DODGE HELLCAT VS. FERRARI F12 VS. ...TOYOTA SEQUOIA?!?

CAR AND DRIVER

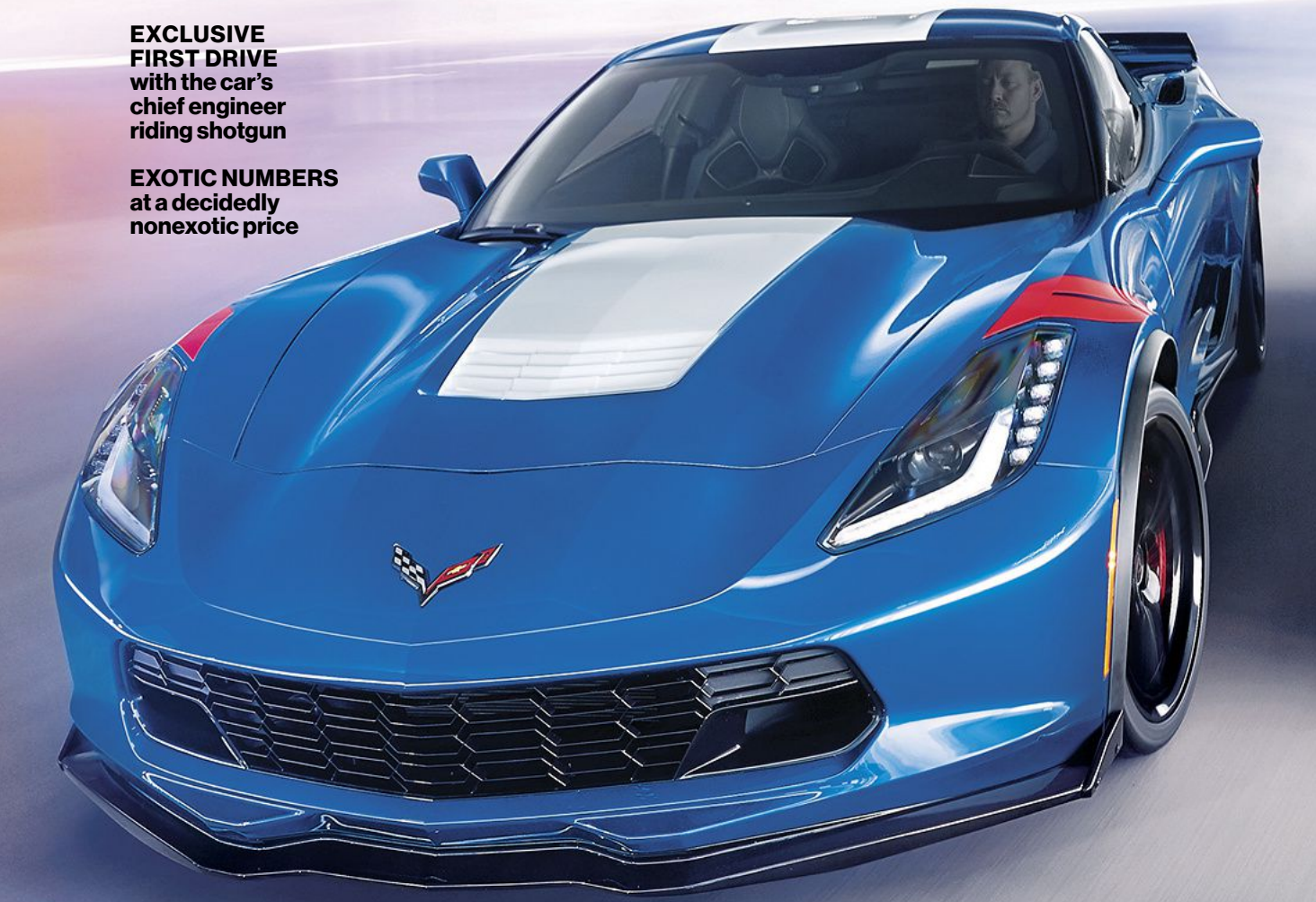
JUL/2016

INTELLIGENCE. INDEPENDENCE. IRREVERENCE.

Why the Grand Sport is the best all-around Corvette ever.

EXCLUSIVE FIRST DRIVE with the car's chief engineer riding shotgun

EXOTIC NUMBERS at a decidedly nonexotic price

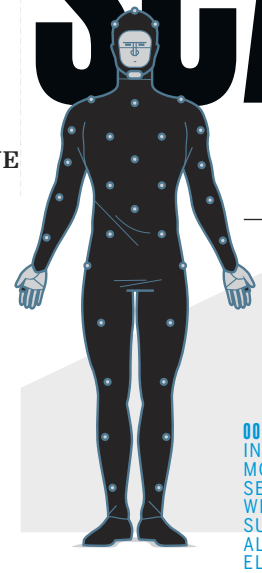


Driven, hard:

JAGUAR F-PACE / CHEVY CAMARO 2.0T
PORSCHE 718 BOXSTER / KIA SPORTAGE
MERCEDES S-CLASS CABRIO

BODY SCANNERS

WHY HUMAN-BODY MODELING IS THE FUTURE OF AUTOMOTIVE SAFETY. ***by Clifford Atiyeh***



001 IN ADDITION TO MOTION-CAPTURE SENSORS (THE WHITE DOTS), TEST SUBJECTS ARE ALSO WIRED WITH ELECTRODES THAT RECORD MUSCLE CONTRACTIONS.

