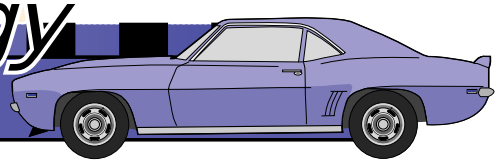
Race-Bred Technology

Z/28 Spoiler Equipment



by Wayne D. Guinn - Author, “Camaro, Untold Secrets”

Automotive aerodynamics plays a large part in how a car handles on the highway, and an even larger part on the race track. It’s from actual racing experience that most high performance options for the 1967-69 Camaro were derived and the Camaro’s aerodynamic spoiler equipment is one of the best examples of Chevrolet’s race-bred technology.

When it came to making the Camaro competitive, Chevrolet was serious, both at the consumer level and on the track. It was through racing that Chevrolet was able to successfully promote the Camaro and tap into the fast growing youth market. The formula was simple: Chevrolet put together the Camaro Z/28 package to compete against their rival, the Ford Mustang, in the Sports Car Club of America’s (SCCA) Trans-Am road racing series.

IT ALL BEGAN...

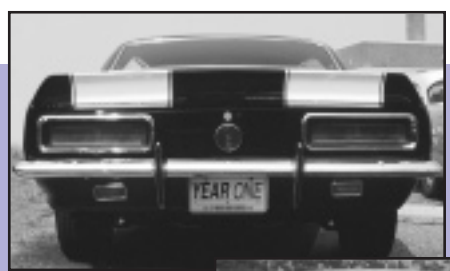
Back in September of 1966, when the Camaro Z/28 package was first being put together, Chevrolet called on engineer Paul Van Valkenburgh to evaluate the Camaro for high speed stability and to suggest “aerodynamic fixes” if necessary. Chevrolet Engineering was meticulous when it came to preparing the Z/28 package for competition. The concentration was on winning, and every aspect of vehicle dynamics was addressed accordingly.

The opening event was to be held at Daytona, where speeds are in excess of 140 mph, and Chevrolet wanted to be certain the Camaro would stick to the track. It was Chevrolet’s experience that production vehicles tend to exhibit front end lift which becomes excessive at high speed. This creates unsafe conditions in racing.

Prior to the Camaro inquiry, there wasn’t much aerodynamic study done on production automobiles; the Corvair and Corvette being the two notable exceptions. The Corvair was found to wander excessively at highway speeds, dangerous nose lift was a real concern, and for this reason aerodynamic studies were performed inside engineering. In those studies, it was determined that a front valance panel (plow) corrected this detrimental effect by decreasing under-body air flow. As a result, it became a production part on the Corvair. It was from this early developmental work that the Camaro would later benefit. The Corvette was a slightly different matter in that it was studied during competition at race tracks and again treated to a similar fix.

Although effective, both of these examples were tested crudely by trial and error. Essentially “guess-timating” which aerodynamic fixes might work best. The Camaro, on the other hand, was more scientifically studied using a scale model in a wind tunnel to determine the base aerodynamic qualities. Lift was measured and, like most production vehicles, determined to be greater than the acceptable limit for racing at high speeds.

Valances of various sizes, angles and shapes were applied to the Camaro front end and the most effective was chosen. Once the problem of nose lift was countered using the front valance panel, engineers began contemplating how an inverse effect, or downforce, could be created and utilized to increase high-speed



Not unlike the first-generation Camaro's dual-disc clutch, 4-wheel disc brakes and cowl induction setup, the front and rear spoiler equipment was designed to improve the car's capabilities on the race track. That the spoilers added so much visual appeal was a welcome by-product. Take a look at the tail shots of the two '67 models above right; the Rally Sport on top has a much more performance-oriented look when compared to the RS/SS below it. The lower car seems to be missing something...

cornering traction. The problem was not how to get downforce as much as it was how to distribute it between front and rear tires, and how to minimize the effect on air drag.

The first front valance was so effective that it produced massive oversteer. To counter that, a smaller unit was substituted until the problem was corrected. Slight understeer is always more desirable for better handling. A rear spoiler was then added for additional downforce but the car began to understeer badly. It then became a balancing act to get the right combination of front and rear aerodynamic effects for vehicle stability.

The measurable effects of the “plows and tails” were recorded and the results with recommendations sent to Chevrolet’s Style group for further consideration and development. The Style group determines what will and will not work from a stylistic standpoint and current trends of consumer acceptance.

