able to change Mirai from a four-seat front-wheel drive car to a comfortable five-seat model with rear-wheel drive.

The new car is longer (+85mm) and wider (+70mm) than its predecessor and has a longer wheelbase (+140mm) but its height has been reduced (-65mm). The front and rear tracks have also been increased (+75 and +60mm respectively).

Adopting the GA-L platform has allowed the fuel cell stack and drivetrain components to be repackaged in a way that makes more efficient use of space. The result is a more spacious,

cabin and a better chassis balance. Significantly, it enables three high-pressure hydrogen tanks to be fitted, increasing fuel capacity and the car's driving range by 30 per cent.

The tanks are arranged in a "T" configuration, the longest running longitudinally and centrally beneath the vehicle floor, with two smaller tanks set transversely beneath the rear seats and luggage compartment. Together they can hold 5.6kg of hydrogen, compared to 4.6kg in the previous Mirai's two tanks. Their position contributes to the car's lower centre of gravity.

The new architecture also permits the all-new hydrogen fuel cell to be moved from its previous location beneath the floor to the front compartment (equivalent to the engine bay), while the (more compact) high-voltage battery and electric motor are positioned above the rear axle. As explained below, powertrain layout has been optimised to give new Mirai a 50:50 front:rear weight distribution.

The tanks have a stronger, multi-layer construction and are highly weight-efficient – the hydrogen accounts for 6 per cent of the combined weight of the fuel and tanks.

**New hydrogen fuel cell stack**

Toyota's new fuel cell stack and fuel cell power converter (FCPC) have been developed specifically for use with the GA-L platform. The designers have been able to bring all the elements together in the stack frame (including the water pumps, intercooler, air conditioning and air compressors and the hydrogen recirculation pump) with each part made smaller and lighter, while at the same time improving performance. The stack case itself has been made smaller by using Friction Stir Welding, reducing the gap between the fuel cell and casing.

The packaging improvements have made it possible to relocate the FC stack in the Mirai's front compartment (engine bay), helping realise the benefits of an optimum 50:50 front:rear weight balance. On the previous generation model, the unit was beneath the front seat

The fuel cell stack uses a solid polymer, as in the previous Mirai, but has been made smaller and has fewer cells (330 instead of 370). Its weight bas been brought down from 56 to 52kg. As well as achieving savings in size and weight, it also sets a new record for specific power density at 5.4kW/l (4.4kW/l excluding end plates). Maximum power from the FC stack has consequently been increased from 153bhp/114kW to 172bhp/128kW. Cold weather

performance has been improved with start-up now possible at temperatures from as low as -30˚C.

By concentrating the system connections within the case, fewer components are needed, again saving space and weight.

Focusing on innovation and improvement in every component has delivered a 42 per cent weight reduction yet a 12 per cent increase in power. New measures include relocation of the manifold, reducing the size and weight of the cell optimising the shape of the gas channel separator and using innovative materials in the electrodes.

The unit also incorporates the Fuel Cell DC-DC Converter (FDC) and modular high-voltage parts, while achieving a 21 per cent reduction in size compared to the current system. Weight has been cut by 2.9kg to 25.5kg. Advanced technology has contributed to the space-saving, with Toyota's first-time use of a next generation silicon carbide semiconductor material in the intelligent power model (IPM) transistors. This enables an increase in output and lower power consumption while using fewer transistors, which in turn allows the FCPC to be made smaller.

The same size and weight-saving approach has been applied to other parts of the FC stack. The air intake is designed for low pressure loss and contains sound-absorbing material so that noise from the air inlets is unnoticeable in the cabin. The exhaust uses a resin pipe and is designed to allow for a large amount of air and water to be discharged; a larger-capacity silencer contributes to the quieter cabin. The complete air system is almost 30 per cent smaller than in the previous Mirai and weighs more than a third (34.4 per cent) less.