002 THE CAMERA ARRAY EVEN INCLUDES A PAIR AIMED THROUGH THE SUNROOF.

003 ANOTHER CAMERA POINTS THROUGH A PLASTIC WINDOW IN THE GUTTED DOOR. THIS HELPS FORM A COMPLETE THREE-DIMENSIONAL PICTURE OF PASSENGER MOVEMENT.

ACCELERATE, SMASH, REPEAT. For decades, crash tests were the only way to predict how well a car might protect the people inside. But what happens when safety engineers stretch their bell curves beyond government standards, to grasp those last tenths of a percent of improvement? When dummies are too dumb, human-body modeling takes over.

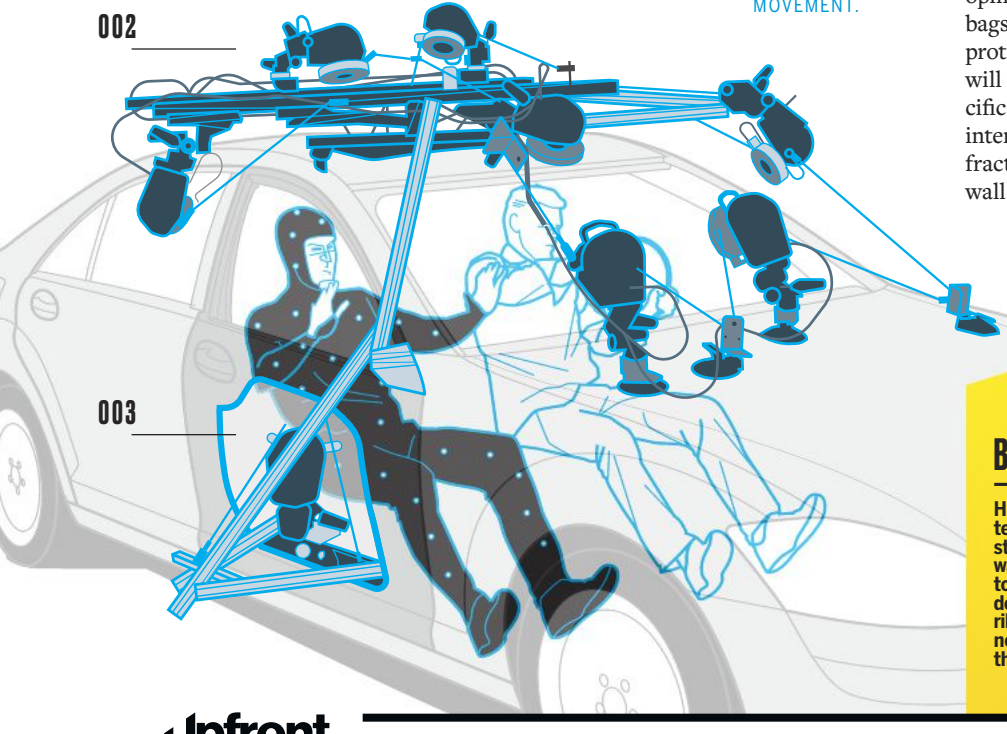
"You see the crash-test dummy leaning out of the window after a crash. That situation has nothing in common with reality," says Dr. Andreas Rieser, who leads a team of mechanical and material engineers at Virtual Vehicle, a research-and-development center in Graz, Austria.

Rieser advises the major German automakers and suppliers, among others, on a people-first approach to designing safety equipment. His partners include BMW, Daimler, Jaguar Land Rover, and Volkswagen, as well as big suppliers such as Bosch, Continental, and Magna. Virtual Vehicle's interest focuses on the seconds before a collision, how people react when they realize an impact is imminent—tensing up, bracing themselves, and shifting in the seat.

The organization has studied body movements of more than 800 passengers. Test subjects, wearing motion-capture suits, get tossed around in three lane-change and braking maneuvers. In the first, the person knows when and how the driver will swerve and stop. In the second, he knows what's happening but not when. The last test is a total surprise. Nine infrared cameras rigged to the exterior of a test car, including some that peer through the door, capture the data.

Back in the lab, researchers replay these recorded scenes over and over. By studying human behavior before and during a crash, body modeling helps automakers fine-tune their safety systems, identifying and preventing additional injuries that are the unintended consequences of other safety features such as smart airbags and pre-collision systems. When a person tenses up before impact, for example, does the pre-tensioner dig the belt too aggressively into his or her shoulders?

Human-body modeling played a key role in Mercedes-Benz's adoption of front-seat bolsters, which move occupants inboard before a side collision, and fueled the development of inflatable seatbelts, knee airbags, and pop-up hoods for pedestrian protection. As the discipline develops, it will enable automakers to delve into specific means of mitigating potential for internal bleeding, organ damage, and bone fractures. Makes smashing a car against a wall seem rather primitive, doesn't it?



BECOMING HUMAN

Human-body modeling won't leave crash-test dummies jobless just yet. As part of stricter model-year 2019 standards, NHTSA wants new ones. Among the many upgrades to the proposed dummies: more accurate detection of brain trauma, spinal injuries, rib deflections, and, with the ability to "nod," neck problems. And in side-impact tests, they'll slouch more naturally in the seat.

illustrations by MARTIN LAKSMAN