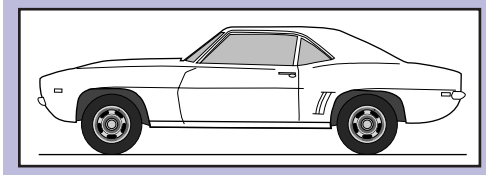
Although the initial recommendations (specifications) submitted by Van Valkenburgh would have been better in terms of optimum effect, the group made the necessary aesthetic compromises, blending lines and altering dimensions in order to create a design that would be acceptable to the consumer. Remember, prior to the Camaro, only race cars like Chaparrals wore spoilers. They just weren’t seen on production vehicles and were at first perceived as a radical departure from the “norm”. A remarkable contrast to today where every other car, including four-door sedans, sports a whale tail!

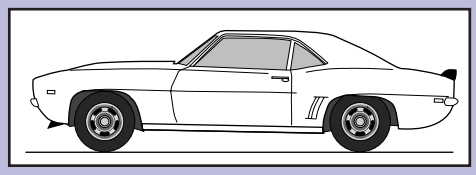
HOW EFFECTIVE?

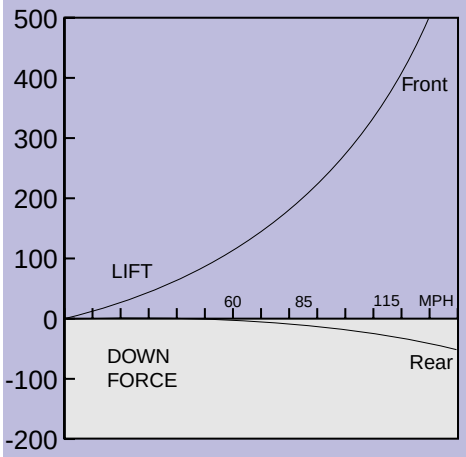
When asked about the effectiveness of this special equipment, Van Valkenburgh emphatically states; “The front valance and rear deck spoiler were more than styling gimmicks. They actually made a measurable contribution to cornering and stability at highway speeds and were indispensable on the race track.”

INDEPENDENT TESTS VERIFY...

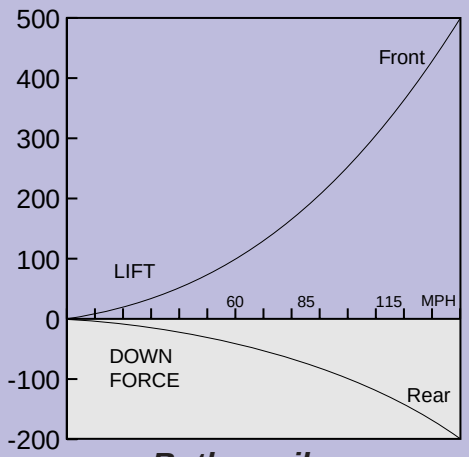
Results of independent tests conducted using a 1969 Camaro Z/28 clearly demonstrate the real value of the optional spoiler equipment. The testing was conducted by the editors of *Car Life* magazine and the results appear in the June, 1969 issue.





