TUNDRA "UNDER THE SKIN" TECH TENT PRESENTATION

Written by Richard Bellikoff

Welcome to the Tundra Tech Tent. I'm from Detroit -- and let me tell you, Detroit is not going to believe the performance, strength, toughness, durability, and safety features of this truck, the all-new Toyota Tundra. To see where all this comes from, we're going to peel back the Tundra's skin and look at what's underneath.

I'm going to use this Tundra cutaway chassis to show you the phenomenal foundation that Tundra is built on, and all the features and benefits that add value for your customers. We'll start by looking at the frame, then the suspension, the engine, and the brakes.

First, the frame.What you see here, other than the highlighting in blue, is exactly how the frame comes from the factory. Let's start where we're just as tough as all the other half-ton trucks. Tundra has what's called a fully-boxed front subframe. That gives it more durability and more stiffness. A stiffer frame allows for more precise location of suspension components, and that helps make Tundra handle responsively.

The way it works is, from the rear of the front bumper all the way to just past the A-pillar -- that's the place where the windshield sits, this well right here -- the front subframe is fully boxed. Toyota takes one C-channel and welds another C-channel to it, making a full box. By doing that, we double the strength in both directions. The heaviest part of the truck is up front. You've got the engine, and if you put a few passengers up front, you've got even more weight. Now when you steer the frame with all that weight on it, you're putting a lot of load on it. So you really need for that subframe to be fully boxed on a half-ton truck.

Now as soon as we go just past that A-pillar, if you look along the frame rail, you're going to see something on Tundra that you won't see on every other manufacturer's half-ton pickup truck. You're going to see a seamless, one-piece frame rail. Tundra is the only half-ton truck out there today that has it. If you eliminate that seam, you eliminate a stress point on the frame. That makes it more rigid, and that gives you more durability, along with responsive handling and excellent payload carrying capability.

What does the competition do?

Well, if you look at Dodge Ram, they have a multi-piece frame rail, and they actually put a little sleeve over it and rivet it together.

On Chevrolet Silverado, they bump the two pieces together and weld them.

Ford thinks it's important enough that they actually put a sleeve over the top of the frame rail, rivet it, and then weld it also. Actually, you can get a one-piece frame rail from Ford. All you've got to do is step up and order one of their Super Duty trucks. That's three-quarters of a ton and up. But if your customers want a one-piece frame rail on a half-ton truck, only Tundra has it.

Let me show you another essential feature of Tundra's frame that's important to point out to customers. Chevy does this also. When you look under the cab of the truck, on the frame, the C-channel has a lip rolled into it. By doing this, we pick up additional bending strength underneath the cab, so that it's more durable, and we have better noise, vibration and harshness characteristics.

In fact, Tundra finished ahead of Dodge, Ford, and Chevy in AMCI's interior quietness tests while accelerating from zero to 55. AMCI is an internationally recognized automotive testing and evaluation company

Let me show you something else. If you look on the inside of the frame, at this crossmember here, all the way to where the rear of this front spring perch is, you'll notice there's a frame reinforcement on the inside. What Toyota does is, they take a C-channel and add another C-channel to the inside, so you have twice the thickness in the section, making it stiffer, for more durability and payload capacity.

On the Tundra's ladder frame, highlighted in blue, we have crossmembers. How many are there? I'm going to count them right now. Here's a crossmember up here, that's one. Here's two. There's number three. Here's four. Here's five, six, seven, eight, nine.

Officially, Toyota says there are eight crossmembers. The reason for that is, it's possible to buy a base Tundra without a rear bumper. As soon as you put the rear bumper on there, you get the ninth cross member, and the ability to tow up to 5200 pounds with the bumper. If you throw the Toyota trailer hitch on there, you can actually tow up to 7200 pounds. What all those crossmembers do for you is, they strengthen the frame, for more durability, a great ride, and outstanding payload and towing capabilities.

Now let's talk about suspensions. Most two-wheel drive half-ton trucks feature a double wishbone front suspension with coil springs. Automotive engineers know that coil springs give you a better ride, and that's why the half-ton pickups from Toyota, Dodge and Ford have them.

But if we go to four-wheel drive trucks, things change dramatically. Because whether I have a two-wheel drive or a four-wheel drive Tundra, I get a coil spring front suspension. That's not true on some of the competition. For example, on a four-wheel drive Ford F150 or a Chevrolet Silverado, you don't get a coil spring. You get a torsion bar.