**Lithium-ion high-voltage battery**

The new Mirai is equipped with lithium-ion high-voltage battery in place of the previous nickel-metal hydride unit. Although smaller in size, it is more energy-dense, giving higher output and superior environmental performance. Containing 84 cells, it has a 310.8V rated voltage compared to the NiMH unit's 244.8V, and a 4.0Ah capacity, versus 6.5Ah. Overall weight has been reduced from 46.9 to 44.6kg. The peak output has improved from 25.5kW x 10 seconds to 31.5kW x 10 seconds.

The battery's smaller dimensions have allowed it to be positioned behind the rear seats, avoiding intrusion in the load compartment. An optimised air-cooling path has been

designed, with discreet inlets either side of the rear seats.

**Dynamic Performance**

- New GA-L platform provides the foundation for a more rigid body, improving the car's responsiveness and stability
- Repackaging of fuel cell, high-voltage battery, electric motor and fuel tanks gives an ideal 50:50 weight balance
- New multi-link suspension design
- Total power of 180bhp/134kW
- Improved acceleration response, fuel economy and driving range

**Handling and stability benefits of the new GA-L platform**

The GA-L platform gives the car the fundamental benefits of a lower centre of gravity, improved inertia characteristics and significantly increased body rigidity, all of which help deliver superior dynamic performance.

With the fuel cell stack moved from beneath the vehicle floor to the front compartment (details above) and the battery and electric motor positioned over the rear axle, a 50:50 front:rear weight balance has been achieved, giving it the stability characteristics of a front-engine car.

The rigidity of the body has been increased with strategic bracing and reinforcements, using aluminium and ultra-high-tensile steel to keep the car's weight down. The key improvements include additional bracing for the front compartment; use of die-cast aluminium for the front suspension towers; a larger rocker cross-section for better twisting and bending rigidity; and a ring structure for the cowl and instrument panel reinforcement. Additional cross-members have been added to the floor to improve twisting rigidity and a continuous flange structure is used improve joint rigidity in the frame connection parts. The rear body frame is new and includes a new rear suspension tower.

The wider application of body adhesives and the use of laser screw welding add to car's rigidity and better handling responsiveness.

**More rewarding driving experience**

The extra power produced by the fuel cell stack and battery are harnessed for smooth, linear take-off, with acceleration harmonised with the driver's use of the throttle. Instant torque and maximum acceleration are provided from start-up, and a significant improvement in the mid-range acceleration curve communicates a more rewarding driving feel to the driver.

Motorway driving is relaxed and stress-free, with excellent response available at all speeds. When driving on winding, open roads, new Mirai's poise is combined with good acceleration out of corners.

The driver can select a brake driving mode to replicate the effect of engine braking using a manual transmission. This provides stronger deceleration and regenerative braking when speed control is needed, for example on a long downhill gradient. The function can be cancelled simply by pressing the accelerator pedal.

**Active Sound Control**

To give the driver a greater sense of connection to the car and of its performance, an Active Sound Control system issues sounds from dedicated speakers in the cabin in response to the driver's use of the accelerator pedal.

**Improvements in performance and efficiency**

With the increase in power, the Mirai's acceleration from 0-62mph has improved by 0.6 seconds to 9.0 seconds; top speed is 108mph.

Despite the higher output, fuel economy is improved: WLTP combined cycle performance gives 0.79kg/100km with 19-inch wheels and 0.89kg/100km with 20-inch wheels. The rise in fuel efficiency and the larger combined capacity of the three fuel tanks, increased from 4.6 to 5.6kg, ensure greater distances can be covered between refuelling stops – around 400 miles. The refuelling process is simple and should take just five minutes or less.

**Active Cornering Assist**

Active Cornering Assist automatically improves the car's stability in high-speed cornering, applying braking force to the inside rear wheel so that drive torque is increased on the outer rear wheel, creating a yaw moment and minimising understeer. As a result, Mirai maintains

a faithful line with one of the best possible cornering limits.

Braking control in high-speed cornering helps prevent the car “tucking in” if the driver takes their foot off the accelerator, maintaining stability and reducing the risk of an oversteer spin. When driving in high cross-winds, the system will again apply braking force to create an anti-yaw moment, keeping the car stable and true to its course.

