Sebring Secret Weapon

The 1957 Sebring Corvettes were armed with a techno wonder — anti-lock brakes

text by Thomas Glatch
photography by Thomas Glatch and Bob Clift

It's said that racing improves the breed, and few automobiles have benefited from competition as much as the Corvette. From its revolutionary "Jet Age" fiberglass body on the first Motorama show car to the late-model ZR-1's 4-cam all-aluminum LT5, much of the technology behind the Corvette is derived directly from racing.

Sebring's 12-hour enduro in 1956 was the place the Corvette first had international exposure, with a fine 9th place showing in the GT class. The pair of '57 fuelies entered in the next year's race were tested and honed to perfection. Could America's sports car compete with the likes of Jaguar and Ferrari? Ed Cole, Chevrolet's general manager, was determined that the Corvette would meet and beat the rest of the world — and deep inside the No. 3 and No. 4 Corvettes was a secret weapon.

Seeking an unfair advantage, Chevrolet engineers examined the area that needed the most help. Horsepower was already world-class and cornering ability was quite good, but the Corvette's high weight and the flat, tight turns at Sebring made the braking system the Achilles' heel on the cars. The "big brake" option helped, but you can never have too much braking capacity on a race car, especially at Sebring.

The front brakes do most of the work on an automobile, and the optional large drums with metallic shoes gave the '57 Corvettes as much stopping power as the factory parts allowed. Although the rear brakes do only about 30 percent of the braking, their importance cannot be overlooked. A driver can feel when the front brakes are about to lock, but the rear brakes are just along for the ride — if they don't grip enough, the stopping distance increases; yet if they grab too much, the rear wheels will lock and the driver could lose control.

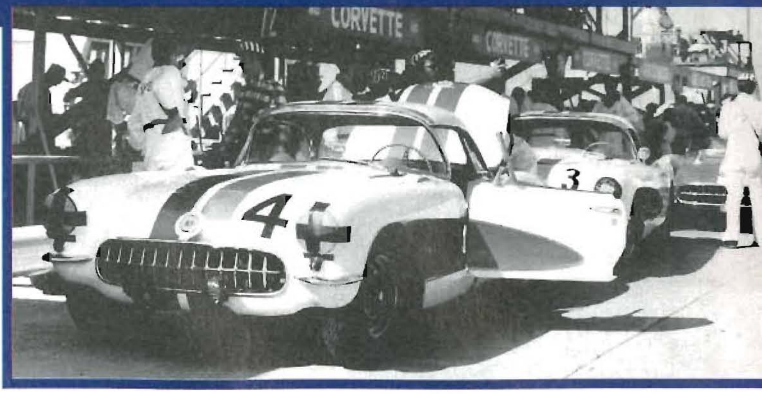
A simple proportioning valve can balance the amount of braking force front and rear, but brakes balanced for a full fuel load will lock as the tank empties (and with a 36-gallon tank in the '57 race Corvettes, the load changed as much as 215 pounds from full to empty). Compromising the balance also compromises the braking ability at different fuel loads, which of course compromises lap times. What to do?

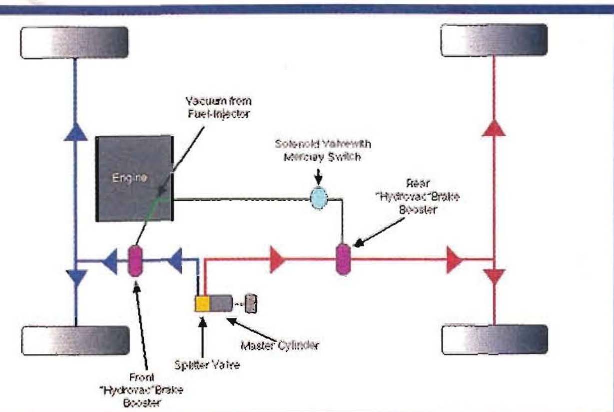
Frank Burrell, a confirmed hotrodder and Chevrolet engineer, devised a system that adjusted the rear braking force in all conditions. It used deceleration force, not brake pedal pressure, to control the rear brakes.

