# PFM Tests Police Tires

By PFM Staff

*The wet testing was not a hydroplane test. Instead, it was a wet surface traction test.*

It has been eight years since the NIJ-NLECTC tested police tires. That was long before any 17-inch (Ford) or 18-inch (Dodge) police tire. In fact, it was long before the Dodge Charger. It was also long before most police fleet managers ever heard of Continental Tire or Pirelli Tire. While Pirelli tires were original equipment (OE) on the then-new Chevrolet Impala, and the Impala was one of its test vehicles, Pirelli tires were not tested. This was back when General and Firestone were OE police tires, and BFGoodrich was a major player.

This was also long before the 12-week strike at Goodyear in 2006, which left many fleet managers and police vehicle manufacturers alike wondering what tire to use. Ford had no other tire approved for the CVPI, and many fleet managers had never used anything other than Goodyear.

Funding issues and body armor priorities kept the NIJ-NLECTC from updating the police tire tests. So, *Police Fleet Manager* stepped up to the plate. We teamed up with Tire Rack, the same tire experts that enthusiast car magazines like Car & Driver turn to for tire testing.

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## OVERALL RESULTS

**Were based on all four objective measurements plus all four subjective impressions, wet results plus dry results.**

| Tire | Rating | Rank |
|---|---|---|
| Firestone Firehawk GT Pursuit | 1.69 | 1st overall |
| Continental ContiProContact | 1.87 | 2nd overall |
| Goodyear Eagle RS-A | 2.06 | 3rd overall |
| Pirelli P6 Four Seasons | 3.56 | 4th overall |
| General Altimax HP | 3.94 | 5th overall |

We selected three OE police tires from Goodyear (Ford), Pirelli (Chevrolet) and Continental (Dodge); an aftermarket tire from Firestone designed for police use; and a low-cost, aftermarket replacement tire from General.

From Goodyear, the benchmark of law enforcement, the Eagle RS-A. The Eagle RS-A is clearly the standard by which all police tires are measured. It is OE on the Ford CVPI and Chevrolet Tahoe PPV, and it is available for the Chevy Impala and Dodge Charger. The Eagle RS-A is the known commodity in policing with a long and proven track record.

From Pirelli, the P6 Four Seasons. This is OE in the Chevy Impala and is available for the Ford CVPI.

From Continental, the ContiProContact. This is OE on the Dodge Charger and is available for the Ford CVPI. From Firestone, the Firehawk GT Pursuit. This is an aftermarket tire developed specifically for police use on the Ford CVPI and the Dodge Charger. From General, the AltiMAX HP. This is a lowest cost, lower speed rated aftermarket tire selected as an example of what happens when a tire not developed for one of the police platforms is pressed into police service.

We performed four very different tire tests: ABS braking on dry pavement, ABS braking on wet pavement, vehicle dynamics on a dry road course and vehicle dynamics on a wet road course. On the road course, we also measured transient response through a cone slalom (wet and dry) and total corning g-force around a static circle (wet and dry). For each of these objective, instrument-measured areas of performance, we also asked each of the test drivers to fill out a subjective driver impression assessment for each tire. That gave us 16 data points for each of the five tires.

*Some tires perform very differently than others.*

The test vehicles were 2009 Dodge Chargers powered by the 5.7L HEMI® V-8. One was used for wet braking and dry handling, the other for dry braking and wet handling. However, this is not a test of replacement tires for the Charger! This is a test of OE and aftermarket tires used on the Ford CVPI, Chevy Impala and Dodge Charger. The Charger was just the test vehicle. The results will help you make better tire selection decisions for all police sedans.

### Braking Tests

The ABS brakes and electronic stability control are only as good as the tire. ABS modulates the brake line pressure to prevent the tire from skidding on the pavement. But it is the traction between the tire and the pavement that gives the feedback to the ABS system. ABS does not give the tire more braking power; it just makes the best use of the tire's traction. Tires with better traction stop the car sooner.

To warm up the brakes in a consis-

## WET-ORIENTED PERFORMANCE

| Tire | Rating | Rank |
|---|---|---|
| Firestone Firehawk GT Pursuit | 1.25 | 1st |
| Continental ContiProContact | 2.38 | 2nd |
| Goodyear Eagle RS-A | 2.75 | 3rd |
| Pirelli P6 Four Seasons | 3.38 | 4th |
| General Altimax HP | 3.50 | 5th |

## DRY-ORIENTED PERFORMANCE

| Tire | Rating | Rank |
|---|---|---|
| Continental ContiProContact | 1.38 | 1st tie |
| Goodyear Eagle RS-A | 1.38 | 1st tie |
| Firestone Firehawk GT Pursuit | 2.13 | 3rd |
| Pirelli P6 Four Seasons | 3.75 | 4th |
| General Altimax HP | 4.38 | 5th |


*The Firestone Firehawk GT Pursuit came in first overall. This tire is an aftermarket tire designed for the Ford CVPI and Dodge Charger.*


Photo courtesy Kelly Wiard / Tire Rack

*The Continental ContiProContact came in second overall. The tire is OE on the Dodge Charger.*

tent way and to conduct the stopping distance tests in a consistent way, each set of tires made nine braking events, counting the warm-ups, i.e., nine laps around the course. The driver exited the outside oval, stabilized the speed at just above 50 mph, got the suspension leveled out from the curve and applied the brakes.