**New multilink suspension**

The rear-wheel drive platform accommodates new multilink front and rear suspension, in place of the previous front MacPherson struts and rear torsion beam arrangement. This set-up – high-mounted at the front, low-mounted at the rear – provides a high level of stability, controllability and ride comfort. Details include the use of thicker anti-roll bars, optimal upper and lower ball joint location and overall high suspension rigidity, yielding rewards in terms of responsiveness and stability.

**Wheels and tyres**

Further benefits are gained from larger wheels and tyres. The 19 and 20-inch alloy rims are fitted with 235/55 R19 and 245/45 R20 tyres respectively, with low rolling resistance and quiet running, contributing to fuel efficiency, handling quality, stability and a quiet cabin environment. Using larger diameter wheels and tyres helps secure the space required for the new triple hydrogen fuel tanks in the lower part of the platform.

**Braking system**

Mirai has a new, more powerful braking system, with ventilated discs with four-pot fixed callipers at the front and ventilated discs with a two-pot fixed calliper at the rear. An electric parking brake is standard.

**Aerodynamic improvements**

The car’s improved aerodynamics plays its part too in raising the quality of handling and stability, and achieving the longer cruising range. The flush side bodywork surfaces help regulate a smooth flow of air over the car, aided by flat surfaces just forward of the wheels and aero stabilising fins on the leading edge of the front side windows. The front and rear wing liners have beading to help streamline the flow of air in the wheel arches to promote

stability and controllability.

The convergence of the airflow over and along the car to the rear is managed by its shape in silhouette, a slimming down of the side surfaces towards the rear and the precise shaping of the lower bumper moulding. The rear window and boot lid are set at the optimum angle for aerodynamic efficiency and a new, flat underbody cover has been introduced to reduce air resistance, contributing to the car's extended driving range. Airflow from beneath the car is directed into the rear oil cooler vent with a negative air pressure difference feeding the air downwards.

**Advanced Safety and Equipment Features**

- Latest generation Toyota Safety Sense provided as standard
- Toyota air filter innovation cleans the air of harmful particulates as you drive
- Advanced equipment specifications, including digital rear-view mirror (Design Premium Pack)

**Toyota Safety Sense**

The new Mirai is equipped as standard with the latest generation Toyota Safety Sense. This provides a series of active safety and driver assistance systems designed to help prevent a number of common accident risks and provide superior protection to driver and passengers, should an impact happen.

In addition to motor traffic, the **Pre-Collision System (PCS)** is able to detect pedestrians in the vehicle's path in day and night-time driving, and bicycle riders during daylight. The system also provides additional safeguards when making a left or right turn at a road junction, detecting oncoming traffic, or pedestrians crossing the road into which the vehicle is turning. Visual and audible alerts are sounded; if the driver does not react, automatic braking is initiated.

The PCS also has an Emergency Steering Assist function. If it determines that a collision is likely, and that there is sufficient room in the vehicle's lane to avoid an impact, it will provide steering assistance, while maintaining vehicle stability and preventing lane departure.

It will also help guard against the risk of an impact if driver puts excessive pressure on the accelerator when driving at low speeds. It will suppress engine output or lightly apply the brakes to suppress acceleration.

The **intelligent Adaptive Cruise Control (iACC)** has an all-speed tracking function and will automatically calculate if speed needs to be reduced when driving through a bend. Speed suppression will operate from the moment the steering wheel begins to turn, continuing until the angle returns to the straight-ahead.

The iACC works with the **Lane Departure Alert (LDA)** and **Lane Trace Assist (LTA)** to help keep the car centred in its traffic lane. If the car deviates from its lane without the turn indicators being used, LDA/LTA will sound and display and alert and trigger steering wheel vibration, Steering assistance will then be applied if required to help return the vehicle to its correct path.

To improve lane-keeping performance the LTA's operation has been improved to give higher resolution detection through pinion angle (motor-rotation angle)-based control. This also helps prevent the driver becoming over-confident and possibly taking their hands off the steering wheel.

The system works through gentle bends, as well as on straight highway sections, and can recognise road margins if the line markings on the road surface are obscured or absent. The lane departure warning and prevention functions also operate when the iACC is switched off.

