Equipment Performance Report: 2001 Patrol Vehicle Tires

National Law Enforcement and Corrections Technology Center

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Preface

The National Institute of Justice's National Law Enforcement and Corrections Technology Center (NLECTC) is pleased to present the results of its comprehensive evaluation of patrol vehicle tires for 2001. When the project was first visualized, the goal was to provide information to help law enforcement agencies nationwide decide which tires would be best for their patrol vehicle fleets.

This report contains a large amount of data generated under a variety of test conditions. Score sheets compare the tires' performance in various categories but do not identify any overall "winner" or "loser." Because driving conditions in different parts of the country vary widely, individual agencies are left with the task of identifying the most suitable tires for their patrol vehicles based on their own driving conditions and needs. It is important that agencies place the appropriate weight on those portions of the test data most representative of the conditions they may encounter. For example, the tire that best meets the needs of a law enforcement agency in the desert Southwest, which has largely dry weather, may be different than what would be best for an agency in the Pacific Northwest, where wet weather is more the norm. In addition, the most suitable tire may also depend on the make and model of the patrol vehicle—the best tire for use on the rear-wheel-drive Ford Police Interceptor may be different from the best tire for the front-wheel-drive Chevrolet Impala.

Each brand of tire was tested on two vehicles, a Ford Police Interceptor and a Chevrolet Impala. These cars were selected for use in this test because they represent the primary "police package" vehicles currently in patrol service throughout the United States.

The major manufacturers of police tires were asked to participate and submit samples of tires for evaluation. Four companies donated tires for testing, and the following police tire models were tested:

BF Goodrich Touring T/A VR
Firestone Firehawk PV41
General XP 2000 V4
Goodyear Eagle RS–A

The size of all of the test tires was the same, P225/60R–16. All of the police tires tested on both cars carried a "V" speed rating, which means they are capable of withstanding sustained speeds up to 149 miles per hour (mph). The load ratings varied slightly between the tire brands.

In addition to the four "police tires" tested, an additional "nonpolice," or regular passenger car tire, was evaluated. This tire carried an "S" speed rating, which means it is capable of withstanding sustained speeds up to 112 mph. The load rating was essentially equal to the police tires.

The nonpolice tire was tested in response to many inquiries from law enforcement agencies to NLECTC regarding the appropriateness of installing regular passenger car tires not specifically designed for typical law enforcement use. Many agencies face budgetary restrictions or other influences in the procurement process (e.g., requirements to give local vendors priority in the procurement of goods and services) that may require them to consider purchasing these types of tires. The nonpolice tire was selected at random from a local tire supplier where the tests were performed. The manufacturer of the nonpolice tire does not market or make any claim that the tire is appropriate for use on police vehicles or in police service. Consequently, the tire is not identified by name in the report, but is referred to throughout as Brand X. The data presented for the Brand X tire is for comparison purposes only. These data should be used to draw generalized conclusions about the performance of tires designed for normal passenger car service when compared to tires specifically designed and engineered for use on police vehicles and in police service. *(Note when reviewing the data that the speed rating of the police tires contributes more than just the ability to withstand higher speeds; it also makes a significant contribution to the overall performance and handling characteristics of the police tires.)* Please consult the police tire descriptions in this report for complete information about each of the tires tested.

Preface

Each of the test procedures is described as completely as possible in the test report. In the dry serpentine and stopping distance tests the pavement surface of the test course was common asphalt with a coefficient of friction typical of many public roads. The wet stopping distance and serpentine tests also were conducted on a common asphalt surface that was wetted down using a sprinkling system. This resulted in a wet pavement surface without any significant standing water. The dry and wet static circle tests were conducted on a polished concrete surface with a low coefficient of friction. This test surface, when wet, had a constant 3/8 inch to 1/2 inch of standing water and provided a good test of the ability of the various tires to resist hydroplaning and stay in contact with the pavement. All tires were evaluated at 35 psi (cold), per the tire manufacturers' recommendations.

The results in this report were calculated on a computer spreadsheet program with an infinite number of decimal places. Some calculations made on an adding machine or calculator will result in slightly different totals.

Acknowledgments

This fourth comprehensive evaluation of patrol vehicle tires is the result of a recommendation made in 1993 by the Law Enforcement and Corrections Technology Advisory Council (LECTAC). LECTAC consists of criminal justice officials from Federal, State, and local agencies who assess equipment needs and set priorities for developing equipment standards, guides, test reports, and other publications. LECTAC felt that periodic evaluations of police tires were crucial to addressing the informational needs of law enforcement agencies in procuring equipment critical to the operation of their patrol vehicle fleets. It is hoped that this evaluation will assist the agencies to select, in a cost-effective manner, the best tires for their fleets.

The National Institute of Justice's National Law Enforcement and Corrections Technology Center (NLECTC) thanks the Federal Law Enforcement Training Center (FLETC) in Glynco, Georgia, for its assistance in preparation and for the use of its Range 7 road course for the high-speed-handling portion of the tests.

NLECTC also thanks the First Coast Technical Center (FCTC) for providing a test facility in St. Augustine, Florida, that was well equipped to meet the needs for this evaluation, and for the much-needed assistance so willingly provided by FCTC personnel during the testing process.

