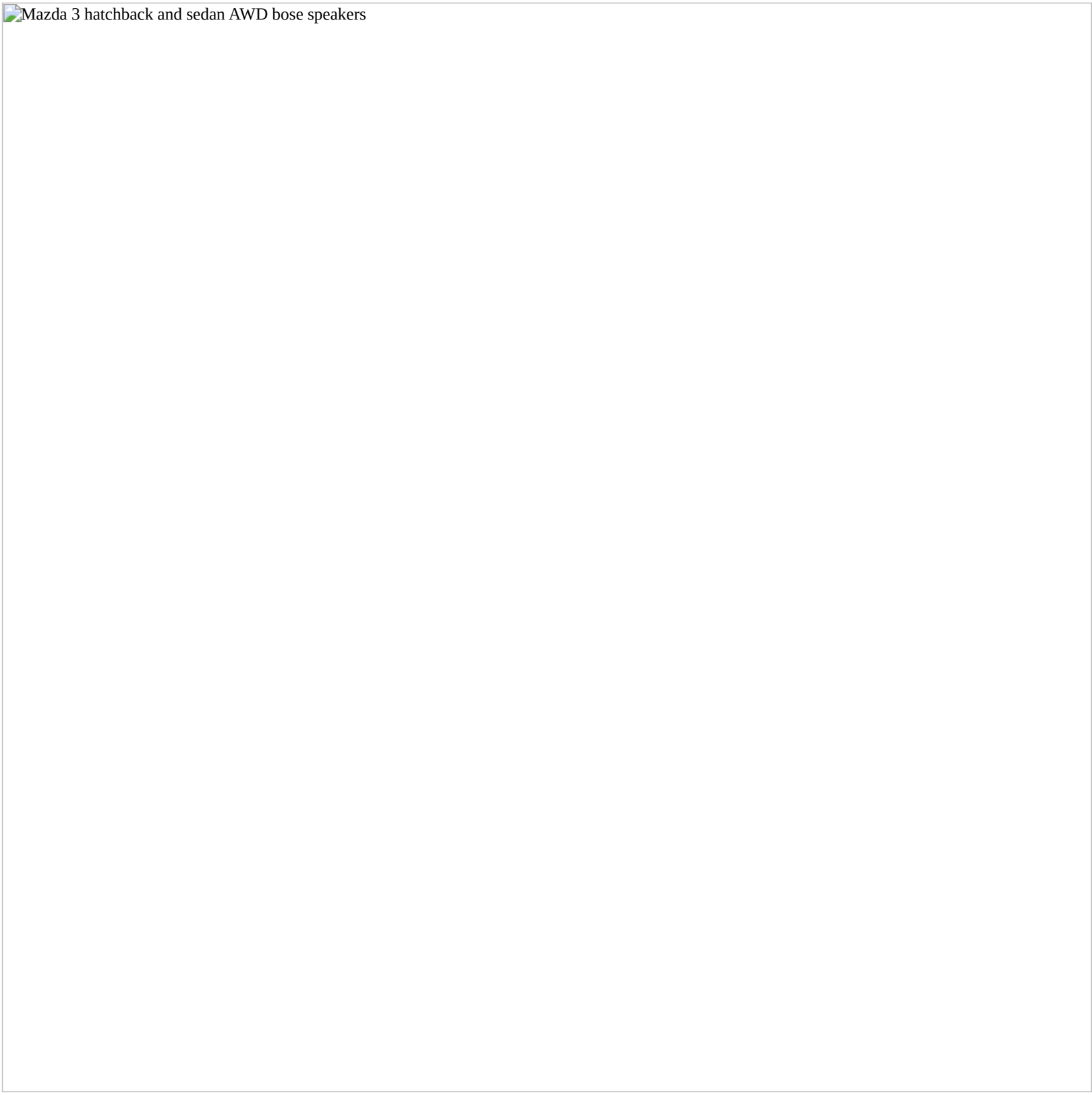
HOW I-ACTIV ALL-WHEEL DRIVE AND G-VECTORING CONTROL PLUS INTERACT TOGETHER IN MAZDA3



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Implementing all-wheel drive is a technical challenge for any automaker, but it's a special challenge for Mazda. Because Mazda makes the human driver the focus of every vehicle, it's not enough to just drive all the wheels. Mazda's all-wheel-drive system must enhance Jinba Ittai – the feeling of oneness between driver and vehicle.

Dave Coleman, vehicle development engineer at Mazda, is one of the people tasked with making that technology a reality. Recently Coleman took a few minutes to explain how the various systems work together in Mazda3.

Dave Coleman, vehicle development engineer at Mazda, driving the Mazda3 with i-Aciv AWD.

Q: YOU'VE DESCRIBED MAZDA'S ALL-WHEEL-DRIVE SYSTEM AS "PREDICTIVE." WHAT DOES THAT MEAN?

A: i-Activ all-wheel drive has been around for a while in the Mazda CX-3, CX-5 and CX-9 crossovers. It's a sophisticated system that uses all the sensors in the car. We use the data we already have to understand what the road surface is like and then we can figure out exactly how much traction there is. For example, we can look at the windshield wipers. If they're on, the car knows it's raining. We can look at steering effort. If steering takes less effort, it means the road is slippery.

Using that data, and much more, we can figure out how much torque the car should apply, and which wheel to apply it to.

Q: IS THIS THE SAME SYSTEM USED IN THE NEW MAZDA3?

A: Mazda3 has an evolution of that system. We've improved the software so the car can apply exactly the amount of rear torque we want. We also look at exactly how much weight is on each tire. The more dynamic your driving is, the more the car's weight shifts around to different tires. The torque split changes in response to changing weight distribution.