On the first run, the brakes were given about half pedal effort. The car continued around the oval and about one minute later, the second braking was done. This was a full ABS-activated stop. This was repeated again to complete the warm up process. The car continued around the course for the next run, which would be a full ABS stop and the distance recorded. The stopping distances were measured by a V-box (Vericom). The driver got the car up to a speed over 50 mph and simply braked hard. The final result was an average of six ABS-activated stops from 50 mph at about 1-minute intervals.

*This is not a test of replacement tires for the Charger! This is a test of aftermarket tires available for the CVPI, Impala and Charger.*

As the braking tests were under way, each of the stopping distances was compared to the one before it and the one after it. This was intended to be a test of the tires, not the brakes. We wanted to be certain the brakes were not building up heat, i.e., a gradual increase in stopping distances. This was not the case. The 1-minute cool down and lap around the track between measured braking was enough to cool and stabilize the Charger's brakes.

The Charger's OE brakes kept up with the 50 mph to 0, full ABS stops, separated by 1 minute. The average g-force deceleration from the first stop to the sixth stop for each tire was consistent. The slightest increase in stopping distances during the fifth and sixth stops were due to the all-season tires heating up, not Charger brake fade, according to both Tire Rack and Firestone officials.

Why not do the test from 60 mph? Two reasons. First, the braking distances from some lower speed-rated tires

*The best wet performance tire by far was the Firestone Firehawk GT Pursuit.*

## OVERALL DRIVER SUBJECTIVE RATING: WET CORNERING

| Tire | Rating* | Rank |
|---|---|---|
| Goodyear Eagle RS-A | 7.67 | 1st |
| Firestone Firehawk GT Pursuit | 7.33 | 2nd |
| Continental ContiProContact | 7.18 | 3rd |
| General Altimax HP | 7.00 | 4th |
| Pirelli P6 Four Seasons | 6.33 | 5th |

**Rating: 1 (unacceptable) to 10 (superior)*

## OVERALL DRIVER SUBJECTIVE RATING: WET STEERING RESPONSE

| Tire | Rating* | Rank |
|---|---|---|
| Firestone Firehawk GT Pursuit | 7.50 | 1st |
| Goodyear Eagle RS-A | 7.33 | 2nd tie |
| General Altimax HP | 7.33 | 2nd tie |
| Pirelli P6 Four Seasons | 7.18 | 4th |
| Continental ContiProContact | 6.67 | 5th |

**Rating: 1 (unacceptable) to 10 (superior)*

under wet conditions at 60 mph were longer than the straight section of the Tire Rack course. Second, every brake test done by anyone differs in the brake warm-up-heat soak procedure and road surface coefficient of friction, even if the initial stopping speed is the same, i.e., 60 mph. Due to these test differences, you could not compare these results to brake tests annually performed by the Michigan State Police or the Los Angeles County Sheriff, even if the initial stop speed was 60 mph.

Second, the results are not accurate when you attempt to extrapolate the stopping distance from the 50 mph actual initiation speed to a 60 mph theoretical speed. Also of note, due to test condition and surface coefficient of friction differences from one test to another, it is not possible to compare the absolute values of one stop test to another, such as those performed annually by the Michigan State Police or the


Photo courtesy Kelly Wiard / Tire Rack

*The Goodyear Eagle RS-A came in third overall. This tire is OE on the Ford CVPI.*


Photo courtesy Kelly Wiard / Tire Rack

*The Pirelli P6 Four Seasons came in fourth overall. This tire is OE on the Chevy Impala.*


Photo courtesy Kelly Wiard / Tire Rack

*The General AltiMAX HP came in last overall. This lowest cost aftermarket tire was selected to represent all low-cost, non-police tires.*

Los Angeles County Sheriff, even if the initiation speed of this test was at 60 mph.

All the braking tests were done on the same road surface, by the same driver and vehicle, following the same warm up-braking sequence and braking from the same suburban highway speed. Brake force tests were conducted first on wet pavement and then later on dry pavement. What makes these results valid and allows these tires to be directly compared is the consistent test procedure. Standard test methodology was employed during our test to account for the small variables in temperature and surface during the course of the testing.

## Handling Tests

The Tire Rack road course is designed to test tires, of course. Tires are only tested when entering and exiting curves and during the curve—not on straights. So Tire Rack's road course is all about turning. Even the extremely short straight used for the braking test was converted to a cone slalom during the handling tests.

The course driven for the dry handling was exactly the same as for the wet handling. The only difference was the number of laps. In the wet handling, each driver made three laps for the average. For the dry handling, each to minimize the effects of brutal tire wear, each driver made two laps through the course for the average.


*The wrong tire selection can make stopping distances on dry surfaces as long as if they were wet.*

The total average time around the road course gives us the best overall measure of the tire's performance. Obviously, the driver is a factor in lap times. The skill (consistency) of the drivers, the blind test protocol, the use of two laps around the course, warm-up laps to get familiar with the course and the progressive up and down sequence of wet testing and the repeated control used during dry testing all minimize the human factor.

In addition to the total lap time, the time through just the cone slalom was also recorded. This gives us the transient response of the tire, i.e., a sudden evasive movement or accident avoidance maneuver. The time around just the static circle was also recorded. With a standard calculation we can calculate the maximum lateral g-force the tire can generate before losing traction. This is the maximum cornering power of the tire, which is not dependent on driver skill.