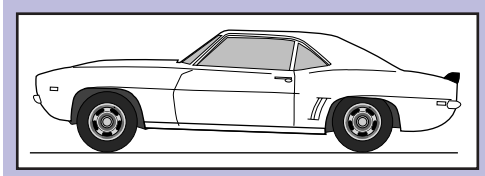


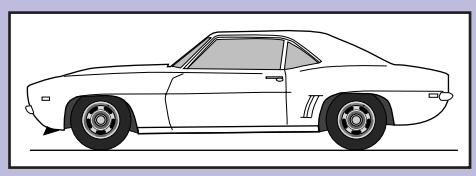
No Spoilers

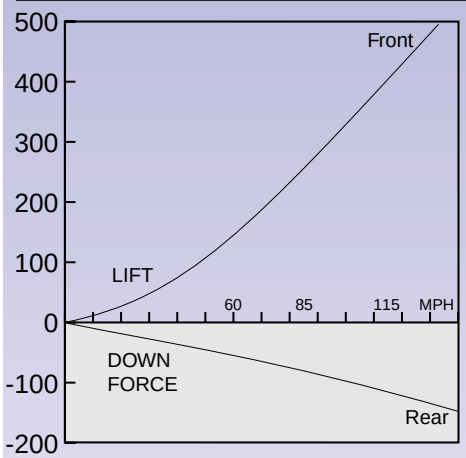


Both spoilers

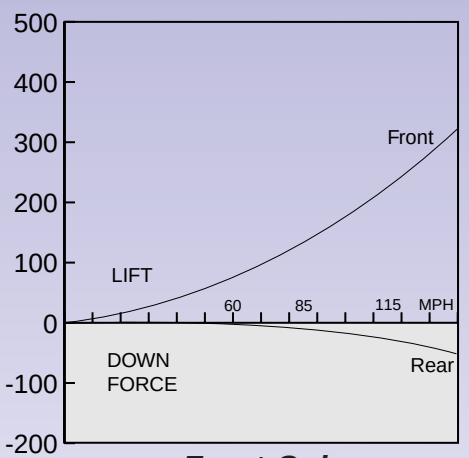
To verify Chevy's claim that the spoilers were functional even below race track speeds, the magazine Car Life performed a series of road tests on a '69 Camaro with various spoiler configurations. Lift and downforce were measured without the equipment, with spoilers on both ends, and with front only and rear only.







Rear Only



Front Only

As shown from these charts, which were recreated from the originals that ran in the magazine, the spoilers did indeed have an affect at moderate speeds. With no spoilers, the car showed a considerable amount of front-end lift, and a small amount of rear downforce. With both, the front showed a more manageable level of lift, while the rear was well planted. The rear only configuration led to a grossly unbalanced chassis, while the front only provided perhaps the best overall combination for a street car. The race cars, however, with their subtle but effective changes, obviously preferred spoilers on both ends, which is why Chevy put them there.

In order to standardize the tests, a single Camaro Z/28 was evaluated both with and without the factory spoiler equipment installed. This testing method eliminated any vehicle/chassis variations that may occur between two like vehicles which can become a factor and thereby affect the validity of the test results.

The parameters measured were lift and downforce; the two most important aerodynamic factors that affect vehicle dynamics at speed. Speed intervals of 65, 85 and 115 mph were chosen as a practical range of test points for analysis and comparison. The 65 mph mark representing a typical highway speed; 85 as the intermediate passing or top cruising speed; 115 as an average race speed on medium and short road race courses.

EVALUATION CRITERIA

In making value judgments on the effectiveness of the spoiler equipment, the desired results would be:

1. Normally, a slight lifting of the nose if there had to be a choice between nose or tail lift at speed;
2. Ideally, the nose would be forced down by the flow of air and the tail would be forced down even further than the nose.

THE RESULTS

At 115 mph with no spoilers front or rear, the Camaro exhibited an excessive 375 lbs. of lift at the front. The rear had a positive 25 lbs. of downforce which is typical for notchback cars.

With the front and rear spoiler equipment installed, the vehicle exhibited a marked improvement overall. Lift decreased to 330 lbs. at the front and downforce at the rear increased to 130 lbs., resulting in a balanced and completely tractable vehicle.

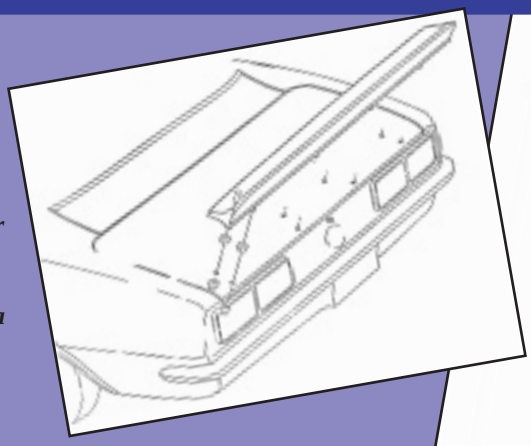
The spoilers produced the desirable effects of increased traction along with a slight understeer condition. In controlling the lift of the nose so well, there was an increase in stability that a sensitive driver is able to feel even at moderate speeds.

