This press pack accompanied the UK launch of the first generation Avensis in October 1997. UK-specific information can be found towards the end of the document. Some changes were made to the model during its time on sale, which can be tracked using the Timeline feature on the first generation Avensis archive web page. Additional assets and information relating to the first generation Avensis can be obtained from the Toyota press office if required.

TOYOTA AVENSIS

AVENSIS – NEW NAME, NEW CONCEPT….

Toyota's new mid-range car for Europe is so much more than a simple replacement for Carina E that is sports a new name – Avensis. Building on the solid reputation carved out by its predecessor, Avensis brings a new level of refinement and maturity to Toyota's mid-range European line-up.

Along with the radical new Corolla, it forms the core of Toyota's European line-up through the late 1990s and into the early years of the 21st century. Avensis and Corolla are the main models Toyota will use to reposition its image and become an aspirational brand for European car buyers.

Carina E was seen as functional and solid. Avensis shifts up a gear and is positioned as a prestigious, desirable car offering quality and integrity in everything it does.

AVENSIS HIGHLIGHTS

- A new, sophisticated model range especially designed for Europe comprising a refined four-door saloon, a sleek five-door liftback and a spacious five-door wagon. Clever packaging makes Avensis more compact outside, but more spacious inside.
- Active and passive safety measures take Avensis to the top of the class in Europe's family car market. The body effectively absorbs and disperses impact energy to give the best possible protection to driver and passengers. Front airbags and Bosh anti-lock brakes are standard equipment right across the Avensis range, while side airbags are standard on Linea Sol grade models and optional on Linea Terra.
- Avensis offers a confident blend of ride comfort, fine handling and class-leading high-speed stability.
- The adoption of front and rear sub-frames mounted by rubbers and more extensive use of vibration-dampening panels, asphalt sheets, composite foam sealing material

and various types of sound insulation material effectively contribute to better reducing noise, vibration and harshness (NVH)

- Avensis engines offer improved low and mid-range torque over Carina E but the car is three per cent more fuel-efficient in the practical driving range, in accordance with Toyota's environmental considerations.
- Generous standard equipment includes Bosch anti-lock brakes, front airbags, power steering, keyless entry, front power windows with key-off operation, clock with external temperature display and electrically adjustable door mirrors.
- Resistance to damage and ease of repair, allied to advanced theft-prevention equipment will mean lower insurance rates than were possible with Carina E

STYLING

Sophisticated looks…

The release of Avensis, following hard on the heels of the appearance of a new-generation Corolla, marks the beginning of a new chapter for Toyota in Europe.

The Carina E and previous Corolla were well-regarded in terms of build quality, reliability and value for money, but perceived to be lacking in emotion, individuality and riving enjoyment. At the same time, product differentiation between Carina E and Corolla was uncertain.

All that has changed. The new Corolla has an eye-catching shape and an appealing 'insect eye' face. Avensis, in contrast, shows a mature and refined style. Both cars appeal more directly tom their target audience and stand out from the crowd as they never did before. European car buyers increasingly take value for money and reliability for granted and Toyota has responded by making Corolla, and now Avensis, image leaders in their respective segments.

Toyota's vision for Avensis was to harmonise Japanese elegance with European dynamics and this was achieved by a close working relationship between Japan-based designers and a European design panel composed of Toyota Motor Europe Marketing and Engineering (TMME) personnel and Toyota distributors from around Europe.

An evolutionary approach…

Toyota chose to follow and evolutionary path for styling development because typical Carina E buyers tended to be quite traditional in their tastes. Avensis will appeal to this

core audience (loyalty to Carina E was the highest in its segment in almost every European country, ahead of Audi and BMW) but its handsome looks should also attract new customers who currently buy competitors' models.

Dynamism, elegance and sportiness were the key criteria for the design programme, qualities suggested by the 'Avensis' name, according to Toyota's research.

Exterior design story…

The saloon was dealt with first because its styling would lay down key markets for the liftback and wagon. The Toyota chief engineer visited six European countries in June 1993 to discuss objectives for the new car and this input was the starting point for designers.

A few months later, several computer-generated evolutions of Carina E were circulated to TMME and some of its distributors. This European Design Panel played a key role at all stages of the development programme. Its opinions were a strong influence on the Avensis programme, although Toyota executives in Japan were responsible for signing the design off.

The programme began in earnest with a series of discussions between Japanese designers and this European panel. By November 1993 nine ideas were ready to go forward for preliminary selection. Two made the grade and underwent further development but this, Toyota decided, was too narrow a focus and it encouraged designers to come up with alternative sketches. A further seven ideas eventually progressed to the next stage along with the two existing themes.

The production of half a dozen one-fifth scale clay models was okayed after a Design Panel meeting held in March 1994. The most promising pair of renderings were turned into full-scale clays three months later. The basic shape of the saloon was now beginning to emerge but European distributors felt that its face was a little bland and asked to see a design incorporating four individual headlamps and a more sculpted bonnet.

Although the quad-lamp idea was not eventually accepted, the move towards a shapelier nose architecture can be seen in the production car, exemplifying the advisory role played by TMME in the design process. Further discussion led to a longer wheelbase

and minor revisions to the car's grille and bumper. By the end of 1994 the Avensis face had acquired its final form.

Meanwhile, work was proceeding on the saloon's rear end. Although several designs were proposed, in August 1994 one of them, boasting clean, elegant lines, was clearly the strongest and topped the selection vote just eight weeks later.