*ABS and stability control are only as good as the tire.*

### What is a Tie?

If one tire is 1/10th second faster around a 31-second road course, is that a "real" difference? In any ranking, we want to know if we have a true 1st Place and 2nd Place. Or, realistically, do we have

**WET HANDLING ROAD COURSE**

| Tire | Lap Time (top 5 average) | Rank |
|---|---|---|
| Continental ContiProContact | 31.314 seconds | 1st tie |
| Firestone Firehawk GT Pursuit | 31.696 seconds | 1st tie |
| Pirelli P6 Four Seasons | 31.831 seconds | 1st tie |
| General Altimax HP | 32.368 seconds | 4th tie |
| Goodyear Eagle RS-A | 32.393 seconds | 4th tie |

a two-way tie for 1st Place? Or even a three-way tie?

Math wizards look for "statistical significance." We could have used a statistical calculation with an associated confidence level, which virtually no one without a college degree in math would understand. Instead, we opted for a simple percentage difference to separate places and determine ties.

On one hand, the extreme spread in the dry testing was a little less than 3% on the handling course and about 5% on braking. The extreme spread in the wet testing was a little more than 3% on the handling course and a little less than 7% on braking. This means, all the tires were within 3% of one another on overall handling, and within 6% on braking, wet and dry.

On the other hand, selecting just a 1% difference in the results to determine separate ranks seemed a bit tight. In reality, two tires, just 1% different,

**WET STATIC CIRCLE (MAX CORNERNING FORCE)**

| Tire | 200-foot Circle | Rank |
|---|---|---|
| Continental ContiProContact | .835 g | 1st tie |
| Firestone Firehawk GT Pursuit | .819 g | 1st tie |
| Pirelli P6 Four Seasons | .818 g | 3rd |
| General Altimax HP | .797 g | 4th |
| Goodyear Eagle RS-A | .777 g | 5th |

**WET STOPPING DISTANCES**

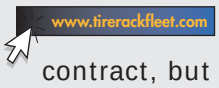
| Tire | 50mph to 0 | Rank |
|---|---|---|
| Firestone Firehawk GT Pursuit | 93.0 feet | 1st |
| Continental ContiProContact | 95.4 feet | 2nd |
| General Altimax HP | 97.6 feet | 3rd tie |
| Goodyear Eagle RS-A | 97.7 feet | 3rd tie |
| Pirelli P6 Four Seasons | 98.2 feet | 3rd tie |

# Tire Rack Inc.

The police tire tests were conducted at the Tire Rack headquarters in South Bend, IN. Tire Rack is the largest Internet supplier of the widest variety of tires and custom wheels in the U.S. Tire Rack has been in business since 1979. Its main brick-and-mortar facility is a massive warehouse on sprawling acreage that includes a 10-acre on-site test course. Tire Rack has five warehouses across the U.S. and an inventory of 1 million tires. The company has warehouse distribution centers in Indiana, Delaware, Georgia, Louisiana and Nevada. Four of the five tires evaluated for this test are in stock at Tire Rack. The company will keep the Firehawk GT Pursuit in inventory (CVPI and Charger only) as it gets fleet demands for it.

Tire Rack is a household name among high-performance car enthusiasts. Most of the company's business is Internet or phone based. It ships the tires UPS, and the customer has them mounted locally. Tire Rack specializes in medium-performance (police) and high-performance (Corvette, Porsche, BMW, Jaguar) types of tires. However, even in low-performance retail tires, the price including shipping is competitive with the discount chains and the big box super stores.

Its price for performance (police) tires is so low, based on personal experience of the editor, that even after shipping charges, the tires are still at least 25% less expensive than exactly the same tire at a local dealer. Tire Rack is not on anyone's state contract, but it does have prices in the state bid range. Keep that in mind for tires NOT on your state bid. State bid prices are hard to beat, but if the state did not bid the tires you need for whatever vehicle, Tire Rack prices are hard to beat.



**WET SLALOM SPEEDS (TRANSIENT RESPONSE)**

| Tire | 60-foot Slalom | Rank |
|---|---|---|
| Firestone Firehawk GT Pursuit | 4.368 seconds | 1st tie |
| Continental ContiProContact | 4.372 seconds | 1st tie |
| Pirelli P6 Four Seasons | 4.418 seconds | 1st tie |
| Goodyear Eagle RS-A | 4.502 seconds | 4th tie |
| General Altimax HP | 4.556 seconds | 4th tie |

# Tire Testing Procedures

Tire Rack officials have the ability to precisely and completely wet their road course by the use of high-flow sprinklers. The wet surface includes pools of water on the road course. The water is not as deep as the tread grooves on a brand new tire but like a typical rain shower is deep enough to cover much of the visible road surface texture. This was not a hydroplane test; it was a wet traction test.

During wet testing, sprinklers were used around the entire course to keep the road surface uniformly wet. This was the case even though it rained almost all day during the wet braking phase. The track at Tire Rack is the standard road mix asphalt used in the area. This was not a special tire testing surface, either smooth or rough.

Prior to conducting the tests, the brakes were burnished on the Dodge Charger, following the Owner's Manual procedures. The police Charger was run the entire time with the Electronic Stability Program (ESP) in the partial-off mode, not the default, full-on mode. The full-on ESP mode is a very good thing. Other police cars should have stability control and will have it by law by 2011.

Until all fleets have transitioned to vehicles with ESP, the reality is that most officers are driving without it, so it made sense to test as close to this reality as possible. Full-on ESP can mask tire traction and handling limitations somewhat, having an impact on objective measurements and often a larger impact on subjective impressions.