To a standard master cylinder Chevrolet engineers added a special splitter valve which divided the brake line pressure to the front and rear wheels. The line pressure to the front activated a Kelsey-Hayes "Hydrovac" power brake booster that was normally used on Chevy trucks. The front brakes acted like typical power brakes. The other brake line sent pressure to the rear to another Kelsey-Hayes Hydrovac booster. Vacuum lines off of the fuel injection unit powered both Hydrovacs. The rear vacuum line, however, was fitted with a solenoid valve that was normally open. Mounted behind the instrument panel of the race cars was a mercury switch that was angled toward the front of the car. Deceleration caused the liquid mercury to flow forward inside the switch, closing the circuit and causing the solenoid valve to close at a pre-set decelerative G-force. When the valve closed, the rear brake pressure was "locked" at that instant, and no amount of additional front brake pressure could be applied to the rear brakes. When the G-force dropped as the car slowed, the solenoid valve opened and the rear brakes acted conventionally. There was no physical connection between the front and rear brakes, only the line pressure that the master cylinder provided to the Hydrovac booster, which was controlled by the solenoid valve.

The angle of the mercury switch was adjustable by mechanics; the more it tilted forward, the less deceleration needed to "hold" the rear brake pressure. No matter how much pressure the driver applied to the brakes, the rear brakes acted sympathetically but independently.

Bob Clift, Zora Duntov's test driver, remembered: "I did a lot of brake testing at Sebring that year. I remember it (the dual-booster system) working quite well." Dr. Dick Thompson recalled that Burrell's system was just one of a number of improvements made to the Corvette's brakes. "It helped the situation," he told us. "Still, the brake linings wore out. The only thing that would have solved the problem would have been disk brakes. As long as the linings were there, it worked alright; they would get a little grabby toward the end, then they were gone. The brakes would only last about a half hour. We couldn't put bigger brakes on, legally. We went to metallic linings, which helped, but they'd still last only half an hour. You had to dissipate a certain amount of heat in a certain amount of time, and these small brakes just couldn't do it."





Burrell's system was also installed in Chevrolet's SS prototype-class race car used at Sebring in 1957. The tube-framed magnesium-bodied SS had little in common with a production Corvette, but it still had drum brakes which continued to cause problems. The SS was raced a few more times with the anti-skid brakes, but the system was removed in August of 1957. One difference between the SS and the '57 GT racers was that the mercury switch was mounted on the instrument panel within reach of the driver. Maybe driver "fiddling" kept the system from functioning as well as on the GT cars, in which the switch was mounted behind the dash.

Despite this setback, Chevrolet engineers continued to toy with the idea. Burrell's invention was again used in 1960 on Bill Mitchell's "Sting Ray" race car, with the same results. Dr. Dick Thompson won the C Modified championship in it that year, but Burrell's complex system was gone by mid-season. Bob Clift also recalled, "I have a photo of a mid-year with a mercury switch mounted on the dash, this was probably around 1963. Of course, once we went to disc brakes (in 1965) we gave up on the idea." An idea, it seems, that was not quite ready for prime time.

In the September 1991 issue of *Corvette Fever*, we told the story of the recovery and restoration of the No. 4 Corvette that won the GT class at the 1957 12 Hours of Sebring. Owner Tim Partridge restored the car, duplicating every detail using prints and information supplied by Dave Bartush, the acknowledged expert on early Corvette race cars. Partridge also owns the No. 3 Corvette that finished third in its class that year. What Partridge did not realize is that both cars were originally equipped with Burrell's anti-skid brakes. Recently, Dave Bartush made Partridge aware of the system and offered him the original parts from one car. He also received assistance from the Indianapolis Hall-of-Fame Museum, which owns the SS prototype racer. Burrell's system is completely intact on the SS, and the museum allowed Tim to inspect the car closely. With the help of GT Motorsports in Mundelein, Illinois, Tim Partridge's historic No. 4 now has the original equipment installed.

In 1986, Chevrolet introduced 4-wheel anti-lock braking on the Corvette, one of the first manufacturers to do so. The system is totally different from the one Frank Burrell devised 30 years before, but the intent was the same: to deliver maximum stopping force to each tire without skidding. Like many other Corvette innovations, it often took decades for technology to catch up to the ideas that flowed out of the GM Tech Center. **CF**