Our thanks also go to the TRW Corporation and its personnel for use of portions of the TRW facility at Green Cove Springs, Florida. TRW's cooperation has allowed us to produce more reliable wet pavement test data.

NLECTC thanks the Ford Motor Company and the Chevrolet Division of General Motors Corporation for the use of police package cars and police wheels for this evaluation. The companies that submitted the tires for testing deserve recognition and thanks as well: Michelin America Small Tire, a Division of Michelin North America; Bridgestone-Firestone, Inc.; General Tire Company; and Goodyear Tire and Rubber Company.

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General Comments on Statistical Analysis

Statistical analyses of these data were performed using standard parametric tests. This means that the sampling and testing fairly represented the characteristics being tested. There is only one most likely result in each sample, and that result is represented by the average (mean) of the sample observations.

A paired T-test was used to determine if statistical differences existed. This test compares two samples at a time. It uses the average and the variability in each sample to determine if two samples are statistically different from one another.

The "paired" aspect simply means that analysts compared the same observation from each sample rather than randomly picking the comparisons. For example, if there were three different drivers in a given test, analysts compared driver "A" in one sample to driver "A" in the second sample rather than mix the drivers. This was done to reduce the effect of differences between drivers, which is unrelated to what analysts were trying to test.

A 95-percent level of confidence was used. Because a sample is, at best, an approximation of reality, one can never be 100-percent sure that the sample result is the same as the actual result would be. In this testing and analysis, analysts are *at least* 95-percent sure of the statistical result. In statistical terms, this is a relatively high degree of certainty.

Where the evaluation shows minor performance differences between the tires on a given test, but analysis of the data indicates the differences are not statistically significant, a specific notation has been made on the overall score page for that test. Detailed explanations are given in Appendix A: Analysis To Determine Statistical Significance.

Carl Davis, who analyzed the data to determine their statistical significance, compiled the information contained in appendix A.

Testing Equipment

The following test equipment was used in the static circle, stopping distance, serpentine, high-speed-handling, and treadwear portions of the evaluation program.

DATRON TECHNOLOGY, INC.
33533 West Twelve Mile Road, Suite 180
Farmington Hills, MI 48331
DLS Smart Sensor–Optical Noncontact Speed and Distance Sensor

CHRONOMIX CORPORATION
650F Vaqueros Avenue
Sunnyvale, CA 94086–3580
Compusport 737 Multi-Function Printing Timer

MICRO SWITCH
Division of Honeywell
Freeport, IL 61032
Modulated LED Control (photoelectric microswitch)
Model FE–MLS–3B

ALGE–TELESIGNAL TX/RX
Phoenix Sports Technology
1344 Route 100 South
P.O. Box 774
Trexlertown, PA 18087
Alge Sports Timing Telesignal Transmitter—Model TX
Alge Sports Timing Telesignal Receiver—Model RX

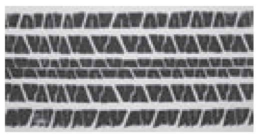
BELL PRO POLICE
Box 927
Rantol, IL 61866
Bell MC–500VBL76 Nascar Style Driving Helmets

MTI CORPORATION
965 Corporate Boulevard
Aurora, IL 60504
Mitutoyo Digital Tread Depth Gauge—
Model 700–105

Police Tire Descriptions

Tested on the Chevrolet Impala and Ford Police Interceptor

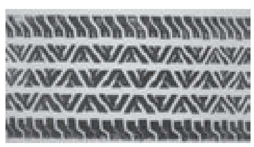
BF Goodrich Touring T/A VR4



P225/60R–16 97V M&S
Tread: 5 plies—2 Polyester, 2 Steel, 1 Nylon
Sidewall: 2 plies Polyester
Max Load: 1609 lbs (730 kg)
Max Inflation: 44 psi (300 kPa)
U.S. Government-mandated ratings:

Treadwear	360
Traction	A
Temperature	A

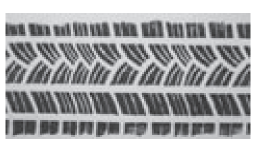
Firestone Firehawk PV41



P225/60R–16 97V M&S
Tread: 6 plies—2 Steel, 2 Polyester, 2 Nylon
Sidewall: 2 plies Polyester
Max Load: 1609 lbs (730 kg)
Max Inflation: 44 psi (300 kPa)
U.S. Government-mandated ratings:

Treadwear	340
Traction	A
Temperature	A

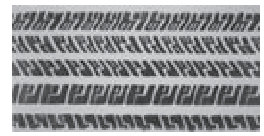
General XP–2000 V4



P225/60R–16 98V M&S
Tread: 6 plies—2 Polyester, 2 Steel, 2 Nylon
Sidewall: 2 plies Polyester
Max Load: 1653 lbs (750 kg)
Max Inflation: 44 psi (300 kPa)
U.S. Government-mandated ratings:

Treadwear	320
Traction	A
Temperature	A

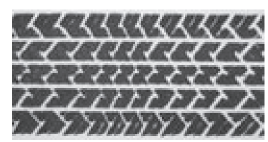
Goodyear Eagle RS–A



P225/60R–16 97V M&S
Tread: 6 plies—2 Polyester, 2 Steel, 2 Nylon
Sidewall: 2 plies Polyester
Max Load: 1609 lbs (730 kg)
Max Inflation: 44 psi (300 kPa)
U.S. Government-mandated ratings:

Treadwear	260
Traction	A
Temperature	A

Brand X



P225/60R–16 97S M&S
Tread: 4 plies—2 Polyester, 2 Steel
Sidewall: 2 plies Polyester
Max Load: 1609 lbs (730 kg)
Max Inflation: 35 psi (240 kPa)
U.S. Government-mandated ratings:

Treadwear	440
Traction	A
Temperature	B

All tires contain very useful information molded into the sidewall. It shows the name of the tire, its size, whether it is tubeless or tube type, the maximum load and maximum inflation, the important safety warning, and much other information.

Passenger Tires

To assist in interpreting the information presented on the preceding pages, shown here is an artist's rendition of the sidewall of one of the tires evaluated. "P" stands for passenger, "225" represents the width of the tire in millimeters, "60" is the ratio of height to width, "V" is the speed rating, "R" means radial, and "16" is the diameter of the wheel in inches.

Some speed-rated tires carry a Service Description instead of showing the speed symbol in the size designation. The Service Description, 97V in this example, consists of the load index (97) and speed symbol (V).

A "B" in place of the "R" means the tire is belted bias construction. A "D" in place of the "R" means diagonal bias construction.

The maximum load is shown in lb (pounds) and in kg (kilograms), and maximum pressure in psi (pounds per square inch) and in kPa (kilopascals). Kilograms and kilopascals are metric units of measurement.

The letters "DOT" certify compliance with all applicable safety standards established by the U.S. Department of Transportation (DOT).

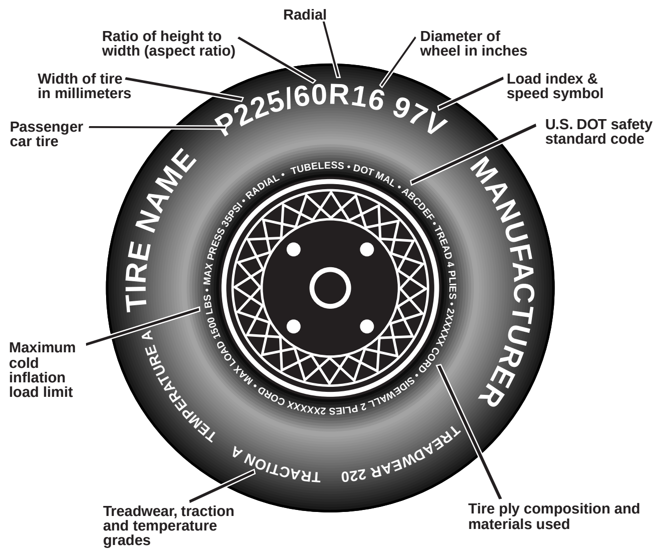
Adjacent to this is a tire identification or serial number. This serial number is a code with up to 11 digits that are a combination of numbers and letters.

The sidewall also shows the type of cord and number of plies in the sidewall and under the tread. DOT requires tire manufacturers to grade passenger car tires based on three performance factors: treadwear, traction, and temperature resistance.

Treadwear

The treadwear grade is a comparative rating based on the wear rate of the tire when tested under controlled conditions on a specified Government test track.

TYPICAL PASSENGER TIRE



A tire graded 200 would wear twice as long on the Government test course under specified test conditions as one graded 100.

It is wrong to link treadwear grades with your projected tire mileage. The relative performance of tires depends upon the actual conditions of their use and may vary due to driving habits, service practices, differences in road characteristics, and climate.

Traction

Traction grades, from highest to lowest, are A, B, and C. They represent the tire's ability to stop on wet pavement as measured under controlled conditions on specified Government test surfaces of asphalt and concrete.

Temperature

The temperature grades, from highest to lowest, are A, B, and C. These represent the tire's resistance to the generation of heat when tested under controlled conditions on a specified indoor laboratory test wheel.

Source: Tire Industry Safety Council

Static Circle Test: Dry Pavement Surface

Test Objective

Determine the road-holding performance characteristics of the test tires in a steady-state turning situation on a dry pavement surface. The course used has a flat polished concrete surface on which a circle has been created using pylons. The circle measures 200 feet in diameter and 628.3 feet in circumference. The driver is allowed 2 laps to accelerate and stabilize the vehicle at the highest speed possible while remaining within the marked lane. Once the vehicle is stabilized, the following 5 laps are timed. The vehicle is then turned around and this process (2 warmup laps, 5 timed laps) is repeated in the opposite direction around the circle to account for any minor differences in the vehicle's suspension design or setup that may favor turning in a particular direction. The average of the 10 timed laps is used to determine the final score for this portion of the evaluation, which is expressed in lateral G attained. Lateral G is the measurement of the resistance of lateral movement before the tire loses adhesion and the vehicle begins to slip. Deficiencies in tire adhesion, or the tendency of the tire to slip sideways under hard, steady-state cornering maneuvers, will result in slower speeds, longer lap times, and a relatively lower overall score on this portion of the evaluation.