Using the partial-off mode allowed our drivers to get a better feel of each tire's potential and limitations. Due to the reactionary intervention of the ESP system, the trick for the drivers was to drive the Charger right up to the point of impending partial-off ESP activation, but not so hard that it did activate. ABS braking was left fully functional throughout the test.

ESP can somewhat mask the tire's objective potential in that it is reactionary. It simply senses a slip or slide and reduces power or realigns vehicle trajectory. The driver has the advantage of knowing what is coming next, and can anticipate the result of the slip, sometimes to his advantage in lap time. So, ESP can slow lap time somewhat. It tends to have a bigger impact on subjective feel, as it takes away the slip and slide at the point of the corner or brake zone that the driver needs the feedback the most to form his opinion.

However, before the tires get a real workout, the full-on (default) position comes on, and counter measures are activated. In a patrol setting, that is how it should be! For a tire test, however, ESP masked the potential of the tire. The partial-off mode allowed each tire to perform closer to its limit.

All the tire testing (wet, dry, braking, handling) was done with the tire pressure set at the placard level. In this case, the door frame placard on the 2009 Dodge Charger reads 35 psi, front and 35 psi, rear.

The handling tests started with 30 minutes of course familiarization using a BMW 328i. This was followed by three laps for each driver in the Charger using the "control" tires. All three drivers were competitive and auto enthusiasts by nature. They were EVOC instructors or racing competitors, or both. Yet none had any experience in the police Charger. This, again, put everyone on equal footing. It is not like one of the drivers raced, taught in or patrolled in the Charger. Excellent drivers, equally unfamiliar with the HEMI Charger.

will seem identical to even a very skilled driver.

So, we selected a 2% difference to be the deciding factor. At 1% difference, the tires seem the same. At 3% difference, all the tires are in a tie for 1st place. At 2%, we could draw a distinction between what both the stopwatch showed and what the drivers felt. And 2% is, in factor, more than half of the extreme spread. For this test then, a "tie" means the differences in performance between any two tires is less than 2%. Or, the different ranks (1st, 2nd, and 3rd) are separated by more than 2%.

Most people would expect bigger differences among the tires in wet performance and smaller differences in dry performance. That is just not true. The road course times, slalom speeds, cornering force and braking distances in the wet had an extreme spread between 3% and 7%, depending on the event being timed. The most variation was in the g-force around the static circle. In the dry, the extreme spread ranged from

**OVERALL DRIVER SUBJECTIVE RATING: WEB BRAKING TRACTION**

| Tire | Rating* | Rank |
|---|---|---|
| Firestone Firehawk GT Pursuit | 8.00 | 1st |
| Goodyear Eagle RS-A | 7.50 | 2nd |
| Continental ContiProContact | 7.18 | 3rd tie |
| General Altimax HP | 7.18 | 3rd tie |
| Pirelli P6 Four Seasons | 6.50 | 5th |

**Rating: 1 (unacceptable) to 10 (superior)*

**OVERALL DRIVER SUBJECTIVE RATING: WET OVERALL HANDLING**

| Tire | Rating* | Rank |
|---|---|---|
| Goodyear Eagle RS-A | 7.83 | 1st |
| Firestone Firehawk GT Pursuit | 7.50 | 2nd |
| Continental ContiProContact | 7.00 | 3rd |
| General Altimax HP | 6.67 | 4th |
| Pirelli P6 Four Seasons | 6.33 | 5th |

**Rating: 1 (unacceptable) to 10 (superior)*

# Tire Test Course

Buckle up and hang on…accelerate down the pit road and make a 180-degree left turn onto a short straight. When you pass the timing tower, the clock starts. Make a 90-degree right turn and drive through a cone slalom series, with a 60-foot cone spacing. Exit the straight line slalom and make a 90-degree right turn. Enter the static circle for a constant radius, left-hand turn. Once the suspension is set and the car stabilized at maximum body roll, a time around a section of this 200-foot-diameter circle is recorded.

Exit the static circle and take a sweeping, high-speed, right-hand curve. Speeds in this section reach 55 mph. The lateral force on the car is usually enough to activate the electronic stability control. At the end of the sweeping, high-speed curve, brake hard for a tight, 90-degree, right-hand turn and enter the timing tower straight. Pass the timing tower to record the time for Lap 1. Continue around the course again for Lap 2 (dry) and Lap 3 (wet).

# The Drivers

Detective Sergeant Jim Cauffman is a 17-year veteran of the South Bend, IN Police and is currently assigned to the Detective Bureau. He has been a state-certified EVOC instructor since 2003. At the Indiana Law Enforcement Academy, he trains basic class recruits, EVOC instructors and the advanced EVOC instructors. The latter course involves true high-speed driving and the PIT technique. Cauffman races mini-stock cars (4-cylinder Mustang) and has been the local track champion at South Bend Speedway 5 times in the past 7 years.

Police Officer Mike Wierenga is a 14-year veteran of the Grand Rapids, MI Police. He has been an EVOC instructor since 2000 and was a part of the dedicated Training Unit for four years. Currently assigned to the Patrol Division, he teaches EVOC at the Michigan State Police Academy as needed by the recruit classes. He is a graduate of the MSP's Advanced Precision Driving Pursuit School, is a PIT instructor through the Ohio Peace Officer's Academy, and SkidCar USA instructor. Wierenga regularly trains GRPD officers at Grattan Raceway, and he is an adjunct instructor with the Grand Rapids Community College Police Academy.