It was time to apply the Avensis look to the liftback and wagon. The fact that this process was relatively straightforward says a lot for the cohesion of the saloon's design.

Toyota wanted the Avensis wagon to show a greater degree of surface tension and dynamism than the Carina E wagon but decided early on to retain its neat tail lights which by coincidence closely mirrored the shape of the Avensis's headlights.

Early sketches for the liftback evolved from shapes close to the saloon towards a much sportier coupe-like profile.

Four-door saloon…

Distinguished by its chiselled sheet metal, the Avensis saloon presents a tauter shape and more dynamic profile than did Carina E. This has been achieved by pushing forward the cowl and the A-pillar and slightly shortening the vehicle's overall length, at the same time stretching the wheelbase and truncating front and rear overhangs.

The B-pillar is raked forward to echo the shut line of the rear door and create a sense of momentum. This forward thrust flows from a sharply drawn rear end topped off by a subtle, integrated lip spoiler. Classy combination lights frame the boot shut-line and wrap around the corners to unite rear and flanks. A slightly concave rocker panel gives a subtly arched line to the lower edge.

The result is a modern, cab-forward design that imbues Avensis with the kind of presence normally associated with larger cars. Toyota hopes it will appeal strongly to young families.

Five-door liftback…

As a style and image leader in the Avensis series, the liftback offers a dynamic variation on the design theme established by the saloon. Far sportier than its counterpart in the

old Carina E range, the Avensis liftback has a raked and tapered roof which sweeps down towards the rear deck. Other stand-out points are a slim, steeply raked C-pillar design and a sharply tilted back door panel. These elements combine to create a coupe-like profile.

Wagon…

The wagon shares the Avensis family face and its fine aerodynamic performance.

It is unusually open around the rear quarter window and the roof line has been raised slightly to create a simple, elegant line, flowing from the A-pillar back to the arched D-pillar. A roof rail is fitted as standard equipment. The main mass of the body closely follows the pattern set by the saloon and liftback.

Toyota tried to keep the design clean and uncluttered and, as a result, the wagon expresses an unruffled European sportiness.

Interior design story…

The Avensis's interior has an ambience more akin to the interior of a home than a car. In form, colour and materials, it is tuned to European tastes. The key player here was EPOC, Toyota's European design studio which was established eight years ago next to Toyota Motor Europe Marketing and Engineering's technical centre at Zaventem, Belgium. EPOC collated information on European design trends and clearly took the lead on colour and trims for the new Avensis.

European distributors offered a great deal of input during a series of tests held in November 1996 and , right up to the last minute, the design team continued to make improvements in the light of comments from the European Design Panel. After studying the final cabin proposal, for example, the panel asked for re-design of the centre console and higher quality switchgear.

The structure of the car's seats was another task given over entirely to European technicians, as was the design of Avensis's elegant wheels.

The Avensis environment…

Subtle dash architecture houses easily legible meters and logically laid-out high-quality switchgear.

The speedometer houses an integrated electrronic odometer/tripmeter. In similar fashion, the rev counter has an LCD clock and outside temperature indicator which flashes a warning if it reads at or below +3°C.

The centre console and the switch cluster beside the main instrument binnacle use a new type of plastic covered with a special film. This material, called Stone Panel, has the sheen and tactile qualities of Japanese lacquer ware. All switches and control panels in this central console are recessed so that the whole surface is flush.

Numerous cubbyholes and storage pockets are scattered around, the largest being a one-litre (DIN) centre console box which has ribs on one side that can accommodate eight music CDs. There is also a pocket in the door trim to store smaller items such as sunglasses and a cup holder just forward of the centre console box.

Fresh colour schemes…

There are two fresh, modern colour schemes – one based on a light grey, the other on green. Bother offer a fresh, modern style that compliments the car's refined exterior styling. The green is a contemporary shade warmed by beige carpeting while the grey is sophisticated and progressive.

New directions were also explored for the exterior colours. A wide-ranging study came up with three trends that Toyota believes will become increasingly influential in the years ahead.

Three natural themes were used. 'Autumn leaves' suggested deep, striking colour attractive to families and middle-aged buyers. 'Deep forest' focuses on classic, refined colours that would appeal to more conventional buyers and to the fleet market. 'Late summer' gave rise to soft pastel shades that reflect the tastes of younger customers.

These themes led directly to three new colours. Autumn leaves inspired a rich, burnished red called Bordeaux; deep forest led designers to Baltic Green; and late summer gave rise to the individualistic Cactus.

These three newcomers are complemented by six existing colours: Pure White, Polar Silver, Satin Black, Night Shadow, Solar Red and Racing Green. A daring, high-impact Electric Blue completes the palette.

Exterior colours and interior trims are carefully matched to offer a series of pleasing combinations.

SAFETY

Body…

Avensis boasts a level of active and passive safety that takes it to the top level the class in Europe's family car market.

Avensis withstands impacts better than Carina E, meeting Toyota's latest, strict, in-house crash resistance parameters, and it goes further than all current and future frontal and side-collision regulations in Europe. The body architecture absorbs and disperses impact energy, as do energy-absorbing pads inside the doors.

High-strength front and rear door locks add to the security of a state-of-the-art survival cell.

The entire body structure is designed to absorb and disperse energy in order to cushion occupants from any impact.