The LTA is also able to detect if the driver may have suffered an emergency. The Driver Emergency Stop Assist determines if there is continuous non-operation of driving functions, for example if the driver's hands are not on the wheel. It will issue visual and audible warnings then, if there is no response from the driver, it will gently bring the car to a halt and activate the hazard warning lights and horn to alert other road users.

The Mirai's LED headlight system is equipped with **Automatic High Beam (AHB)**, on Design and Design Plus Pack grades and an **Adaptive High-beam System (AHS)** on Design Premium Pack grade. The **Road Sign Assist (RSA)** system keeps the driver alert to principal road sign commands and warnings, presenting them as images on the multi-information display and (on Design Premium Pack model) head-up display. The system also works with the iACC to automatically keep the car within the speed limits enforced in the

course of a journey.

Additional safety features available according to model grade include a Blind Spot Monitor, Rear Cross Traffic Alert with auto brake and Intelligent Clearance Sonars with auto brake.

**Fuel tank safety**

Mirai is built with a collision safety structure designed to protect vehicle occupants, the fuel cell stack and the hydrogen tanks in the event of an impact. A strong body frame minimises cabin deformation, channelling and absorbing impact forces.

To address the features specific to an FCEV, aluminium members are integrated in the fuel cell stack structure, with energy-absorbing parts at the front to mitigate the effects of a front-end impact.

Sensors throughout the car will immediately detect any leak of hydrogen from the fuel tanks and illuminate a warning light in the driver's instrument display. All three tanks are located outside the cabin space, so any escaping gas will quickly disperse in the environment.

The tanks have a resin lining to prevent the permeation of hydrogen. On the outside they are coated with a light and strong reinforced carbon fibre resin. In the unlikely event of a fire or increased temperature inside the tanks, a safety valve will automatically release the gas to avoid rupture.

**Cleaning the air as you drive**

A Toyota innovation, a catalyst-type filter is incorporated in the air intake. As air is drawn into the vehicle to supply the fuel cell, an electric charge on the non-woven fabric filter element captures microscopic particles of pollutants, including sulphur dioxide ($SO_2$), nitrous oxides (NOx) and PM 2.5 particulates. The system is effective in removing 90 to 100 per cent of particles between 0 and 2.5 microns in diameter from the air as it passes into the fuel cell system.

Water is the only by-product from the fuel cell process and it is automatically discharged through a waste pipe. The driver can activate water discharge using the $H_2O$ switch. The system can be linked to the car's navigation to prevent water being released in inappropriate locations, such as car parks.

**Digital rear-view mirror and Panoramic View Monitor**

A digital rear-view mirror is featured in the Mirai Design Premium Pack model. This can be switched from normal optical view to digital mode, presenting real-time images from the car's rear camera. This removes any obstructions in the driver's line of sight, such as head rests, luggage or other vehicle occupants.

The Panoramic View Monitor (Design Plus Pack and Design Premium Pack grades) presents a view of the vehicle's immediate surroundings on the central multimedia screen, as seen from above the car. This gives the driver a clear, all-round view that would be difficult to achieve from the driver's seat alone. The system includes a See-through View function that shows an image as if looking through the vehicle to the outside; this provides extra support when checking for obstacles or other traffic when parking or at junctions.

When reversing, the rear camera presents an image with dynamic guidelines to help the driver make the correct steering manoeuvres. The lens for the camera and digital rear-view mirror is kept clean with a link to the rear washer system.

**Windscreen wiper operation**

The timing of the windscreen washer operation has been accurately tuned to take into account the wiper position, vehicle speed and external air temperature. Optimal spraying ensures good visibility is maintained. The wipers have a lower-set stop position, adding to the Mirai's sleek frontal appearance.

**Head-up Display**

The colour head-up display (Design Premium Pack) projects principal driving, navigation and safety information and graphics on the windscreen in the driver's eyeline. The perspective gives the effect of the image being 2.6m ahead. High brightness ensures the display is clearly visible, including in full daylight.