Woody Rogers has been with Tire Rack for 10 years as a product information specialist. The company's product evaluation program includes tires, brakes and suspension components. Rogers is a nationally ranked competitor in the Sports Car Club of America Solo Events and has raced autocross for 20 years. (The sport of autocross and police EVOC are absolutely identical.) Racing a Mazda RX-8, he placed 6th at the Solo Nationals and 2nd in the Pro Solo series. He also races in the High Performance Driver's Event (HPDE) events. In addition to tire test facilities both domestic and international, Rogers has raced at Grattan, Mid-Ohio, Nelson's Ledges, Sears Point, Laguna Seca and Indianapolis Raceway Park.

*Sergeant Jim Cauffman is a 17-year veteran of the South Bend, IN Police, EVOC instructor and stock car racer.*

*Officer Mike Wierenga is a 14-year veteran of the Grand Rapids, MI Police, Advanced EVOC instructor and PIT instructor.*

*Woody Rogers is a product specialist with Tire Rack and a nationally ranked Solo Event autocross racer. He has driven on tracks all across America and Europe.*


*The best dry performance tire was a tie between the ContiProContact and the Eagle RS-A.*

3% to 12%. The most variation was in responsiveness through the slalom.

## Results

Blind tests. Door placard inflated, properly broken-in tires. Experienced EVOC instructors. Precision measurement equipment. Standard asphalt road surface. Wet track testing. Dry track testing. Three different drivers. Four objective test parameters. Four subjective test parameters. Industry-accepted subjective test methods. Widely respected test facility and staff. Tests monitored by officials from three major tire companies. So, what are the results? Was there a "winning" tire?

When the wet and dry, objective and subjective results are all factored together, giving equal weight to all four test protocols, one tire did win. The clear, stand-alone overall winner of the 2009 police tire tests was the Firestone Firehawk GT Pursuit. This is available in sizes to fit the Ford CVPI and the Dodge Charger.

The second place overall tire was just as clear, the Continental ContiProContact. The ContiProContact is not as widely or easily available as the Firestone tire, but the ContiProContact gives very good performance, wet and especially dry.

*The best overall tire, the Firehawk GT Pursuit, was the one with both consistently high objective results and where the subjective driving impressions are in close agreement with the objective results.*

The third place tire was the Goodyear Eagle RS-A. The RS-A is the standard by which other police tires are put into perspective, and two other police tires solidly bested that standard. The Eagle RS-A is an aging tire in a game where the most recent technology, i.e., the newest tire, usually wins. The younger ContiProContact is better, and the almost new Firehawk GT Pursuit is better yet.

The fourth place tire was the Pirelli P6 Four Seasons…and not because we tested the H-rated version. Pirelli makes some

**DRY HANDLING LAP TIMES**

| Tire | Lap Time (top 5 average) | Rank |
|---|---|---|
| Continental ContiProContact | 30.450 seconds | 1st tie |
| Firestone Firehawk GT Pursuit | 30.661 seconds | 1st tie |
| Goodyear Eagle RS-A | 30.743 seconds | 1st tie |
| Pirelli P6 Four Seasons | 30.953 seconds | 1st tie |
| General Altimax HP | 31.236 seconds | 5th |

**DRY SLALOM SPEEDS (TRANSIENT RESPONSE)**

| Tire | 60-foot Slalom | Rank |
|---|---|---|
| Continental ContiProContact | 4.020 seconds | 1st |
| Firestone Firehawk GT Pursuit | 4.362 seconds | 2nd tie |
| Pirelli P6 Four Seasons | 4.402 seconds | 2nd tie |
| Goodyear Eagle RS-A | 4.446 seconds | 2nd tie |
| General Altimax HP | 4.508 seconds | 5th |

# Repeated Control and Up & Down Testing

The Repeated Control or Re-inserted Control test method is the most valid way to conduct "subjective" testing with numerous items to evaluate. With Repeated Control, one tire, any tire, is selected as the control or benchmark. The randomly selected control tire for the wet handling tests and dry handling tests were two different tires.

The drivers get a feel for the control tire first and rate it in four areas. At the end of each two-lap or three-lap sequence, the drivers filled out a subjective assessment form. These include 1) cornering traction, 2) steering response, 3) braking traction and 4) overall handling. The working assumption is that the randomly selected control starts off with a rating of 7 out of 10 in all areas.

The drivers then test the next tire, rate it in the four areas based on their impressions of this tire versus the control. With new information, i.e., the second tire, the drivers were permitted, even encouraged, to change their rating on the control tire. Then the third tire is tested and rated.

By this time, with two driving evaluations after the control, it is difficult for all drivers to precisely remember how the control tire performed. So, the control tire is tested again, hence the test name, Repeated Control. After the control tire is evaluated for the second time, the fourth and fifth tires are tested then the control tire is driven for the third time. This means that every tire in the test is evaluated immediately before or immediately after the control tire.

Repeated Control testing is the best way to handle "subjective" testing, like wet and dry handling. However, Up and Down testing is the best way to handle "objective" testing, like wet and dry stopping distance. Up and Down testing averages out test variables like subtle changes in the pads and rotors and slight temperature changes in the track surface from morning to the afternoon.

The Up-Down method tests each tire twice, following a reverse order for the second go around (A –B –C – D – E – pause – E – D – C – B – A). The result from the first and second test for each tire is averaged together to adjust for any influence of external variables.

# Disclaimer: H-rated Pirelli P6 Four Seasons

The 16-inch Pirelli P6 Four Seasons tire that comes as OE on the police Impala is V-rated. This tire was developed specifically for the police Impala. The 18-inch Pirelli P6 Four Seasons in a size that fits the police Charger is only H-rated and is tuned as the original equipment tire for the Ford Taurus.