A torsion bar is simply a bar of steel. One end is fixed into the lower control arm of the suspension, the other end is fixed under the chassis. Which means the first thing you lose is ground clearance compared to Tundra.

You also lose wheel travel. Because if I twist the bar and let it go, it returns to its original position, like a spring. If I twist it too far, it stops becoming a spring, it loses its memory, and it can actually break if I go far enough. So you have to limit the amount of wheel travel you get with a torsion bar. That's why Tundra has more wheel travel than both Ford and Chevy, which tends to give you a smoother ride, especially off-road. That's because the wheel has more room to travel up and down, so any changes in the terrain are absorbed by the wheel and not transferred to the chassis.

Now what about Dodge Ram? Dodge knows you need a coil spring for both wheel travel and ride, but they harness you with something else in order to accomplish that. Dodge gives you a solid or Y front axle. Basically, they've taken the rear axle, flipped it over, brought it up front and put some steering ends on it. So it's fully attached side-to-side, one to the other. That means, if I hit a bump on the right side with the Dodge, it also reacts on the left side. Dodge Ram going down a straight road actually has a pretty good ride. But as soon as we get it into some rough stuff, then the ride gets rougher too.

In fact, Tundra 4x4 outperformed Ford, Dodge, and Chevy in ride quality tests by AMCI, at 55 miles an hour on a rough road.

Tundra's suspension has something really unique up front. We refer to this as a coil-over-front suspension. When I say coil- over, I'm not talking about the shock absorber being buried inside the coil spring, which it is.

What I'm talking about is this: The shock absorber is now the mount for the spring. We have a spring perch here on the bottom, we have a cap on top. So if I take these three bolts out, I have the complete coil spring and shock absorber assembly in my hand. The benefit of that is, I've got a lot of ground clearance down here, which means you're more likely to clear obstacles you might encounter off-road.

Next, let's look at Tundra's V-8 engine. Toyota calls it the i-Force engine. It's got 4.7 liters, double overhead cam, four valves per cylinder. In fact, Tundra has the first DOHC, 32-valve V8 in the half-ton full size pickup segment. Now double overhead cam, four-valve per cylinder engines make great horsepower. They also get great fuel economy. They last a long time, as proven by their millions of miles of use in Toyota cars and trucks -- and durability is one big reason why Toyota offers them.

But they're not known for tremendous low-end torque. Torque is what gets you going from a standing start. Tundra's engine changes all that, with 315 pound-feet of torque. It's kind of unusual for a four-valve engine to be able to deliver that much torque. How did Toyota accomplish that?

Here's the answer. Up here on top is the intake manifold. On Tundra, it's got a special name -- it's a split-plenum induction system. Split-plenum refers to the fact that the right side cylinders are actually getting their air from the left side of the intake manifold, and the left side cylinders are pulling their air from the right side of the intake manifold. By crossing the air over like that, we're making a very long intake runner. If we make that intake runner long, as the air gets closer to the cylinder, closer to the valve, it picks up more velocity. If we pick up more velocity, we fill the cylinder quicker, and we wind up with more air in the cylinder at a higher pressure. The result of that is, we get more low-end torque. So the longer the intake runner, the more air in the cylinder and the better the low-end torque.

But usually, if you have a lot of low-end torque, you sacrifice horsepower. Remember, torque is what gets you going and horsepower is what keeps you going when you're already moving. To find out why Tundra's engine gets such good horsepower, we have to look at the size of the plenum.

Basically, a plenum is a storage area for air. Think about your home furnace, for example. We shoot the gas into the plenum chamber and that's where it burns. We store the heated air in there, and then it goes into the blower and off to the rest of the house. So on Tundra, we have a big storage area, or plenum, right here, underneath the manifold. That gives us a big volume of air, in this case about the same as the size of the engine, or 4.7 liters. So when the engine does start pulling that air, it has a lot to work with, and that keeps the horsepower up. So you need that big plenum to maintain the horsepower, and you need a split plenum with long intake runners to get the torque. Tundra's got both.

This area right here, looking at the top of the engine, you'll notice that there are no spark plug wires. We call that a coil- on-plug ignition. Tundra has this and the half-ton pickups from Chevrolet, Dodge and Ford don't. It gives you a hotter spark, which results in more efficient burning of fuel. The benefits are more reliable starts, and smoother idling and acceleration. Also, there's less maintenance, with no high voltage spark plug wires to break down -- and having individual coils right on top of the spark plug helps keep outside elements, like water, from getting to the plug. We actually give it even more protection with a second gasket right here.