Interior…

The dual airbags fitted as standard to Avensis are bigger than those found in Carina E (driver's bag capacity is now 60 litres; the passenger's bag 110 litres).

Occupants are restrained by three-point seatbelts. Front seatbelts have an electric pretensioners and force limiter.

Side airbags are standard on Linea Sol and optional equipment on Linea Terra.

Safety considerations for head impact protection led Toyota to insert more padding into the cabin roof and upper frame, in order to dampen impact injuries to the head in the event of an accident.

In a frontal collision, driver and passenger can be hurt by flying luggage if the rear seat latches give way and bags are unsecured. Avensis has extremely strong rear seat back frames and latches and a warning system comes into play if the seat is improperly fastened.

Four hooks are built into the deck of the luggage compartment to make the task of securing bags easy. Because of its higher load lugging capacity, the qagon model also has a protective net to hold baggage in place.

Chassis…

Bosch anti-lock brakes (ABS) are standard equipment right across the range. Suspension is fine-tuned to cope with an unexpected emergency manoeuvre.

HANDLING AND DRIVING STABILITY

Avensis dynamics – re-inventing Carina E…

Engineers at Toyota's European headquarters near Brussels are proud of the 'fun to drive' factor they have injected into Avensis.

The team set out to re-invent Carina E by striking a balance of ride comfort, dynamic handling and stability. Treating Carina E's chassis as a blank canvas, it stretched the wheelbase and thoroughly reworked the suspension set-up.

Exhaustive testing in Europe…

An exhaustive test programme, initiated more than two years ago, gave the engineering team twice as much time to localise the car's character as they had been given for Carina E. They used this opportunity to transform the chassis from a solid but uninspired performer into a platform capable of taking on the very best in Europe.

The tuning process was painstaking and methodical, involving a full year of test drives 0- using mules powered by petrol and diesel engines – to experiment with new chassi variations.

First, test beds were assessed with zero damping in order to set sping rates for optimum front/rear balance. At the same time the steering gear ratio and pump pressure were fixed. Working closely with local suppliers, the shock absorbers were then tuned in three stages by extended tests over a variety of roads, ranging from bone-jarring Belgian cobbles to challenging English country roads.

Feedback from test drivers and state-of-the-art instrumentation led engineers to fit a front assist link to the suspension in pursuit of responsiveness and steering feel.

Steering feel was also enhanced by a PCF (Positive Centre Feel) mechanism which gives more immediate responsiveness at and around the neutral position.

At the rear, MacPherson struts with newly arranged dual links contribute to the car's stable, predictable handling.

The rear suspension is mounted differently to Carina E, effectively reducing roll and, like the dual link struts, improving adhesion to the road.

A rod connecting right and left rear suspension towers with the tonneau cover makes the wagon additionally resistant to scuttle and shake by improving body rigidity. The same technique was used in the liftback, although its stiffening rod is place further forward, running across the body through the rear section of the front floor side-member.

A performance rod has been added to the rear suspension member to increase rigidity and improve driving stability.

Carina E was very stable and predictable in its handling but offered little to the enthusiastic driver. Avensis is a different animal, as Tsuyoshi Adachi, the man in charge of the test programme, explains: "Carina E was a car to drive from A to B. Now there is also commitment to the driver; to driving pleasure."

The buzz phrase right through the development programme, which drew in more than 500 people for four years, was 'handling with ride'.

RIDE COMFORT

A new level of ride comfort…

Over the last few years, Europe's mid-range segment has scaled new heights of engineering excellence. Avensis sets out to challenge the boundaries set by current class leaders.

New seats are best in class…

New seats were designed from scratch to help Avensis compete against higher quality competitors than those which Carina E had to face. Early on, a dedicated Toyota team had brainstorming sessions with personnel from a British supplier and its America R&D

centre in order to define a set of goals for comfort and support and suggest ways in which the seats could best be balanced with a new suspension system.

A smaller team used pressure distribution sensors and an array of computerised instrumentation to hone the basic design. After the full team re-assembled to give further input, a series of long-distance test drives began.

Again and again, Avensis produced the lowest level of driver and passenger fatigue over long journeys.

The same intensive R&D effort went into the rear seats. The centre berth has a headrest and its back can fold forward to form a tray with cup holders.

Cabin sits on rubber bushings…

The car's smooth, supple ride stems from its construction as well as an advanced seat design. Whereas Carina E's body was bolted directly onto the chassis, Avensis's front and rear sub-frames sit on rubber bushings so that occupants sit in an oasis of calm, isolated from noise caused by road surfaces.

It sounds like a simple change, but the engineering challenge is formidable because bushings, while enhancing ride comfort, negate handling. To counteract this tendency, bodyshell and sub-frame both have to be exceptionally rigid.

Engineers concentrated on minimising noise intrusion at frequencies above 500Hz because the average sound frequency of European conversations, described as the 'centre of speech' is 1,600Hz. Reduced noise in this band is really noticed by occupants.