Is it fair to compare an H-rated tire to other V-rated tires? Probably not. This is why we are pointing out the situation. No one combination of makes and models of tires were available in the speed ratings for all three police sedans. We got three out of four in the field of tires were tested. If a V-rated, P6 Four Seasons were available for the Charger, we would have tested it.

This raises the question, in the same make and model of tire, what are the differences between some sizes that are V-rated and some that are H-rated? According to Pirelli officials, the short answer is internal construction. In most cases, a stronger (or an additional belt) is used to allow the tire to go from a max speed of 130 mph (H) to a max speed of 149 mph (V).

So what if the H-rated P6 we tested had been a V-rated version? According to Pirelli officials, the transient response (slalom) would be slightly better. The H-rated and V-rated sizes in the P6 Four Seasons size line-up have the same tread pattern and a similar tread compound. According to Pirelli officials, the wet and dry braking between tires with these two different speed ratings would be "similar." And the wet and dry handling between tires of the same model but two different speed ratings would be "similar."

Pirelli officials were quick to mention that they make a truly high performance, all-season tire, the P Zero Nero M+S. See the online March-April 2006 issue of *Police Fleet Manager* for our high praise of this excellent tire after thousands of miles on a Ford CVPI. Since this tire is not OE on any current police vehicle, we opted to test the P6 Four Seasons, which is used on the Impala.

This situation, of course, means that this is not an apples-to-apples test between the H-rated P6 Four Seasons and the V-rated Eagle RS-A, V-rated Firehawk Pursuit and V-rated ContiProContact. This slight mismatch could not be helped and was unavoidable. However, the overall results for the V-rated Pirelli P6 Four Seasons tire would have been "similar" to these H-rated results had a V-rated P6 Four Seasons been used.

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true high-performance, all-season tires. However, these tests indicate the P6 Four Seasons, which is more of a touring, all-season tire, is simply not up to the performance of these Firestone, Continental and Goodyear tires.

The fifth place tire was the General AltiMAX HP. We selected this tire to show what may happen if just any ol', low-cost retail tire is put on a police vehicle. The "generic" tire tested by the NIJ-NLECTC in 2001 came in dead last. Our tests confirmed the organization's bleak results with an entirely different retail-oriented tire, which came in dead last.

What if your jurisdiction has an extremely wet climate? The best tires for the Seattle kind of wet weather happen to be exactly the same as the best overall tires: first, and by a wide margin, the Firehawk, then the ContiProContact, then the Eagle RS-A. The best wet weather tire may be one of the better melted snow tires. Yes, temperature will also have an effect on traction.

What if your jurisdiction has an extremely dry climate? The best tires for the Phoenix kind of dry weather are a tie between the ContiProContact and the Eagle RS-A, with the Firehawk dropping back to third place for a dry-only patrol area.

The overall placings were equally weighted between wet and dry results, and between subjective and objective results. The placings were also equally weighed between the various sub-categories of performance, i.e., tire response in slalom, tire cornering around static circle, braking distances, and total lap times. The reason? Panic stops, for example, may not necessarily be covered by just looking at overall lap times.

## Making Decisions

Tire tests are all about making decisions. The tire is one of the most complex compromises on the police vehicle. You cannot gain in one area without giving up in another. And as these tests

# Objective v. Subjective Testing

Like so many tests, these tire tests raised some questions as they provided answers to others. Why did one objectively superior tire get relatively low subjective driver impressions in the wet? Why did another objectively inferior tire get relatively high driver subjective ratings in the wet? How important is it for the objective measurements and the subjective driver impressions to match, as in the case of the Firehawk GT Pursuit?

What feels good may not be fast. What is fast may not feel good. This was certainly the case in the wet testing. The Continental ContiProContact had three 1st-ties and 2nd in the various aspects of measured wet testing. Yet in wet driving, the driver assessment rated in 3rd out of five, in the middle of the pack. On the other hand, the ContiProContact was clearly the 1st Place dry performance tire, objectively, and was arguably rated as such by the drivers, subjectively.

The Goodyear Eagle RS-A was a solid 4th Place wet performance tire as measured by the instruments. Yet it was a 2nd Place or better wet performance tire according to the drivers' subjective ratings. The RS-A is slippery when wet but was progressive and predictable enough to instill confidence. A police tire should provide confidence to the driver, or else the driver will mistrust the vehicle and slow down. Again, like the ContiProContact, during dry testing of the Eagle RS-A, the objective and subjective results matched.

The wet results for the Firestone Firehawk GT Pursuit made a little more sense. It measured either 1st or 1st-tie in every wet event, and the drivers rated it 2nd overall. The dry results also made more sense in matching timed performance to driving impressions.

Tires that feel good to the driver are not always the fastest around the course. Tires that are the fastest around the course don't always feel good. We found clearly that one driver may prefer the feel of one tire, while another driver may prefer the feel of another tire. Since police officers are all different, and tires are different, this difference in what "feels right" or "feels good" or "is confidence inspiring" is to be expected.

The tires with higher driver subjective ratings would be driven closer to the limit of that tire, whatever the objective limit may be. However, the driver favoring the tire does not make the tire stick any better. On the tires with lower driver subjective ratings, the drivers would back off sooner, not push them as hard, and be well below the tire's objective limit, as high as it might be.