We can also completely decouple the rear axle when you don't need it. That means less driveline drag and overall better efficiencies.

Q: MAZDA3 ALSO INCLUDES AN UPDATE TO G-VECTORING CONTROL. CAN YOU EXPLAIN THAT SYSTEM?

A: G-Vectoring Control monitors the driver's steering inputs. When the wheel turns, GVC shifts weight around very slightly to improve grip and make the car behave more naturally. If you're accelerating and you try to steer, the car doesn't respond quite as well as if you're off the throttle. That happens because the car's weight shifts forward onto the front tires when you're off the throttle. G-Vectoring Control reduces the engine's power output a little bit as you turn the wheel. That shifts weight onto the front tires to make Mazda vehicles respond more consistently.

We've introduced G-Vectoring Control Plus on Mazda3. The new part is that this system also works when you're coming out of a corner. Theoretically, it seems like we should apply power to shift the weight to the rear, right? It turns out that people don't like how that feels. So instead we apply a tiny amount of brake to the outside front tire to help straighten the car as you exit a corner.

Q: DOES THE GVC PLUS SYSTEM WORK TOGETHER WITH THE ALL-WHEEL DRIVE SYSTEM?

A: The most exciting part is the way we've tied G-Vectoring Control into the i-Activ all-wheel drive system. If you have the front and rear wheels working together, all four wheels want to go the same speed. So the car naturally wants to go straight.

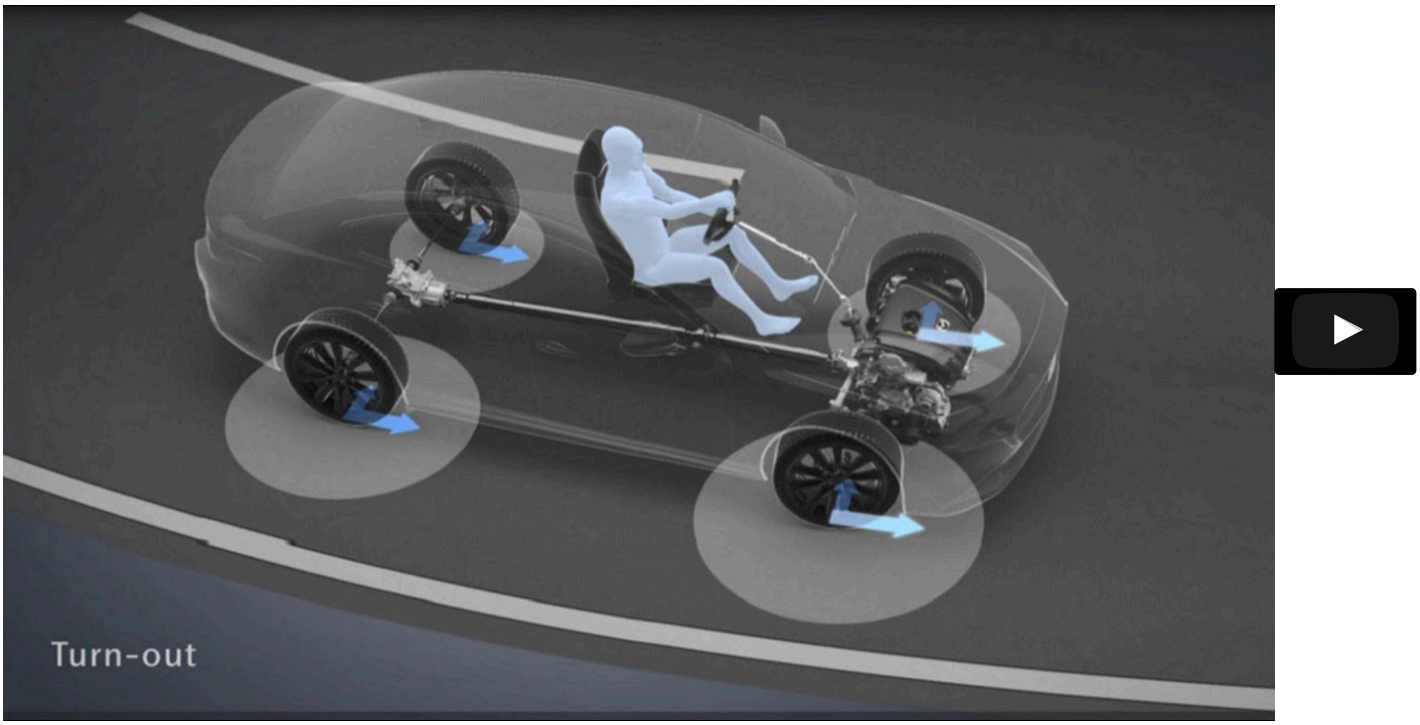
Here's how we fix that problem: When you turn the steering wheel, Mazda3 decouples the rear wheels, so the car is easier to turn. Then as you start to straighten out again, the car couples the wheels up again to help pull the car straight.

Everything's integrated now. When you turn the steering wheel, the car is turning the wheels. It's also operating the engine, the brakes, and the all-wheel-drive system. It's all based on what the driver is doing with the steering wheel. We're getting harmonious interaction of all the different parts to make the car behave naturally.

Q: IS THE MAZDA3 THE FIRST VEHICLE TO HAVE TWO SYSTEMS INTERACT THAT WAY?

A: This is the first time that we've tied G Vectoring Control to the all-wheel-drive system. But it's an evolution of the same process we've been going through over the last 25 or 30 years. It's about trying to make the car behave as naturally as possible. It's really, really paying off in the way the car drives and feels.

WATCH I-ACTIV ALL-WHEEL DRIVE & G-VECTORING CONTROL IN ACTION



DISCOVER THE ALL-NEW MAZDA3

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