# TECHNICAL

### ALL-NEW 300 SERIES LANDCRUISER

A look at what's under the skinof the latest generation of one of the world's most iconic -over-Frame vehicles – Part I



he recently released (world premiere in June of this year), flagship full-size SUV from Toyota is still immediately identifiable as a Landcruiser (certainly since the introduction of the 80 series back in 1990) – and is the latest iteration of a platform that dates back to 1951, when Toyota began manufacturing the Willys Jeep spec'd BJ prototype for the US government, before the "Landcruiser" nameplate was adopted in 1955.

#### **EVOLUTION RATHER THAN REVOLUTION:-**

Unlike several other vehicle-makers that have made significant changes over the years to their full-size off-road legacy platforms, the Landcruiser has always been a "body & chassis" configuration, and is Toyota's longest running series of models. Sales reached the landmark figure of 10 million units in 2019.

The new model features a substantial number of changes across the entire vehicle platform (as would be expected, with the outgoing 200 series having been in production for almost 14 years).

While exterior dimensions including length, total width and wheelbase remain substantially the same as the 200 series (as does the departure and approach angles), significant electronic and mechanical improvements / upgrades include :-

- Adaptive Variable Suspension (AVS).
- Electronic Kinetic Dynamic Suspension System (E-KDSS) for the GR Sport model.
- An advanced Multi-Terrain Select system.
- A Multi-Terrain Monitor system incorporating an under-body camera that provides a virtual view of the underside of the vehicle.
- An improved suspension structure which lowers the centre of gravity and improves weight distribution.
- The V8 engine options have been discontinued in favour of a more powerful 3.4 litre twin turbo V6 petrol, and 3.3 litre V6 diesel.
- A 10 speed automatic transmission.
- Heads Up Display (HUD) and autonomous emergency braking.
- 10 airbags on all model variants.
- A 200 kilogram overall weight reduction.



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#### AN IN-DEPTH LOOK AT THAT SIGNIFICANT WEIGHT REDUCTION:-

While some savings can be attributed to the smaller, lighter and more (powerful) fuel-efficient engines, with a corresponding smaller capacity fuel tank, most of the weight reduction was achieved by the introduction of new mixed material technologies for the upper body, and the use of Advanced High Strength Steel (AHSS) combined with cutting edge production processes, for the full-frame.

Toyota have expanded their range of platforms that are derived from the Toyota New Global Architecture **(TNGA)** philosophy.

**TNGA** platforms (**TNGA – B** for subcompacts eg. Yaris, and **TNGA – C** for compacts eg. Corolla) are designed to simplify the production process by standardising key components, such as steering systems, shifters, pedals, seat frames and airbags / SRS systems. TGNA costs 20% less to produce while increasing structural stiffness, lowering the centre of gravity for better handling, and lowering the bonnet / windscreen line-of-sight for better forward visibility.



Landcruiser 300 series sees the first application of **TNGA -F**, which will underpin other Toyota body-on-frame,full size SUV's and light commercials (utilities), in the future.



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#### THE BODY IN WHITE (BIW) - UNIBODY STRUCTURE : -



2 grades of Ultra High Strength Steel (980 to 1180 MPa tensile strength) for the sill / rocker reinforcements, cant rail reinforcements and front screen pillar stiffeners. 780 MPa high tensile steel connecting the upper hoodledge to the screen pillars and firewall / bulkhead areas.



Hot-Stamped steel is used in the front screen inner pillars, forward cant rail area and B pillar reinforcements. Note the two longitudinal box – section HSS braces (780 MPa tensile strength) that pass over the centre floor tunnel and connect the rear seat pan to the bulkhead.



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Bolt-on (closure panels) are now made entirely from 6000 series aluminium – including front and rear door shells, bonnet, front guards, and tailgate. The roof skin is also made of alloy and is connected directly to the steel super-structure by an entirely new connection method (more on that in **Part II**).

#### THE FULL-FRAME CHASSIS :-



Almost all of the metals used for the full-frame are of high strength steel – note the use of 780 MPa HSS for the front cab mounts and gusset plates to stiffen / strengthen the torque box and kick-up areas. The longitudinal side members incorporate three different grades of high tensile steel. The bolt-on front crash beam is made of aluminium.



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Tailor - welded blank technology enables these different strength steels to be combined into a single stamping -









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The strategic placement and usage of these High Tensile Strength steels has negated the need for reinforcements that have previously been required to stiffen the structure – thereby reducing weight, while at the same time increasing torsional strength and offering better corrosion resistance.

These articles have been written by Martyn Lane: I-CAR Instructor, Weld Test Administrator and Technical Specialist to the auto body industry



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