For all these reasons, selecting a tire based only on subjective feel is not the best answer, even at the hands of a qualified EVOC driver. The subjective opinion is a part of reality of driving, but the objective, actual performance is the ultimate measure. On some tires, in some aspects of performance, the three drivers had the same subjective impression of the tire. On others, the drivers had separate and different opinions. On others, a majority and minority report. Clearly, more consensus is better than less consensus.

The objectively superior ContiProContact drew some lower driver impressions in some areas. The objectively inferior Eagle RS-A produced some higher driver ratings in some areas. The "best" overall tire, the Firehawk GT Pursuit, was the one with both consistently high objective results and where the subjective driving impressions are in close agreement with the objective results.

This helps us sort out the four possible outcomes, 1) the tire feels good, and is good, 2) the tire feels good, but is not, 3) the tire does not feel good, but it is, and 4) the tire does not feel good and it is not. In the final analysis, the top two tires (Firehawk GT Pursuit, ContiProContact) turned out to be the ones with the highest objective performance, even though driver impressions had an equal weight in the calculations.

proved, all tires perform differently. They are not all the same. A tire is not a tire. Some tires perform BETTER than others, even though they don't "feel" like it. Some tires perform WORSE than others, even though they don't "feel" like it.

If you take one tire off a patrol car and replace it with a different tire, you WILL change the braking and handling characteristics both in the wet and in the dry. By switching to some tires you will extend panic stopping distances and make the car harder to handle under emergency driving.

You may not care that one tire is one second faster around a road course than another. However, in an ABS-activated panic stop from just 50 mph, there is a 5-foot difference between tires. That is the length of a hood, clearly the differ-

## DRY STATIC CIRCLE (MAX CORNERING FORCE)

| Tire | 200-foot Circle | Rank |
|---|---|---|
| Continental ContiProContact | .894 g | 1st tie |
| Goodyear Eagle RS-A | .877 g | 1st tie |
| Firestone Firehawk GT Pursuit | .871 g | 3rd |
| General Altimax HP | .854 g | 4th tie |
| Pirelli P6 Four Seasons | .848 g | 4th tie |

## DRY STOPPING DISTANCES

| Tire | 50mph to 0 | Rank |
|---|---|---|
| Firestone Firehawk GT Pursuit | 87.4 feet | 1st tie |
| Goodyear Eagle RS-A | 87.5 feet | 1st tie |
| Continental ContiProContact | 88.2 feet | 1st tie |
| General Altimax HP | 90.7 feet | 4th tie |
| Pirelli P6 Four Seasons | 91.9 feet | 4th tie |

ence between a crash and not, just by selecting a low-performance tire.

Put another way, that is about the average difference between stopping on dry pavement and stopping on wet pavement. Pick a low-performance tires, and it is like panic stops on wet pavement all the time.

Are all V-rated tires about the same? No. A higher performance tire, V-rated designed for the police platform does better than a touring class, V-rated tire. But even among high performance, police-oriented tires, differences exist. Are H-rated tires about the same as V-rated and W-rated tires? No. Does the tire technology required to make 18-inch tires make all 18-inch tires equally good? No.

*The best tires for a very wet climate are exactly the same as the best overall tires.*

Can you replace the OE tire on the Ford CVPI with another tire and improve performance? Probably. The Firehawk GT Pursuit and ContiProContact both offer more performance. Departments using the Ford CVPI should seriously consider the Firehawk GT Pursuit as a replacement tire. At least get a couple of sets to begin wear testing.

Can you replace the OE tire on the Charger with any other tire and realistically improve performance? Not really, and definitely not unless you select the Firehawk HP Pursuit. If you select something else, you are likely to hurt vehicle performance. Those departments with the Dodge Charger would do just as well to continue to use the

# Disclaimer: General AltiMAX HP Tire

The General AltiMAX HP was selected as a lower speed rated, low-bid comparison against the original equipment-grade tires. To pick the tire, we searched the Internet for the cheapest P225/60R-18 tire, period. Isn't that how tires are so frequently purchased by penny-pinching, tire-naïve, bean counters? Get the least expensive thing that will fit the rim. Speed rating doesn't matter, just get the cheapest thing out there. And, hey, get one that will give better tire wear or tread life.

We checked every discount tire store in Chicagoland and every online tire source, period. We selected the tire that was consistently the lowest in price. In fact, as it turned out, this particular tire was the replacement tire selected by some of the area police departments. You will probably take off the OE high performance, all-season tire and put on a grand touring or standard touring all-season tire. You wanted a lower cost tire and one with a 60,000 or 80,000 tread life warranty. So that is how we selected the baseline retail tire.

At the time of testing, Tire Rack had 19 different all-season P225/60R18 tires available from 12 different makes in speed ratings from H (130 mph) to W (168 mph). The General tire we selected was the single least expensive tire. It wasn't the cheapest tire in the correct (V) speed rating. Not the cheapest tire from the once-American makes. The cheapest tire, period, at the time of testing.

The aftermarket General AltiMAX HP is a low-cost, touring-grade, all-season tire. It was selected to put the OE high performance all-season tires in perspective. The General AltiMAX HP tire did not "fail" in any objective way, but it did draw some sharp criticisms by all three drivers.

Most of all, out of five test tires, the General tire came in dead last in objective, measured performance. The "last place" finish in overall objective and subjective performance is a heads-up to chiefs, sheriffs and fleet managers how much the patrol car can be affected by the wrong tire selection. The police vehicle, driven in a high performance manner, as designed by the auto makers, is now both low performance and a possible safety liability.