**Ambient lighting**

The inviting cabin atmosphere is enhanced by an ambient lighting system (Design Premium Pack) that provides gentle illumination in the footwells, the lower dashboard, the centre console cupholders, the door handles and the door switch panel. The lighting can be

changed through eight different colours to create different effects to suit the driver's mood and the occasion. The footwell lights remain in Clear Blue at all times.

**Centre Console**

New Mirai's wider centre console contains two cupholders, the console box with two USB ports, the shift lever, drive mode select control and the electronic parking brake switch. On the Design Premium Pack model, there is also a wireless mobile phone charger. On the rear of the unit there are two USB ports and a 100V power outlet.

**Equipment grades and specifications**

In the UK, the new Mirai is available in three equipment grades: Design, Design Plus Pack and Design Premium Pack. Each reflects the new car's advanced technology with a range of new features for on-board comfort, information, connectivity and style.

The Design specification includes 19-inch silver alloy wheels, multimedia system with 12.3-inch control screen, bi-LED headlights with Automatic High Beam, dual-zone air conditioning with remote control, heated front seats, power-adjustable driver's seat, smart entry and push button start, Rear Cross Traffic Alert with auto brake, and eight-inch multi-information display.

The Mirai Design Plus Pack comes with synthetic leather seat upholstery, Panoramic View Monitor, Blind Spot Monitor, intelligent parking sensors with auto brake, heated steering wheel and ambient cabin lighting with eight colour choices.

The Design Premium Pack specification builds on this with the addition of black 20-inch alloy wheels, Skyview panoramic glass roof (fixed), colour head-up display, wireless phone charger, digital rear-view mirror, semi-aniline leather seat upholstery, triple-zone air conditioning, heated steering wheel, heated and ventilated front and outer rear seats, power steering wheel adjustment, rear seat passenger control panel and the Teammate Advanced Park automated parking system.

**Automated parking**

The Teammate Advanced Park system, featured as standard on the Mirai Design Premium Pack, is an automated system for safe, precise and simple parallel and adjacent parking

manoeuvres. It references thousands of different parking patterns, analysing distance, entry angles, vehicle speed and operation sequence, controlling the car's steering, acceleration, forward and reverse gear selection, and braking.

To use the system, the driver stops the car next to the parking space and presses the Advance Park switch in the centre console. It then uses the Panoramic View Monitor and Intelligent Clearance Sonars to assess the space and nearby vehicles and obstacles. The driver should also check the area for safety before confirming the parking space by pressing the on-screen start icon to initiate the parking manoeuvre. If the system detects an obstacle, it will brake the car and sound an alert.

Advanced Park can store details of frequently used parking spaces in its memory, such as at home or work. It can then provide automatic parking in these locations, regardless of whether there are white line markings delineating the space.

Appendix

**Toyota makes its Fuel Cell Technology available to commercial partners to accelerate progress towards a Hydrogen Society**

- With fast-expanding interest and investment in hydrogen fuel cell technology, low carbon benefits can be realised in a wide range of applications
- Toyota establishes new European Fuel Cell Business Group to support and stimulate this growth
- The company's fuel cell technology is evolving rapidly in terms of capability, lower costs and convenient packaging
- Toyota expects global hydrogen fuel cell system sales to increase 10-fold in the short term

The launch of the new Mirai in Europe coincides with action by Toyota to help accelerate progress towards a hydrogen society by making its fuel cell technology available for a wide range of applications.

The potential of hydrogen to help achieve a future zero-emissions society, as set out in the global Sustainable Development Goals (SDG), is generating fast-growing interest and investment around the world, with businesses and consumers alike becoming ever more aware of the benefits it can deliver, across a wide range of applications.

To maximise the opportunities for hydrogen in Europe, Toyota Motor Europe (TME) has established a Fuel Cell Business Group to oversee its hydrogen activities across the region. Based in Brussels, it will strengthen the business case for hydrogen and support its introduction into mobility and other fields, making it accessible to new commercial partners. This will support the company's long-term sustainability strategy, in order to have a deeper impact on the SDGs.