Once again, Toyota's determination not to fall short of its own world-beating standards led to intense scrutiny of every aspect of the car's construction. Other sound and vibration damping measures include: -

- Additional damping and sound insulation material
- Redesigned outside door mirrors to reduce wind noise
- Flush surface of front and rear window moulding to reduce wind noise
- Addition of foamed urethane in pillar to reduce wind noise
- New intake and exhaust manifolds to make the engines run quieter

- A special bending damper that cuts engine vibration controlling crankshaft movement
- A layer of sealing material to bond the instrument panel and windshield
- Double sealing on all doors
- A liner for the rear wheel housing to soak up the noise created by sand and pebbles kicked up by tyres
- A new undercover design for the front passenger side

ENGINES

Improved range of engines…

Avensis is powered by the same range of engines as Carina E but they have been refined and re-mapped to offer more urge at low and medium engine speeds and more kilometres per litre.

The drive to suppress noise and increase occupant protection and body rigidity makes Avensis 50kg heavier than Carina E. Even so, it is three per cent more fuel-efficient in 'real-life' driving conditions, an improvement brought about by a more efficient engine management system, low roll-resistance tyres, an aerodynamically efficient shape and a stae-of-the-art drive-by-wire throttle system. Engineers also experimented with final drive ratios to get the optimum balance of performance and frugality.

The performance of the 2.0-litre SC-TE diesel is enhanced by means of an effective charge air intercooling system and a sophisticated electronically controlled throttle. It does away with the traditional accelerator cable and instead uses a sensor to monitor the way in which the driver depresses the accelerator pedal, constantly feeding information to an ECU. This electronic brain in turn controls the throttle valve in the engine offering the driver drive-by-wire acceleration, a feature offered by very few cars in the Avensis class.

Buyers in Europe can choose between four engines. All Avensis motors adopt lightweight aluminium radiators.

- 1.6-litre (1,587cc) 16-valve DOHC in-line-4 (4A-FE stoichiometric)
    - The intake manifold has been lengthened and the capacity of the intake chamber reduced to improve dynamic performance. The two components have been integrated into a single unit, saving weight and making the engine easier to manufacture.

    - Power up nearly four per cent to 81kW @ 6,000rpm.
    - Torque climbs to a peak 145Nm, kicking in at 4,800rpm compared with the previous 5,200rpm.

- 1.6-litre (1,587cc) 16-valve DOHC in-line-4 (4A-FE Lean-burn)
    - A similar intake manifold/intake chamber redesign also benefits the lean-burn version of the Avensis 1.6.
    - A new fuel delivery system, called Toyota Direct Injection (TDI), makes the engine more reliable, reduces electromagnetic interference and eliminates the need to adjust ignition timing.

      An electronic control unit manages a pair of integrated ignition coils and igniters (one connected to the iridium spark plugs firing up cylinders one and four; the other connected to cylinders two and three), and a couple of sensors monitoring the position of camshaft and crankshaft to ensure optimum performance.
    - Power edges up from 73kW to 74kW at 5,800rpm.
    - Torque climbs 4.6 per cent to 136Nm at 4,400rpm. The Carina E 1.6 lean-burn did not achieve peak torque until 4,600 – 5,200rpm.
- 1.8-litre (1,762cc) 16-valve DOHC in-line-4 (7A-FE Lean-burn)
    - Like the 4A-FE Lean-burn, the 7a-FE uses the Toyota Direct Injection system. It also adopts an integrated intake manifold.
    - Maximum output rises 2.5 per cent to 81kW at 5,600rpm, while peak torque is up four per cent to 155Nm at 2,800rpm.
- 2.0-litre (1,998cc) 16-valve DOHC in-line-4 (3S-FE)
    - The 2C-TE now boasts electronic rather than mechanical fuel injection, an electronically operated diesel throttle and an intercooler – a new package that greatly improves dynamic performance and driveability. A cooling air inlet in the front bumper and expulsion of warm air through slots in the wheel arch lining ensure air flow through the charge air intercooler.
    - Power has been lifted by nearly eight per cent to 66kW at 4,000rpm and torque also rises 17 per cent, to 203Nm at 2,200rpm.

POWERTRAIN

Transmission…

A five-speed manual transaxle (transmission and differential) is standard on all Avensis models. Application of the triple-cone type multi-synchromesh mechanism previously ised in the second gear of Carina E's 3S-FE engine has been widened to include the diesel engine (2C-TE), enhancing shift response and durability.

Avensis customers who prefer automatic shift get an electronically controlled four-speed auto transaxle, available on certain models powered by the 1.8 and 2.0-litre petrol engines.

MARKETING AND SALES

A new grade strategy…

Toyota introduced a user-friendly grade system when it launched the new Corolla in the summer of 1997. It is a policy that will be continued with Avensis and all future Toyota model launches in Europe. Instead of simply differentiating models by price, targeted lifestyle packages have been put together to suit a wide spectrum of potential buyers.

Different Carina E models are best-sellers in different European markets. In Greece and Ireland, the 1.6 saloon is the most popular variant; in France it is the diesel liftback; in the UK it is the 1.8 liftback. The goal of the new grade strategy is to come up with a core volume seller that will sell well right across the region.

The XL and Gl grades have been combined in Linea Terra, which offers better equipment than GL and better value than XL. To illustrate the results of this change, XL upholstery has been scrapped and higher quality GL velours offered as standard.

A more luxurious grade, Linea Sol, is added to move Avensis's reputation above Carina E. Linea Sol takes Avensis into the near-luxury category, offering existing buyers an aspirational upgrade and going head-to-head with the strongest competitors.

On both cars, specifications will be as far as possible pan-European, making it easier to communicate the Avensis message on a trans-national basis.