# Tire Wear and Tread Life

For two reasons, this tire test did not involve any aspect of tire wear, tread life. Why not? Wouldn't the tire wear during this test tell something about tread life? No.

And why weren't before and after tread depths reported? First, it is completely invalid to compare tread life in a couple dozen laps of EVOC-style, accelerated wear tests to 10,000 miles of patrol use. The side force (g-force) on the tread blocks is totally different, and so is the heating of the tire.

Second, during the handling tests, two tire models were selected as control tires, one for wet and a different one for dry. The control tires were inserted at several points through the test to provide a baseline for subjective ratings and to allow for tracking any potential change in surface, vehicle or driver performance during the test. Any tire that was driven on a second (or even third) time was rotated in an effort to minimize wear in any one wheel position.

Since one tire model features a directional tread pattern, all tires were rotated front to rear, regardless of their tread design. One (non-directional) control tire was rotated in an X pattern for its third and final drive in the wet, again in an effort to balance wear and minimize performance differences due to wear.

No valid test exists for tread wear in a police application. While the tires showed some feathered tread blocks, this must not be considered an indication of tire wear or tread life. The only valid way to test tread wear is to actually mount the tires on your patrol cars driven by a couple of different officers for the entire duration of the tire life. Even still, that resulting tire life will only be valid for your department or a department exactly like yours. Tire life tested by the highway patrol will be different from a heavily urbanized metro PD. Tire life tested by the county sheriff will be different from that of officers patrolling a suburban community.

Tire wear, tread life, is certainly an issue among fleet managers. However, this is only a topic for discussion AFTER the tire has been approved for duty use by some form of performance testing. That is, it must pass a fitness for duty test first. Experience shows higher mileage, longer tread-life tires, give up aspects of braking distances and road holding ability to gain tread life.

Two facts about tread life warranties. First, they do not apply to police use. Second, the long-lasting tire gives up dry and wet performance to gain tread life. In the end, you will get a warranty you can't claim, put on a slippery-when-wet tire, probably violate the OE speed rating and perhaps endanger the life of the officer driving the vehicle…and you may not get THAT much more tread life.

ContiProContact. However, if for local availability or bid price reasons another tire is needed, begin with the Firehawk GT Pursuit. Again, get a couple of sets for tire wear testing. After the Firehawk GT Pursuit, consider the Eagle RS-A.

Can you replace the OE tire on the Chevy Impala with another V-rated tire and improve performance? Yes. The ContiProContact and Eagle RS-A both appear to be better choices. The Firehawk HP Pursuit is tire is not available for the Chevy Impala. Only a H-rated Firehawk GT (not Firehawk GT Pursuit) is available for the police Impala that requires a V-rated tire.

If in doubt, should you put the OE tire back on? Probably. However, this test shows improvements for the Ford CVPI, and definitely the Chevy Impala, are possible with prudent tire selection. The purposes of this test are to point toward some tires as good options to start your own in-service wear tests. And to point away from other tires. And to say, in some cases, leave well enough alone. Each of the test tires will be on display at TrackTech during the 2009 Police Fleet Expo. (www.policefleetexpo.com)

Disclaimer: Tire Rack provided all the objective test data and moderated all of the subjective driver impression rankings. However, all of the conclusions, rankings and methods of ranking and rating are the opinions and decisions of *Police Fleet Manager*, and not necessarily the position of Tire Rack Inc.

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## OVERALL DRIVER SUBJECTIVE RATING: DRY OVERALL HANDLING

| Tire | Rating | Rank |
|---|---|---|
| Continental ContiProContact | 7.67 | 1st |
| Goodyear Eagle RS-A | 7.33 | 2nd |
| Firestone Firehawk GT Pursuit | 7.18 | 3rd |
| General Altimax HP | 6.17 | 4th |
| Pirelli P6 Four Seasons | 5.67 | 5th |

**Rating: 1 (unacceptable) to 10 (superior)*

## OVERALL DRIVER SUBJECTIVE RATING: DRY CORNERING

| Tire | Rating | Rank |
|---|---|---|
| Continental ContiProContact | 7.50 | 1st |
| Firestone Firehawk GT Pursuit | 7.18 | 2nd tie |
| Goodyear Eagle RS-A | 7.18 | 2nd tie |
| General Altimax HP | 6.17 | 4th |
| Pirelli P6 Four Seasons | 6.00 | 5th |

**Rating: 1 (unacceptable) to 10 (superior)*

## OVERALL DRIVER SUBJECTIVE RATING: DRY STEERING RESPONSE

| Tire | Rating | Rank |
|---|---|---|
| Goodyear Eagle RS-A | 7.50 | 1st |
| Continental ContiProContact | 7.18 | 2nd |
| Firestone Firehawk GT Pursuit | 7.00 | 3rd |
| Pirelli P6 Four Seasons | 6.67 | 4th |
| General Altimax HP | 6.17 | 5th |

**Rating: 1 (unacceptable) to 10 (superior)*

## OVERALL DRIVER SUBJECTIVE RATING: DRY BRAKING TRACTION

| Tire | Rating | Rank |
|---|---|---|
| Goodyear Eagle RS-A | 7.67 | 1st |
| Firestone Firehawk GT Pursuit | 7.18 | 2nd |
| Continental ContiProContact | 7.00 | 3rd |
| General Altimax HP | 6.33 | 4th |
| Pirelli P6 Four Seasons | 5.83 | 5th |

**Rating: 1 (unacceptable) to 10 (superior)*