Audi TT: How VW Did It

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Features the development of the 2000 Audi TT automobile of Volkswagen (VW) using a common platform in designing other vehicle models. Definition of a platform according to VW; How did the TT team come up with the 2000 Audi out of common parts from other car models. INSET: AL2 on Track.

Audi TT: How VW Did It

By creating a unique new sports car from the humble Golf, VW again proves it's the industry's platform engineering leader.

VOLKSWAGEN'S FOURTH GENERATION "A" platform is one of the few examples of multiple personalities being a good thing. Introduced in the summer of 1997 as rolling stock in the form of the Audi A3, the A platform is arguably the world's most successful example of one platform producing the largest number of significantly different vehicles.

"They have done a phenomenal job of differentiating the common platform. High differentiation? Nobody has done it better," observes Jim Hall, vice president of industry analysis for Auto Pacific Inc. in Southfield, Mich.

Using this "sub-divide and conquer" philosophy, the A platform provides the mechanical underpinnings for a wide range of vehicles, including the Golf, Jetta/Bora, New Beetle, Audi A3 and Seat Toledo. More are planned. But the newest and most different is the 2000 Audi TT, a new vehicle company officials hope will be nothing less than a "brand-defining moment in Audi history."

The trick for VW Group, however, was taking what's often referred to as the "Golf platform" and producing a vehicle that is not merely a variation, but so radically different that it has the potential to be an Audi icon.

Cost-Driven Program

From the beginning, the TT's design brief was for a sports car that would "emotionalize the brand," recalls Marc Trahan, product planning manager for Audi North America. But there was a catch. For the TT to have maximum impact, Audi officials felt it had to be reasonably priced.

"It had to be attainable. It couldn't be an Avus," Trahan notes, referring to Audi's exotic showcar of the late '80s. That meant the TT had to come from an existing platform -- VW couldn't afford to start from scratch.

The concept for the new sports car came from a series of titillating sketches by American Freeman Thomas (see interview, p. 87). In theory, VW could choose from its four platforms. Besides the A cars, there's the B platform, which includes the Passat, Audi A4 and Skoda Octavia; C, which includes the Audi A6, and the top-range D platform, which covers the aluminum-bodied Audi A8.

By VW Group's definition, the platforms consist of cost-intensive underpinnings such as floor pans, front suspensions, powertrains and fuel tanks, all of which are changed so they feel different and impart a different character, says Trahan.

But the new sports car was to be small, so Thomas began working with the packaging engineers "who knew every dimension and every possibility of the A platform," notes Trahan.

Ultimately the basic A floorpan was shortened 3.5 inches (90mm) to provide the TT's 95.4-inch wheelbase. But the domed-and-arched form created by Thomas had be more than a Golf with an high-impact look. It could not be a Golf in TT clothing.

That sparked the usual internal debates over cost. Initially, the automaker urged the TT development team to simply take the standard MacPherson strut front suspension and re-tune it for the new car. But the team didn't buy that -- such a plan, though cost-effective, wouldn't meet their performance bogeys.

"We said, `No, we've done it, we've driven it, and it doesn't handle like we want," recalls Trahan.

Common Parts, Unique Vehicle

Ultimately, the TT team was able to make changes including unique lower control anus (in forged, rather than stamped, steel) to match the revised geometry. There is also a new lower strut/wheel bearing housing and a new stabilizer design. The stabilizer bar is connected directly to the struts with links, rather than being connected to the lower control ann.

The resulting suspension package has distinctly different handling than that of an A3, Golf or Jetta.

The TT's steering had to be different, too. The rack-and-pinion system from the A platform was used as a starting point

"If you look at the steering gear on an A3 and a TT and put them on the floor, they look similar," says Trahan. But there are significant changes. The TT's system has a much quicker ratio (15.6:1 versus 17:1), plus different bushings and a fatter torsion bar.

"By doing these little tweaks, we came up with what is a unique part," he notes. The cost to develop this "unique" steering is about 20% above the initial investment for the A platform's steering gear.

The 1.8L turbocharged 4-cylinder engine used in various VW Group vehicles was also revised for TT use. The biggest changes were using a larger turbocharger, setting the boost at 26 psi (1.8 bar) rather than 23.2 psi (1.6 bar); developing new camshaft timing and changing the control software. The result is 180 hp at 5,500 rpm, compared to the engine's 150 hp output as installed in the A4 and New Beetle Turbo.

The TT arrives first in North America as a front-drive coupe, with a 5-speed manual gearbox. It will be followed soon by an all-wheel-drive quattro coupe and a roadster, with available Tiptronic automatic. Due in mid-2000 is a twin-intercooled 200-hp variant and a 6-speed manual gearbox. (See Oct. '98 AI p.94).

By the time the TT was finished, only about 20% of the little coupe's parts could be transferred directly to another vehicle without modification, claims Trahan. Common items include the air conditioning, wipers, rear suspension and switchgear, the latter coming from the A3. Another 40% of the TT's components -- such as the instrument

panel's cross-car beam and the floorpan -- were used with some minor modifications. The remaining 40% are new, including the exterior skin and most of the interior.

Trahan admits that Audi would have liked to achieve "more commonality," but the prime corporate directive was to create "an unmistakable product."

Audi declines to discuss the TT's program cost, but the savings from modifying various A platform pieces parts allowed the team to get what it wanted and still save some money. Some of that savings is used elsewhere on things "that the customer sees, feels and touches," like the aluminum trim placed throughout the passenger compartment, notes Trahan.

The TT is now in production at VW's Gyor, Hungary, plant, and VW is moving ahead with its platform smorgasbord. In the short term, Trahan doesn't see the automaker's use of such platforms as changing radically.

"It will continue with optimizations and the evolutionary process," he reports (see sidebar this page). And in doing so, VW Group aims to remain ahead of Fiat, GM, Ford and others in the platform engineering race.

RELATED ARTICLE: AL2 ON TRACK

VW will expand its platform family later this year with the Audi AL2, a competitor to Mercedes-Benz's A-Class. Derived from an aluminum-bodied concept car introduced at Frankfurt in 1997, the AL2 continues Audi's exploration of aluminum space frames begun with the A8.

Audi hasn't announced plans to sell the AL2 in the U.S., but Trahan sees the little sedan as a step to the next, big change in platform engineering, which would be based on a space frame.

"We will have limitless possibilities," he predicts. "By simply putting a few more pieces you can make it longer, higher, wider, whatever, without having to invest a lot of tooling. Then, you are just down to changing the sheet metal and you have basically a whole new car. That is where I see it going 10 years from now. Limitless flexibility."