Avensis will be key weapon for Toyota in Europe…

Toyota will use Avensis to build on the solid platform established by Carina E since 1993, its first full year of production in the UK. For four years through 1996 it consistently enjoyed a D-

segment market share of close to four per cent. In 1996 Carina E accounted for just over a third of Toyota's European passenger car sales and about a tenth of its worldwide car sales.

Avensis is tasked with raising Toyota's D-segment business in Europe by 15 per cent, equivalent to sales of 130,000 units in 1998 and 137,000 in 1999. It will do this by commanding the loyalty of existing Carina E owners, making conquest sales by virtue of its emotional styling and fine handling, and through a sustained assault on Europe's fleet market.

Toyota aims to sell a total of 600,000 vehicles in Europe in 2000.

MANUFACTURING – THE TOYOTA PRODUCTION PHILOSOPHY

At the heart of the Toyota approach to manufacturing lies one simple proposition: "Employee motivation is key to customer satisfaction."

The Toyota approach is to give responsibility to workers at lal levels in order to involve them as individuals in the development and aims of the production system. Toyota's workers – or members – are encouraged to know and understand the company's business and technical processes, to challenge their own standards and seek constant improvement.

To assist this process of empowerment the company deliberately maintains a flat organisational structure, offers job security, excellent training and development, good remuneration and real opportunities for promotion. It places great emphasis – through the unique Toyota team structure – on good internal communications.

Every member benefits from one of the most thorough training programmes offered by any manufacturer anywhere in the world. Having a workforce trained to be multi-skilled, flexible and highly motivated means the company can respond quickly to fluctuations in demand for its products without placing individuals under too much pressure or threatening their jobs.

Many years of experience have taught that individuals work best as members of relatively small, supportive teams and the ability to function well as one of a team is the key criterion of the company's employee selection procedures – more important even than previous motor industry experience. In fact, 90 per cent of those who join Toyota UK have no experience of motor manufacturing.

Through their teams the members effectively take control of, and full responsibility for, the entire production process. Indeed, through a procedure called *Andon*, any member can call a halt to the production process if they judge it necessary.

The result is a workplace culture in which the reward for shared responsibility is shared success and concern for quality is a way of life, where every member can contribute positively to the improvement of their own work conditions, the work process and the product itself.

All these principles are also extended to Toyota's suppliers. For Toyota, suppliers are not outsiders to be beaten down on cost, but fellow professionals whose opinions and expertise are valued. Significant resources are devoted to helping Toyota's industry partners to develop, restructure and improve their practices and processes.

The Toyota Production System (TPS)

The practical expression of Toyota's people and customer-oriented philosophy is known as the Toyota Production System, or TPS. This is not a rigid, company-imposed procedure, but a set of principles that have been proven in day-to-day practice over many years.

Many of these ideas have been adopted and imitated all over the world.

***Kaizen* – continuous improvement**

Kaizen is the heart of the Toyota Production System.

Like all mass-production systems since Henry Ford's, the Toyota process requires that all tasks, both human and mechanical, be very precisely defined and standardised to ensure maximum quality, eliminate waste and improve efficiency.

Toyota members have a responsibility not only to follow closely these standardised work guidelines, but also to seek their continual improvement. This is simply common sense – since it is clear that inherent efficiencies or problems in any procedure will always be most apparent to those closest to the process.

The day-to-day improvement that members and their team leaders make to their working practices and equipment are known as *Kaizen*. But the term also has a wider meaning: it means a continual striving for improvement in every sphere of the company's activities –

from the most basic manufacturing processes to serving the customer and the wider community beyond.

Just In Time

It is perhaps not widely known that the ‘just in time’ approach to production that has now gained almost universal acceptance in world manufacturing was actually pioneered by Toyota.

This, too, is a simple but inspired application of common sense.

Essentially ‘just in time’ manufacturing consists of allowing the entire production process to be regulated by the natural laws of supply and demand.

Customer demand stimulates production of a vehicle. In turn, the production of the vehicle stimulates production and delivery of the necessary parts… and so on.

The result is that the right parts and materials are manufactured and provided in the exact amount needed – and when and where they are needed.

Under ‘just in time’ the ultimate arbiter is always the customer. This is because activity in the system occurs only in response to customer orders. Production is ‘pulled’ by the customer rather than being ‘pushed’ by the needs or capabilities of the production system itself.

The link between customer demand and production is made by analysing takt time, a device for measuring the pace of sales in the market in relation to the capacity of a manufacturing plant. For example, if a plant operates for 920 minutes a day and daily demand is for 400 vehicles, then takt time per vehicle will be 2.3 minutes.

If takt times are reduced, more resources are allocated. Toyota never tries to accommodate chances in demand by making substantial changes in individuals’ workloads.

Assigning more members to a line means that each handles a narrower range of work. Assigning fewer means that each handles a broader range. Hence the paramount importance of having a well-trained, flexible and multi-skilled workforce.

Within a Toyota plant itself, the mechanism whereby production is regulated in this way is known as the *Kanban*.

A *Kanban* is simply a message. For example, in the assembly shop at Burnaston this message takes the form of a printed card attached to every component that is removed and returned when the component is used. The return of the *Kanban* to its source stimulates the automatic re-ordering of the component in question.

Paperwork is minimised, efficiency is maximised and the members themselves are completely in charge.