Test Methodology

Following a 2-lap tire warmup, each test vehicle equipped with the make and model of tire to be evaluated makes a minimum of 5 timed laps around the static circle course. The vehicle is then turned around and the process (2 warmup laps, 5 timed laps) is repeated in the opposite direction around the circle. The final score for each tire on this portion of the evaluation is the average of the 10 timed laps and is expressed as lateral G attained.

Formulas

To determine the lateral G attained, multiply pi times the diameter of the test circle and divide by the lap time. Square this quotient, divide by the radius of the circle, and divide by 1 G.

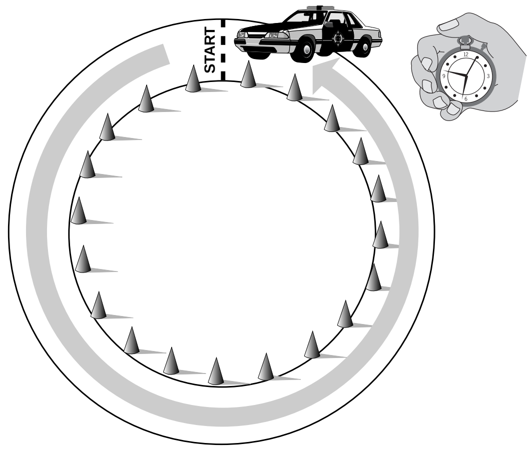
Example:

(3.14159 x 200 ft ÷ lap time) x (3.14159 x 200 ÷ lap time) ÷ 100 ft ÷ 32.2 ft/s
(pi) (diameter) (radius) (1 G)

To determine speed, divide the circumference of the test circle by the lap time, then divide by 1.4667 ft/s.

Example:

628.3 ft ÷ lap time ÷ 1.4667 ft/s



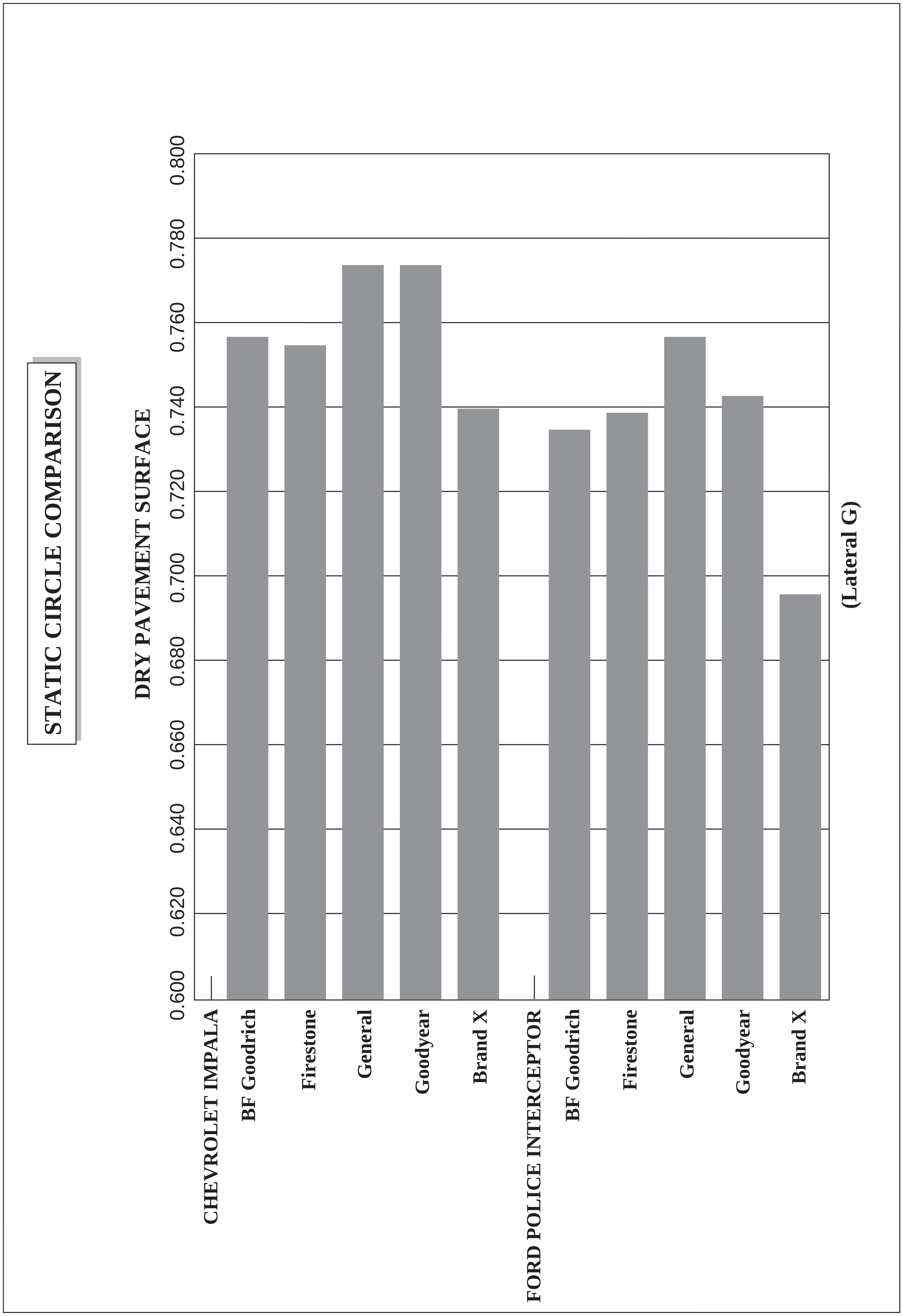
Summary Test Data

Static Circle Test
Dry Pavement Surface (628.3 feet in circumference)
Overall Scores

	Elapsed time (seconds)	Average speed (mph)	Lateral G	Percent difference*
CAR: **Chevrolet Impala** TIRE SIZE: **P225/60R–16**				
BF Goodrich Touring T/A VR4**	12.725	33.67	0.757	1.13%
Firestone Firehawk PV41**	12.743	33.62	0.755	1.27%
General XP 2000 V4**	12.589	34.03	0.774	0.05%
Goodyear Eagle RS–A**	12.583	34.05	0.774	0.00%
Brand X**	12.871	33.28	0.740	2.29%
CAR: **Ford Police Interceptor** TIRE SIZE: **P225/60R–16**				
BF Goodrich Touring T/A VR4**	12.922	33.16	0.735	1.56%
Firestone Firehawk PV41**	12.879	33.26	0.739	1.22%
General XP 2000 V4**	12.724	33.67	0.757	0.00%
Goodyear Eagle RS–A**	12.843	33.36	0.743	0.94%
Brand X**	13.270	32.28	0.696	4.29%

* The percent difference is obtained by subtracting the elapsed time of the tire of interest from the elapsed time of the best scoring tire (lowest score is best) and dividing that number by the elapsed time of the best scoring tire.

** See appendix A for details of statistical analysis.


STATIC CIRCLE COMPARISON
DRY PAVEMENT SURFACE
0.600
0.620
0.640
0.660
0.680
0.700
0.720
0.740
0.760
0.780
0.800
(Lateral G)
CHEVROLET IMPALA
BF Goodrich
Firestone
General
Goodyear
Brand X
FORD POLICE INTERCEPTOR
BF Goodrich
Firestone
General
Goodyear
Brand X

Test Data

Static Circle Test
Dry Pavement Surface (628.3 feet in circumference)

TIRE: **BF Goodrich Touring T/A VR4**
SIZE: **P225/60R–16 97V**
CAR: **Chevrolet Impala**

Lap #	**Lap Time**	**Speed**	**Lateral G**
Counterclockwise			
Lap #1	12.735	33.64	0.756
Lap #2	12.661	33.84	0.765
Lap #3	12.802	33.46	0.748
Lap #4	12.612	33.97	0.771
Lap #5	12.716	33.69	0.758
Average Lap Times:	12.705		
Clockwise			
Lap #1	12.645	33.88	0.767
Lap #2	12.797	33.48	0.749
Lap #3	12.769	33.55	0.752
Lap #4	12.752	33.59	0.754
Lap #5	12.763	33.56	0.753
Average Lap Times:	12.745		
Overall Average:	**12.725**	**33.67**	**0.757**

Static Circle Test
Dry Pavement Surface (628.3 feet in circumference)

TIRE: **BF Goodrich Touring T/A VR4**
SIZE: **P225/60R–16 97V**
CAR: **Ford Police Interceptor**

Lap #	Lap Time	Speed	Lateral G
Counterclockwise			
Lap #1	12.762	33.57	0.753
Lap #2	12.783	33.51	0.750
Lap #3	12.745	33.61	0.755
Lap #4	12.739	33.63	0.755
Lap #5	12.805	33.45	0.748
Average Lap Times:	12.767		
Clockwise			
Lap #1	13.126	32.64	0.712
Lap #2	13.143	32.59	0.710
Lap #3	13.099	32.70	0.715
Lap #4	13.019	32.90	0.723
Lap #5	13.003	32.95	0.725
Average Lap Times:	13.078		
Overall Average:	**12.922**	**33.16**	**0.735**

Static Circle Test
Dry Pavement Surface (628.3 feet in circumference)

TIRE: **Firestone Firehawk PV41**
SIZE: **P225/60R–16 97V**
CAR: **Chevrolet Impala**

Lap #	**Lap Time**	**Speed**	**Lateral G**
Counterclockwise			
Lap #1	12.768	33.55	0.752
Lap #2	12.748	33.60	0.754
Lap #3	12.714	33.69	0.758
Lap #4	12.688	33.76	0.762
Lap #5	12.765	33.56	0.752
Average Lap Times:	12.737		
Clockwise			
Lap #1	12.783	33.51	0.750
Lap #2	12.818	33.42	0.746
Lap #3	12.770	33.55	0.752
Lap #4	12.817	33.42	0.746
Lap #5	12.558	34.11	0.777
Average Lap Times:	12.749		
Overall Average:	**12.743**	**33.62**	**0.755**