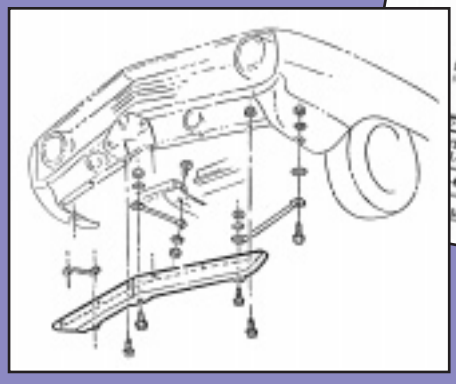
In referring to the graph, it should be noted that the effectiveness of the spoiler equipment is proportional to vehicle speed. The faster you go, the more effect the equipment has. The best part is it looks as good as it works, and it works for free!

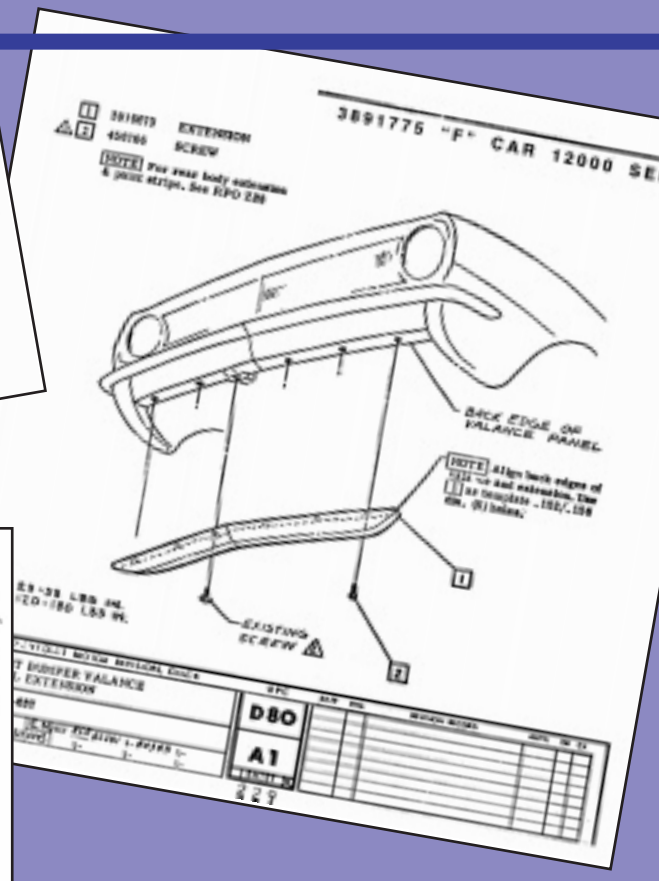
The type of racing done dictated how the spoilers were utilized. The Smokey Yunick-prepared Trans-Am '68 Camaro up top (which is now part of the Edelbrock collection) made good use of the spoiler equipment for improved road holding. Any increases in overall aerodynamic drag were more than made up for by increased cornering speed. The Dave Strickler-driven '68 Z/28 drag racer was more concerned with overall speed and as little aerodynamic drag as possible. Present-day Super Stock drag racers have been known to use the front spoiler only to reduce front end lift, which decreases the amount of air passing under the car. The undercar area is aerodynamically "dirty", which means there are lots of nooks and crannies to impede the air's progress, and thus slow the car down.

As proven by the previously mentioned Car Life tests, however, the use of the spoiler equipment on a street car results in noticeable but not large differences in lift and downforce. It becomes, then, a matter of personal taste. If you like the looks, use 'em.

Like the ZL-2 cold air hood, the front and rear spoiler equipment has proven to be an extremely popular add-on to standard models. The spoilers and all their associated attaching hardware are available through the restoration industry, and seeing a car without at least the rear spoiler is a rarity these days. In fact, just about every new car produced currently includes or offers as an option some type of aero-inspired appendage on the front and/or rear. Current taste dictates that spoilers are mandatory equipment on any new vehicle with the slightest bit of sporting flavor, even though those vehicles may be 4-door sedans or pickups! This infatuation is at least indirectly attributable to Chevy's success at designing and styling the Camaro's spoiler equipment.







The race track is where all the research and development paid off. Despite the GM ban on racing, Chevrolet managed to develop, test, manufacture and catalog a tremendous amount of "heavy-duty" parts to make their car competitive. 1967 was a development year for the Camaro, and although it managed to win a few races, Mustang drivers won the championship for Ford. The program really bore fruit in the 1968 and 1969 seasons, winning 18 of 25 races and manufacturer's championships for Chevrolet.