Now coil-on-plug is not the same as direct ignition. Direct ignition means you have an individual coil for each spark plug, and no distributor. Tundra has the Toyota Direct Ignition system. Chevy Silverado and Ford F150 have their own direct ignition systems. But they don't have coil-on-plug. They have direct ignition to individual coils for each cylinder, but they still put a high voltage wire to the spark plug.

Now let's talk about brakes. AMCI did braking tests on Tundra 4x4 and its three key 4x4 competitors. In their tests, going from seventy miles an hour to zero, Tundra out-braked the Silverado by 19 feet. It beat the Ford F150 by 26 feet. And it beat Dodge Ram by 28 feet. 28 feet -- that's over a car length. In a panic stop, wouldn't your customers like to have an extra car length? I certainly would.

How'd Toyota do it? Actually, several different ways.

Here's the single most impressive thing to me about the this truck. Underneath the front wheel here is a 12.6 inch diameter front rotor -- the largest in Tundra's segment. A larger brake rotor means you have more surface area, which creates more friction when the brake pad contacts the rotor -- and that gives you more braking power.

Another big braking advantage for Tundra is its four-piston calipers. Ford F150 and Chevy Silverado have only two pistons on one side to push against the rotor. Tundra has two pistons on each side, so we're actually squeezing the rotor.

Let me explain how this works. If I asked you to pull your hand out from under my hand, it would be a lot easier for you to do that than if I squeezed your hand with my grip. A disc brake works the same way. If I'm squeezing the rotor, I'm putting a lot more pressure on the brake than if I'm just pushing on it from one side, like Ford and Chevy do. So we're putting more pressure with four pistons than you could with two, and the result is, you get better braking.

What does Dodge have for a front brake? Just a single piston caliper. That's one big reason why the Tundra beat the Ram by 28 feet in braking tests.

Let's talk about the rear brakes. Tundra has the largest rear drum brakes in its segment, at over 11½ inches. That's a quarter-inch larger in diameter than Ford, which happens to be in second place. We're also a quarter-inch wider in surface area. Just like with a larger front rotor, a larger rear drum gives you more surface area and more contact between the brake pad and the drum. That creates more friction, which gives you quicker braking. So we have more rear braking power than Ford, and that's one reason why the Tundra stops 26 feet faster than the F150 going from 70 miles an hour to zero.

But Chevrolet gives you four wheel discs, and everybody thinks that's better than front discs and rear drums, like on Tundra. So let's talk about that a little bit. First of all, if the Chevy's so much better, why does Tundra 4x4 V8 stop 19 feet shorter going from seventy miles-an-hour to zero? Rear brake drums have a tendency to fade after repeated use, which is why they get badmouthed so much. But if you make the drum big enough, and provide ventilation, like Tundra does, you reduce that effect.

Let me take that a step further. If I take the back wheel off a Chevy and look at their rear discs, I see something that actually takes away a lot of their heat dissipation properties. If you look at their rotor, it's not ventilated like the front rotors are, to help keep the brakes from fading. The other thing is, like the Dodge in the front, the Chevy has just a single piston in the caliper in the rear. So Tundra has a larger rear brake, we brake faster -- and the bottom line is, for big trucks, rear drums can give you even quicker braking than rear discs, if you make them big enough.

Now this right here is another braking feature Tundra customers get standard -- an LSPV, Load Sensing Proportioning Valve, in the rear.

Here's how it works. Most of the braking is done in the front of a vehicle -- about 70%, with 30% in the rear. So I've got a truck here, Tundra 4x2 V8, that can carry up to 2011 pounds. Do I need more braking power in the back when I'm carrying a big load like that? You bet I do. What happens is, when I'm not carrying a load in the back, the proportioning valve is restricting the amount of brake fluid that goes to the rear wheels. But as soon as I start putting a load in the truck, you can see that there's a lever that is working on this rod here, that works on the valve. And when it works on the valve, it opens up a little valve down here and lets more fluid go to the rear brakes. So as I need more rear brake pressure, I get it.

So to wrap things up with Tundra, we've got a powerful, fuel-efficient engine, we've got a rock-solid platform, we've got a smooth and responsive suspension, and we've got more braking power than the competition. Be sure to tell your customers about all these great features and benefits that Tundra offers just under the skin.