Static Circle Test
Dry Pavement Surface (628.3 feet in circumference)

TIRE: **Firestone Firehawk PV41**
SIZE: **P225/60R–16 97V**
CAR: **Ford Police Interceptor**

Lap #	**Lap Time**	**Speed**	**Lateral G**
Counterclockwise			
Lap #1	12.844	33.35	0.743
Lap #2	12.796	33.48	0.749
Lap #3	12.951	33.08	0.731
Lap #4	12.823	33.41	0.746
Lap #5	12.790	33.49	0.749
Average Lap Times:	12.841		
Clockwise			
Lap #1	13.008	32.93	0.725
Lap #2	12.917	33.16	0.735
Lap #3	12.862	33.31	0.741
Lap #4	12.833	33.38	0.744
Lap #5	12.967	33.04	0.729
Average Lap Times:	12.917		
Overall Average:	**12.879**	**33.26**	**0.739**

Static Circle Test
Dry Pavement Surface (628.3 feet in circumference)

TIRE: **General XP 2000 V4**
SIZE: **P225/60R–16 98V**
CAR: **Chevrolet Impala**

Lap #	**Lap Time**	**Speed**	**Lateral G**
Counterclockwise			
Lap #1	12.578	34.06	0.775
Lap #2	12.614	33.96	0.771
Lap #3	12.526	34.20	0.781
Lap #4	12.663	33.83	0.765
Lap #5	12.626	33.93	0.769
Average Lap Times:	12.601		
Clockwise			
Lap #1	12.698	33.74	0.760
Lap #2	12.432	34.46	0.793
Lap #3	12.411	34.52	0.796
Lap #4	12.629	33.92	0.769
Lap #5	12.710	33.70	0.759
Average Lap Times:	12.576		
Overall Average:	**12.589**	**34.03**	**0.774**

Static Circle Test
Dry Pavement Surface (628.3 feet in circumference)

TIRE: **General XP 2000 V4**
SIZE: **P225/60R–16 98V**
CAR: **Ford Police Interceptor**

Lap #	**Lap Time**	**Speed**	**Lateral G**
Counterclockwise			
Lap #1	12.709	33.71	0.759
Lap #2	12.732	33.65	0.756
Lap #3	12.667	33.82	0.764
Lap #4	12.662	33.83	0.765
Lap #5	12.650	33.86	0.766
Average Lap Times:	12.684		
Clockwise			
Lap #1	12.728	33.66	0.757
Lap #2	12.667	33.82	0.764
Lap #3	12.757	33.58	0.753
Lap #4	12.817	33.42	0.746
Lap #5	12.847	33.35	0.743
Average Lap Times:	12.763		
Overall Average:	**12.724**	**33.67**	**0.757**

Static Circle Test
Dry Pavement Surface (628.3 feet in circumference)

TIRE: **Goodyear Eagle RS–A**
SIZE: **P225/60R–16 97V**
CAR: **Chevrolet Impala**

Lap #	**Lap Time**	**Speed**	**Lateral G**
Counterclockwise			
Lap #1	12.565	34.09	0.777
Lap #2	12.643	33.88	0.767
Lap #3	12.535	34.18	0.780
Lap #4	12.590	34.03	0.773
Lap #5	12.542	34.16	0.779
Average Lap Times:	12.575		
Clockwise			
Lap #1	12.585	34.04	0.774
Lap #2	12.514	34.23	0.783
Lap #3	12.698	33.74	0.760
Lap #4	12.590	34.03	0.773
Lap #5	12.563	34.10	0.777
Average Lap Times:	12.590		
Overall Average:	**12.583**	**34.05**	**0.774**

Static Circle Test
Dry Pavement Surface (628.3 feet in circumference)

TIRE: **Goodyear Eagle RS–A**
SIZE: **P225/60R–16 97V**
CAR: **Ford Police Interceptor**

Lap #	**Lap Time**	**Speed**	**Lateral G**
Counterclockwise			
Lap #1	12.989	32.98	0.727
Lap #2	12.917	33.16	0.735
Lap #3	12.952	33.08	0.731
Lap #4	12.981	33.00	0.728
Lap #5	12.949	33.08	0.731
Average Lap Times:	12.958		
Clockwise			
Lap #1	12.778	33.53	0.751
Lap #2	12.699	33.73	0.760
Lap #3	12.693	33.75	0.761
Lap #4	12.760	33.57	0.753
Lap #5	12.716	33.69	0.758
Average Lap Times:	12.729		
Overall Average:	**12.843**	**33.36**	**0.743**

Static Circle Test
Dry Pavement Surface (628.3 feet in circumference)