Speaking at Toyota's Kenshiki forum in December 2020, Thiebault Paquet, Director of the Fuel Cell Business Group said: "The benefits of hydrogen are clear. That's why we expect our global sales of fuel cell systems to increase by a factor of 10 in the short term, and why we have dramatically increased our production capacity.

"Toyota is leading the way with strong investment in the hydrogen society, through next generation vehicles, the opening of new markets and technology applications, in extra fuel cell production capacity and in our organisation here in Europe."

Toyota is at the forefront of hydrogen technology innovation, having introduced Mirai, the world's first commercialised hydrogen fuel cell electric saloon, in 2014. Since then, development of the Toyota fuel cell system has continued, making it more compact, lighter, and yet also more energy-dense. Now, in early 2021, the comprehensively improved system is making its debut in the all-new, second generation Mirai.

Toyota's technology has the flexibility to be used not just in cars but to produce zero-emission power in multiple applications. It is already powering trucks, urban bus fleets, fork lifts and generators. Tests are also under way for its use in boats and trains.

To accelerate hydrogen's widespread take-up, Toyota will focus on hydrogen "clusters" or eco-systems in European centres where a local infrastructure is supporting transport fleets and mobility services. It believes activity like this will drive demand for hydrogen, bringing down costs and strengthening the viability of the supply infrastructure, which in turn will attract more customers.

Through the new Fuel Cell Business Group, Toyota will work closely with industry partners, national and regional governments and organisations to stimulate the development of hydrogen eco-systems in more locations and progress towards the goal of a hydrogen society for the benefit of all.

**TOYOTA MIRAI TECHNICAL SPECIFICATIONS**

| | |
|---|---|
| **FUEL CELL STACK** | |
| Model code | FCB130 |
| Type | Polymer electrolyte |
| Number of cells | 330 |
| Connection method | Series |
| Max. output bhp/DIN hp/kW | 172/174/128 |
| Volume (l) | 4 (exc. end plates)<br>4.4 (inc. end plates) |
| Weight (kg) | 52 |
| **BATTERY** | |
| Type | Lithium-ion |
| Number of cells | 84 |
| Nominal voltage | 310.8 |
| Capacity (Ah) | 4.0 |
| Package weight (kg) | 44.6 |
| **ELECTRIC MOTOR/GENERATOR** | |
| Motor model code | 3KM |
| Type | Permanent magnet, synchronous |
| Max. power (bhp/DIN hp/kW) | 180/182/134 |
| Max. torque (Nm) | 300 |
| **DRIVETRAIN** | |
| Layout | Rear-wheel drive |
| Reduction gear ratio | 11.691:1 |
| **SUSPENSION** | |
| Front suspension | Multilink |
| Rear suspension | Multilink |
| **STEERING** | |
| Type | Rack and pinion., electric power steering |
| Turns lock-to-lock | 2.51 |
| Min. turning radius – body (m) | 6.3 |
| Min. turning radius – tyre (m) | 5.8 |
| **BRAKES** | |
| Type - front | Ventilated discs |
| Type - rear | Ventilated discs |
| **TYRES AND WHEELS** | |
| Wheels | 19 x 8.0J<br>20 x 8.5J |
| Tyres | 235/55R19<br>245/45R20 |
| **PERFORMANCE** | |
| Max. speed (mph) | 108 |
| 0-62mph acceleration (sec) | 9.0 |
| EV driving range (miles) | Up to 400 |

| | |
|---|---|
| **FUEL CONSUMPTION** | |
| Combined (kg/100km) | 0.79 – 19in wheel<br>0.89 – 20in wheel |
| Fuel tank capacity (kg/l) | 5.6/142.2 |
| **WEIGHT** | |
| Kerb weight (kg) | 1,900-1,950 |
| Gross vehicle weight | 2,415 |
| Towing capacity | Not permitted |
| **EXTERIOR DIMENSIONS** | |
| Overall length (mm) | 4,975 |
| Overall width (mm) | 1,885 |
| Overall height (mm) | 1,470<br>1,480 Design Premium Pack |
| Wheelbase (mm) | 2,920 |
| Front track (mm) | 1,610 |
| Rear track (mm) | 1,605 |
| Front overhang (mm) | 965 |
| Rear overhang (mm) | 1,090 |
| Ground clearance (mm) | 150 |
| Drag coefficient (Cd) | 0.29 |
| **INTERIOR DIMENSIONS** | |
| Length (mm) | 1,805 |
| Width (mm) | 1,595 |
| Height (mm) | 1,135<br>1,110 Design Premium Pack |
| VDA boot capacity (l) | 321 |