At Burnaston *Kanban* are collected and delivered by a member using a bicycle, simply because long experience has proven this to be the simplest and most effective method available.

Jidoka

In Japanese, *Jidoka* simply means automation. At Toyota it means "automation with a human touch".

In 1902 Sakichi Toyoda invented the world's first automatic loom that would stop automatically if any of the threads snapped. This principle, *Jidoka*, of designing equipment and processes to stop and call attention to problems immediately when a problem is sensed is a central concept of TPS.

The most visible manifestation of "automation with a human touch" at the Burnaston plant is the *Andon* cord situated above the line. The presence of the *Andon* cord permits any team members to intervene and bring production to a halt if abnormalities occur.

The Toyota Production System has inherited the principle originated by Henry Ford of breaking down work into simple steps and distributing those steps among employees on the line. But employees in the Toyota system are in charge of their own jobs. Through their teams, they run their own work sites. They identify opportunities for making improvements and take the initiative in implementing those improvements in co-operation with management.

Above all, the whole process is subordinate to the needs of the customer.

The Five Rs – minimising environmental impact

Toyota's commitment to the environment extends to all areas of its operations. IN 1992 the company established a set of environmental guidelines for all its subsidiaries worldwide. This is the Toyota Earth Charter. This new policy charged everyone within the business, as well as suppliers, with a responsibility not only to minimise environmental impact at every stage in the production cycle, but also to positively support and participate in environmental initiatives within host communities at large – even those having no connection with automotive production.

The Earth Charter encapsulated Toyota's environmental policy within five key principles, the five Rs: **Refine, Re-use, Recycle, Reduce waste, Retrieve energy**.

At Toyota's plants in the UK many innovations have been made within these guidelines. These include: -

- The use of water-based paints which drastically reduce volatile emissions.
- Installation of thermal oxidisers on all paint curing ovens, resulting in a 95 per cent reduction in solvent emissions.
- The use of clean natural gas in all boilers, with efficient burners that minimise nitrogen oxide emissions.
- The separation of rainwater run-off from trade effluent, which is treated to very high standards before being discharged into sewers.

In 1006, partly as a result of these initiatives, Toyota became the first British motor manufacturer to achieve certification under ISO 14001 for environmental management at its sites.

Being a good neighbour

The greatest contribution that Toyota makes to the communities in which it operates is the provision for large numbers of men and women of secure and rewarding employment.

The company's strong emphasis on buying supplies and services locally also contributes to this effect.

Being a good neighbour is one of Toyota's most basic operating philosophies; its active participation in the community takes many forms.

In just five years, close to 2,700 schools across the UK have benefited from the Toyota Science and Technology Education Fund.

In Derbyshire, a Community Liaison Committee provides a forum where Toyota can meet representatives of the wider community to exchange information and discuss local issues relating to Toyota UK.

The Toyota UK Social Fund supports more than 100 projects every years in Derbyshire and Deeside, from theatres and schools to the National Trust and Derby Breast Screening Unit.

Through continuous improvement and through faith in people, Toyota aims not just to deliver a superlative product like Avensis, but to enrich the lives of its customers and it workforces, and the communities to which they belong.

AVENSIS MARKET POTENTIAL

After seven generations and 236,000 sales in the UK, the Carina model will be replaced by the all-new Avensis from January 1998.

Toyota (GB) Ltd has sold 125,000 Carina E in the UK since the model was introduced in 1992 and in this, the Carina E's run-out year, sales have shown continued strength and are expected to exceed 21,000 – about the same as in 1996.

Year to date, Toyota (GB) Ltd has grown its total car sales by about 20 per cent compared to 1996, and the addition of Avensis is expected to continue this strong growth in 1998.

Toyota (GB) Ltd predicts next year's car market to plateau or even dip slightly. The ultra-competitive upper medium sector of the market in which Avensis will compete has accounted for 25 per cent of the total UK car market already this year and Toyota (GB) Ltd expects to sell 25,000 Avensis models in 1998.

Avensis will also be a key player in the fleet market where upper medium class vehicles account for more than 34 per cent of total UK fleet sales. Toyota (GB) Ltd expects fleet sales to account for 56 per cent of 1998 UK Avensis sales.

Best-selling model is tipped to be the Avensis 1.8 GS five-door Liftback model, while the turbodiesel models will account for around 13 per cent of Avensis sales volume.

BUILT IN BRITAIN

Avensis Saloon, Liftback and Estate models will be built at the Toyota Motor Manufacturing (UK) Ltd site at Burnaston, Derbyshire. Toyota is the only manufacturer to produce all body styles of its upper medium class car in the UK.

The Burnaston plant will build 130,000 new Avensis models in a full year's production. The highly economical Lean Burn 1.6-litre 16v and 1.8-litre 16v engines are sourced from the Toyota engine plant at Deeside, Clwyd, in Wales.

UK BADGING

The UK is not following the European mainland markets with the two-tier Linea Terra and Linea Sol range line-up as this is incompatible with the UK fleet and retail market, which demands more hierarchically clear derivatives. Therefore the UK range will start with the Avensis S model, followed by GS, GLS and CDX. All four badges and long-established designations for UK Toyota models.

STANDARD SPECIFICATION HIGHLIGHTS

Class-leading safety

All four Avensis specification grades feature standard-fit safety equipment that is the envy of the upper medium class.