**TOYOTA MIRAI EQUIPMENT SPECIFICATIONS**

| SAFETY & DRIVING DYNAMICS | DESIGN | DESIGN PLUS | DESIGN PREMIUM |
|---|---|---|---|
| Toyota Safety Sense: Pre-Collision System with Emergency Steering Assist, intelligent Adaptive Cruise Control, Lane Departure Alert, Lane Trace Assist, Road Sign Assist, Automatic High Beam (AHB)/Adaptive High-beam System (AHS) | ✓ (AHB) | ✓ (AHB) | ✓ (AHS) |
| ABS with Electronic Brakeforce Distribution | ✓ | ✓ | ✓ |
| Vehicle Stability Control | ✓ | ✓ | ✓ |
| Traction Control | ✓ | ✓ | ✓ |
| Vehicle Dynamics Integrated Management | ✓ | ✓ | ✓ |
| Airbags (x7) | ✓ | ✓ | ✓ |
| Hill-start Assist Control | ✓ | ✓ | ✓ |
| Blind Spot Monitor | × | ✓ | ✓ |
| Rear Cross Traffic Alert with auto brake | ✓ | × | × |
| Front parking sensors/intelligent rear parking sensors with Rear Cross Traffic Alert and auto braking | × | ✓ | ✓ |
| Driver Attention Alert | ✓ | ✓ | ✓ |
| Emergency brake light signal | ✓ | ✓ | ✓ |
| Isofix child seat anchors | ✓ | ✓ | ✓ |
| Tyre Pressure Warning System | ✓ | ✓ | ✓ |
| eCall | ✓ | ✓ | ✓ |
| **SECURITY** | **DESIGN** | **DESIGN PLUS** | **DESIGN PREMIUM** |
| Anti-tamper alarm | ✓ | ✓ | ✓ |
| Intrusion alarm and sensor | ✓ | ✓ | ✓ |
| Tilt detection sensors | ✓ | ✓ | ✓ |
| Immobiliser | ✓ | ✓ | ✓ |
| Childproof door locks | ✓ | ✓ | ✓ |
| Speed-detecting automatic door locking | ✓ | ✓ | ✓ |
| Remote door locking | ✓ | ✓ | ✓ |
| **COMFORT & CONVENIENCE** | **DESIGN** | **DESIGN PLUS** | **DESIGN PREMIUM** |
| Dual-zone automatic air conditioning | ✓ | ✓ | × |
| Triple-zone automatic air conditioning | × | × | ✓ |
| Remote air conditioning operation | ✓ | ✓ | ✓ |
| Nanoe air purification system | ✓ | ✓ | ✓ |
| Multi-function control panel in rear arm rest | × | × | ✓ |
| Power windows with auto up/down functions | ✓ | ✓ | ✓ |
| Power steering wheel adjustment with memory | × | × | ✓ |
| Heated steering wheel | × | × | ✓ |
| Under floor and side storage in boot | ✓ | ✓ | ✓ |