Twin airbags, front side airbags, anti-lock brakes, five three-point seatbelts and electronic front seatbelt pretensioners with force limiters are standard-fit equipment on all Avensis models.

Going into more detail, all Avensis models feature anti-trap mechanisms for the one-touch close feature on the driver's window and power sunroof (GS grade upwards).

SPECIFICATION BY GRADE

The following table gives major standard specification items.

S	GS	GLS	CDX
Tilt adjust steering	✓	✓	✓
Height adjust seat	✓	✓	✓
Twin airbags	✓	✓	✓
Side airbags	✓	✓	✓
RDS radio cassette	✓	Radio cassette/single CD player	✓
Power steering	✓	✓	✓
Immobiliser	✓	✓	✓
Remote locking	✓	✓	✓
Five three-point seatbelts	✓	✓	✓
Power front windows	✓	✓	✓
Anti-lock brakes	✓	✓	✓
Tachometer	✓	✓	✓
Power mirrors	Heated power mirrors	✓	✓
Velour trim		Luxury velour trim	Leather upholstery
	Air conditioning	Leather steering wheel	✓
	Seat undertray	✓	✓
	Remote alarm	✓	✓
	Power sunroof	✓	✓
	15in wheels	✓	15in alloy wheels
		Full colour-keyed body	✓
		Front fog lamps	✓
		Mud flaps	✓
		Chrome grille	✓
		Power rear windows	✓

2.0-litre 16v GLS/CDX models also have climate control air conditioning.

TECHNICAL SPECIFICATIONS

DIMENSIONS & CAPACITIES			
Exterior dimensions			
	Saloon	**Liftback**	**Wagon**
Length	4,490mm	4,490mm	4,570mm
Width	1,710mm	1,710mm	1,710mm
Height	1,425mm	1,425mm	1,425mm
Wheelbase	2,630mm	2,630mm	2,630mm
Track (front)	1,480mm	1,480mm	1,480mm
Track (rear)	1,450mm	1,450mm	1,450mm
Overhang			
Front	875mm	875mm	875mm
Rear	985mm	985mm	985mm
Interior dimensions			
Length	1,930mm	1,930mm	1,930mm
Width	1,455mm	1,455mm	1,455mm
Height	1,160mm (1,110mm*)	1,160mm (1,110mm*)	1,170mm (1,120mm*)
Boot space			
Luggage capacity	500l	500l	530l/1,000l with rear seats folded
Fuel tank capacity	60l	60l	60l
Weights			
Kerb weight (min).	1,195 – 1,280kg	1,225 – 1,300kg	1,240 – 1,315kg
Gross vehicle weight	1,730 – 1,830kg	1,730 – 1,830kg	1,730 – 1,830kg
Towing capacity (braked)	1,300kg	1,300kg	1,300kg
Towing capacity (unbraked)	500kg	500kg	500kg
Drag coefficient (Cd)	0.28	0.28	0.31

* with sunroof

ENGINES	
1.6-litre Petrol Engine	
Engine type	4A-FE Stoichiometric engine
No of cylinders and arrangement	4-cylinder, in-line
Valve mechanism	16-valve DOHC, belt drive
Block material	Steel
Head material	Aluminium
Capacity	1,587cc
Bore x stroke	81.0 x 77.0
Compression ratio	9.5:1
Fuel injection type	Electronic fuel injection
Ignition system	Transistorised
Octane rating	95 Ron
Max. output	81kW.6,000rpm
Max. torque	145Nm/4,800rpm
1.6-litre Lean-burn Petrol Engine	
Engine type	4A-FE Lean-burn engine
No of cylinders and arrangement	4-cylinder, in-line
Valve mechanism	16-valve DOHC, belt drive
Block material	Steel

Head material	Aluminium
Capacity	1,587cc
Bore x stroke	81.0 x 77.0
Compression ratio	9.5:1
Fuel injection type	Electronic fuel injection
Ignition system	Toyota Direct Ignition
Octane rating	95 Ron
Max. output	74 kW/5,800rpm
Max. torque	136Nm/4,400rpm
1.8-litre Lean-burn Petrol Engine	
Engine type	7A-FE Lean-burn engine
No of cylinders and arrangement	4-cylinder, in-line
Valve mechanism	16-valve DOHC, belt drive
Block material	Steel
Head material	Aluminium
Capacity	1,762cc
Bore x stroke	81.0 x 85.5
Compression ratio	9.5:1
Fuel injection type	Electronic fuel injection
Ignition system	Toyota Direct Ignition
Octane rating	95 Ron
Max. output	81kW/5,600rpm
Max. torque	155Nm/2,800rpm
2.0-litre Petrol Engine	
Engine type	3S-FE
No of cylinders and arrangement	4-cylinder, in-line
Valve mechanism	16-valve DOHC, belt drive
Block material	Steel
Head material	Aluminium
Capacity	1,998cc
Bore x stroke	86.0 x 86.0
Compression ratio	9.8:1
Fuel injection type	Electronic fuel injection
Ignition system	Toyota Direct Ignition
Octane rating	95 Ron
Max. output	94kW/5,400rpm
Max. torque	178Nm/4,400rpm
2.0-litre Turbodiesel Engine	
Engine type	2C-TE
No of cylinders and arrangement	4-cylinder, in-line
Valve mechanism	8-valve OHC, belt drive
Block material	Steel
Head material	Aluminium
Capacity	1,975cc
Bore x stroke	86.0 x 85.0
Compression ratio	23.0:1
Fuel injection type	Electronic fuel injection
Cetane rating	48
Max. output	66kW/4,00rpm
Max. torque	203Nm/2,200rpm
TRANSMISSION	
Transmission type	Front-wheel drive