| | | | |
|---|---|---|---|
| Rear console box | ✓ | ✓ | ✓ |
| Illuminated glovebox | ✓ | ✓ | ✓ |
| Driver and passenger seatback pockets | ✓ | ✓ | ✓ |
| Sunglasses holder | ✓ | ✓ | ✓ |
| Auto-dimming rear-view mirror | ✓ | ✓ | × |
| Digital rear-view mirror | × | × | ✓ |
| Automatic wipers | ✓ | ✓ | ✓ |
| Advanced Park system | × | × | ✓ |
| **INSTRUMENTS & CONTROLS** | **DESIGN** | **DESIGN PLUS** | **DESIGN PREMIUM** |
| Hydrogen consumption indicator | ✓ | ✓ | ✓ |
| Fuel cell system indicator | ✓ | ✓ | ✓ |
| Electronic parking brake with hold function | ✓ | ✓ | ✓ |
| Push-button start | ✓ | ✓ | ✓ |
| Water release switch | ✓ | ✓ | ✓ |
| Active sound control | × | × | ✓ |
| Pitch and bounce control | ✓ | ✓ | ✓ |
| Reversing camera | ✓ | ✓ | ✓ |
| Panoramic View Monitor | × | ✓ | ✓ |
| **SEATING, UPHOLSTERY & TRIM** | **DESIGN** | **DESIGN PLUS** | **DESIGN PREMIUM** |
| Heated front seats | ✓ | ✓ | ✓ |
| Ventilated front seats | × | × | ✓ |
| Heated and ventilated outer rear seats | × | × | ✓ |
| Power front seat slide adjustment | ✓ | ✓ | ✓ |
| Power driver's seat recline, cushion tilt, height and lumbar adjustment | ✓ | ✓ | ✓ |
| Adjustable front seat seatbelt extender | ✓ | ✓ | ✓ |
| Black fabric seat upholstery | ✓ | × | × |
| Black synthetic leather upholstery | × | ✓ | × |
| Black semi-aniline leather upholstery | × | × | ✓ |
| Piano black and satin chrome trim inserts | ✓ | ✓ | ✓ |
| Satin chrome deco line | ✓ | ✓ | ✓ |
| Ambient lighting in cupholders and footwells | ✓ | ✓ | ✓ |
| Ambient lighting on dashboard, doors and door handles with 8 colour options | × | × | ✓ |
| Mirai scuff plates | ✓ | ✓ | ✓ |
| Perforated leather steering wheel trim | ✓ | ✓ | × |
| Smooth leather steering wheel trim | × | × | ✓ |
| **MULTIMEDIA & CONNECTIVITY** | **DESIGN** | **DESIGN PLUS** | **DESIGN PREMIUM** |
| 12.3-inch multimedia display | ✓ | ✓ | ✓ |
| Toyota Touch 2 multimedia system | ✓ | ✓ | ✓ |
| Satellite navigation | ✓ | ✓ | ✓ |
| DAB reception | ✓ | ✓ | ✓ |
| Bluetooth | ✓ | ✓ | ✓ |

| | | | |
|---|---|---|---|
| Smartphone integration (Apple CarPlay & Android Auto) | ✓ | ✓ | ✓ |
| Voice recognition | ✓ | ✓ | ✓ |
| 14-speaker JBL premium sound system | ✓ | ✓ | ✓ |
| WiFi | ✓ | ✓ | ✓ |
| Wireless phone charger | × | × | ✓ |
| 8in colour multi-information display | ✓ | ✓ | ✓ |
| 10.1-inch colour head-up display | × | × | ✓ |
| MyT connected services | ✓ | ✓ | ✓ |
| USB ports (x2 front, x2 rear) | ✓ | ✓ | ✓ |
| USB device charger | ✓ | ✓ | ✓ |
| **EXTERIOR** | **DESIGN** | **DESIGN PLUS** | **DESIGN PREMIUM** |
| 19in 5-double-spoke silver alloy wheels | ✓ | ✓ | × |
| 20in 20-spoke black alloy wheels | × | × | ✓ |
| Power-adjustable, heated, retracting door mirrors with reverse tilt function and memory | ✓ | ✓ | ✓ |
| Door mirrors with reverse-tilt function and memory setting | × | ✓ | ✓ |
| Puddle lights integrated in door mirrors | × | ✓ | ✓ |
| Shark fin antenna | ✓ | ✓ | ✓ |
| Rear privacy glass | × | × | ✓ |
| Bi-tone paint finish with black roof | × | × | ✓ |
| Toyota Skyview panoramic roof with power sunshade | × | × | ✓ |

ENDS

Ref:210426M