Gearbox type			5-speed manual or 4-speed automatic	
Ratios (manual)	**4A-FE**	**7A-FE**	**3S-FE**	**2C-TE**
1st	3.545	3.545	3.285	3.538
2nd	1.904	1.904	1.960	2.041
3rd	1.310	1.310	1.322	1.322
4th	0.969	1.031	1.028	0.945
5th	0.815	0.815	0.820	0.731
Reverse	3.250	3.250	3.153	3.153
Differential	4.058	3.941	3.944	3.736
Ratios (auto)	**7A-FE**		**3S-FE**	
1st	4.005		3.643	
2nd	2.208		2.008	
3rd	1.425		1.296	
4th	0.981		0.892	
Reverse	3.272		2.977	
Differential	2.962		3.178	
SUSPENSION				
Front			MacPherson strut type with L-shaped lower arm	
Rear			MacPherson strut type with dual link	
STEERING				
Steering gear type			Rack and pinion	
Steering gear ratio			44.08	
Power steering type			Integral	
Turns lock-to-lock			3.0	
Min. turning radius – body			5.8m	
Min. turning radius – tyre			5.4m	
BRAKES				
Type – front			Ventilated discs	
Type – rear			Leading-trailing drum	
Brake booster, type and size			Single booster, 9in	
Proportioning valve type			Dual P-valve	
ABS			Standard	
WHEELS AND TYRES				
Wheels			Steel 14 or 15in	
			Alloy 15in	
Tyres			185/65HR14 or 195/60HR15	

PERFORMANCE

	1.6	1.6 Lean-burn	1.8		2.0		2.0 TD
	5MT	5MT	5MT	4AT	5MT	4AT	5MT
Max. speed (km/h, saloon & liftback)	195	190	195	185	205	200	180
Max. speed (km/h, wagon)	190	185	190	180	200	195	175
0-100km/h (saloon & liftback)	11.7	12.1	11.0	12.2	9.3	10.6	12.0
0-100km/h (wagon)	11.9	12.3	11.2	12.4	9.5	10.8	12.2
0-400m	18.0	18.1	17.6	18.5	16.8	17.6	18.1

(saloon & liftback)							
0-400m (wagon)	18.1	18.2	17.7	18.6	16.9	17.7	18.2
FUEL CONSUMPTION							

Engine	**1.6**		
Transmission	5MT		
Body style	Saloon & liftback		Wagon
IW class	1,250kg	1,360kg	1,360kg
CO2 mass emission (g/km)	183	185	192
Urban (l/100km)	10.6	10.8	11.0
Extra urban (l/100km)	6.1	6.1	6.5
Combined (l/100km)	7.7	7.8	8.1

Engine	**1.6 Lean-burn**		
Transmission	5MT		
Body style	Saloon & liftback		Wagon
IW class	1,250kg	1,360kg	1,360kg
CO2 mass emission (g/km)	169	174	182
Urban (l/100km)	9.4	9.7	9.9
Extra urban (l/100km)	5.9	6.0	6.3
Combined (l/100km)	7.1	7.3	7.6

Engine	**1.8**			
Transmission	5MT			
Body style	Saloon & liftback		Wagon	
IW class	1,250kg	1,360kg	1,360kg	1,470kg
CO2 mass emission (g/km)	169	176	183	185
Urban (l/100km)	9.3	9.6	10.0	10.1
Extra urban (l/100km)	5.9	6.2	6.4	6.5
Combined (l/100km)	7.1	7.4	7.7	7.8

Engine	**1.8**			
Transmission	4AT			
Body style	Saloon & liftback		Wagon	
IW class	1,250kg	1,360kg	1,360kg	1,470kg
CO2 mass emission (g/km)	198	200	203	206
Urban (l/100km)	11.5	11.7	11.6	11.7
Extra urban (l/100km)	6.5	6.6	6.8	6.9
Combined (l/100km)	8.3	8.4	8.5	8.6

Engine	**2.0**		
Transmission	5MT		
Body style	Saloon & liftback		Wagon
IW class	1,250kg	1,470kg	1,360/1,470kg
CO2 mass emission (g/km)	195	197	202
Urban (l/100km)	11.2	11.3	11.5
Extra urban (l/100km)	6.5	6.6	6.8
Combined (l/100km)	8.2	8.3	8.5

Engine	**2.0**		
Transmission	4AT		
Body style	Saloon & liftback		Wagon
IW class	1,250kg	1,470kg	1,360/1,470kg
CO2 mass emission (g/km)	212	215	217
Urban (l/100km)	12.2	12.4	12.4
Extra urban (l/100km)	7.0	7.0	7.2
Combined (l/100km)	8.9	9.0	9.1

Engine	**2.0 TD**			
Transmission	5MT			
Body style	Saloon & liftback		Wagon	
IW class	1,360kg	1,470kg	1,360kg	1,470kg
CO2 mass emission (g/km)	172	174	174	176
Urban (l/100km)	8.5	8.5	8.5	8.6
Extra urban (l/100km)	5.2	5.4	5.4	5.5
Combined (l/100km)	6.4	6.5	6.5	6.6