TIRE: **Brand X**
SIZE: **P225/60R–16 97S**
CAR: **Chevrolet Impala**

Lap #	**Lap Time**	**Speed**	**Lateral G**
Counterclockwise			
Lap #1	12.828	33.39	0.745
Lap #2	12.788	33.50	0.750
Lap #3	12.850	33.34	0.743
Lap #4	12.795	33.48	0.749
Lap #5	12.853	33.33	0.742
Average Lap Times:	12.823		
Clockwise			
Lap #1	12.989	32.98	0.727
Lap #2	12.959	33.06	0.730
Lap #3	12.897	33.22	0.737
Lap #4	12.853	33.33	0.742
Lap #5	12.897	33.22	0.737
Average Lap Times:	12.919		
Overall Average:	**12.871**	**33.28**	**0.740**

Static Circle Test
Dry Pavement Surface (628.3 feet in circumference)

TIRE: **Brand X**
SIZE: **P225/60R–16 97S**
CAR: **Ford Police Interceptor**

Lap #	**Lap Time**	**Speed**	**Lateral G**
Counterclockwise			
Lap #1	13.260	32.31	0.697
Lap #2	13.242	32.35	0.699
Lap #3	13.201	32.45	0.704
Lap #4	13.228	32.39	0.701
Lap #5	13.229	32.38	0.701
Average Lap Times:	13.232		
Clockwise			
Lap #1	13.324	32.15	0.691
Lap #2	13.289	32.24	0.694
Lap #3	13.281	32.26	0.695
Lap #4	13.334	32.13	0.690
Lap #5	13.313	32.18	0.692
Average Lap Times:	13.308		
Overall Average:	**13.270**	**32.28**	**0.696**

Static Circle Test: Wet Pavement Surface

Test Objective

Determine the road-holding performance characteristics of each test tire in a steady-state turning situation on a wet pavement surface having a constant 3/8 inch to 1/2 inch of water depth. The course used has a flat polished concrete surface on which a circle has been created using pylons. The circle measures 200 feet in diameter and 628.3 feet in circumference. The driver is allowed 2 laps to accelerate and stabilize the vehicle at the highest speed possible while remaining within the marked lane. Once the vehicle is stabilized, the following 5 laps are timed. The vehicle is then turned around and this process (2 warmup laps, 5 timed laps) is repeated in the opposite direction around the circle to account for any minor differences in the vehicle's suspension design or setup that may favor turning in a particular direction. The average of the 10 timed laps is used to determine the final score for this portion of the evaluation, which is expressed in lateral G attained. Deficiencies in tire adhesion, or the tendency of the tire to slip sideways under hard, steady-state cornering maneuvers, will result in slower speeds, longer lap times, and a relatively lower overall score on this portion of the evaluation.

Test Methodology

Following a 2-lap tire warmup, each test vehicle equipped with the make and model of tire to be evaluated makes a minimum of 5 timed laps around the static circle course. The vehicle is then turned around and the process (2 warmup laps, 5 timed laps) is repeated in the opposite direction around the circle. The final score for each tire on this portion of the evaluation is the average of the 10 timed laps and is expressed in lateral G attained.

Formulas

To determine the lateral G attained, multiply pi times the diameter of the test circle and divide by the lap time. Square this quotient, divide by the radius of the circle, and divide by 1 G.

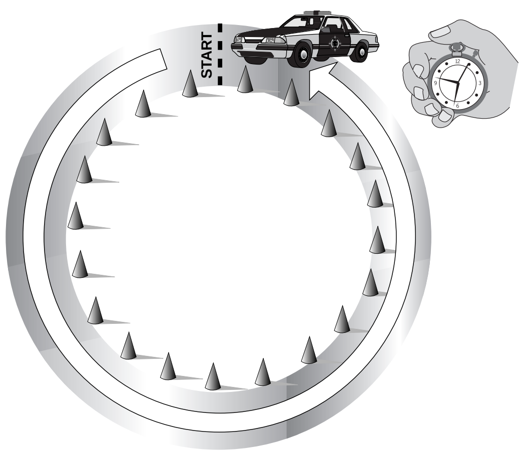
Example:

(3.14159 x 200 ft ÷ lap time) x (3.14159 x 200 ÷ lap time) ÷ 100 ft ÷ 32.2 ft/s
(pi) (diameter) (radius) (1 G)

To determine speed, divide the circumference of the test circle by the lap time, then divide by 1.4667 ft/s.

Example:

628.3 ft ÷ lap time ÷ 1.4667 ft/s



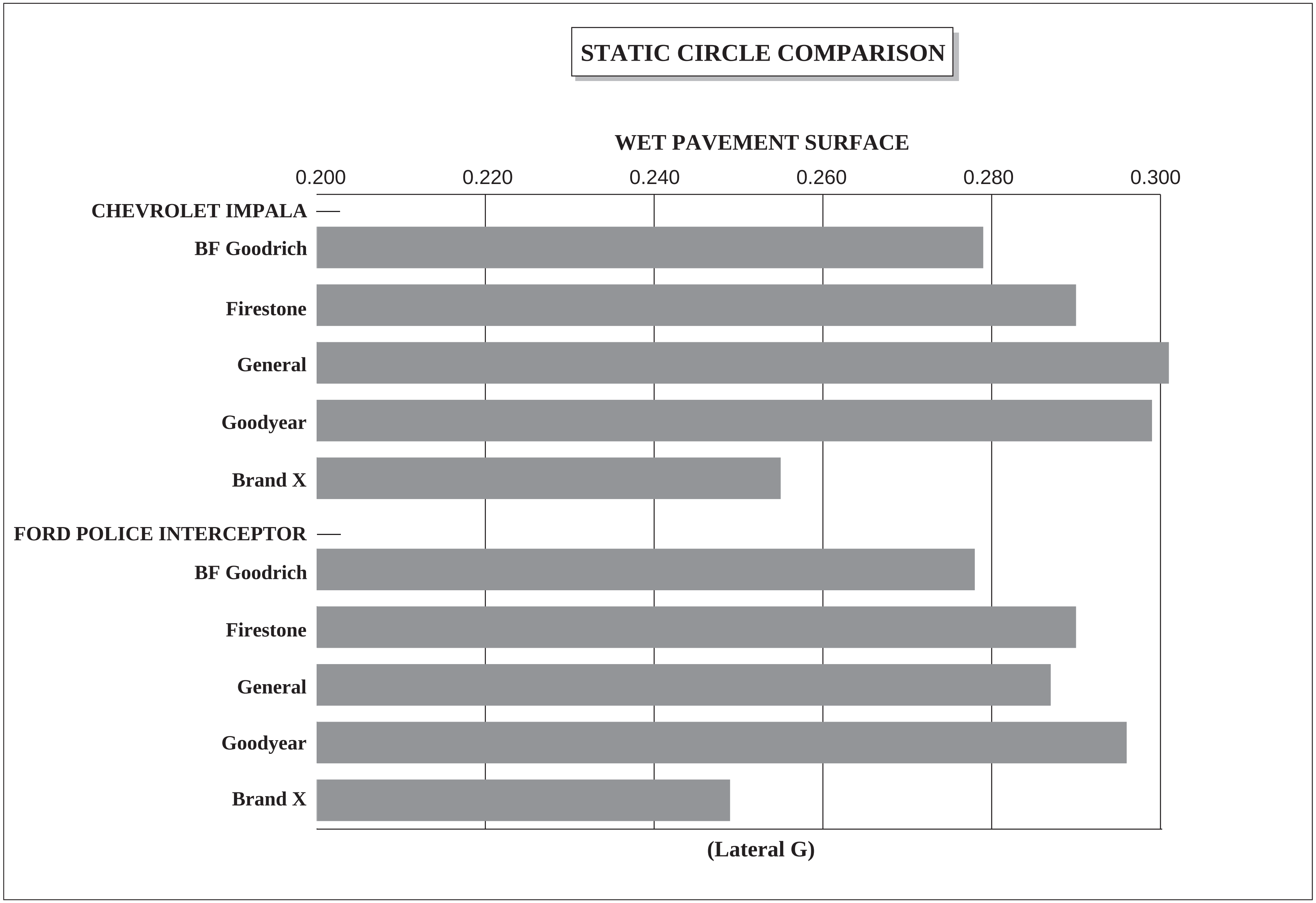
Summary Test Data

Static Circle Test
Wet Pavement Surface (628.3 feet in circumference)
Overall Scores

	Elapsed time (seconds)	Average speed (mph)	Lateral G	Percent difference*
CAR: **Chevrolet Impala**				
TIRE SIZE: **P225/60R–16**				
BF Goodrich Touring T/A VR4**	20.987	20.42	0.279	3.96%
Firestone Firehawk PV41**	20.554	20.85	0.290	1.82%
General XP 2000 V4**	20.187	21.22	0.301	0.00%
Goodyear Eagle RS–A**	20.248	21.16	0.299	0.30%
Brand X**	21.948	19.52	0.255	8.72%
CAR: **Ford Police Interceptor**				
TIRE SIZE: **P225/60R–16**				
BF Goodrich Touring T/A VR4**	21.022	20.38	0.278	3.33%
Firestone Firehawk PV41**	20.569	20.83	0.290	1.10%
General XP 2000 V4**	20.667	20.72	0.287	1.58%
Goodyear Eagle RS–A**	20.345	21.06	0.296	0.00%
Brand X**	22.209	19.29	0.249	9.16%

* The percent difference is obtained by subtracting the elapsed time of the tire of interest from the elapsed time of the best scoring tire (lowest score is best) and dividing that number by the elapsed time of the best scoring tire.

** See appendix A for details of statistical analysis.


STATIC CIRCLE COMPARISON
WET PAVEMENT SURFACE
0.200
0.220
0.240
0.260
0.280
0.300
CHEVROLET IMPALA
BF Goodrich
Firestone
General
Goodyear
Brand X
FORD POLICE INTERCEPTOR
BF Goodrich
Firestone
General
Goodyear
Brand X
(Lateral G)

Test Data

Static Circle Test
Wet Pavement Surface (628.3 feet in circumference)

TIRE: **BF Goodrich Touring T/A VR4**
SIZE: **P225/60R–16 97V**
CAR: **Chevrolet Impala**

Lap #	**Lap Time**	**Speed**	**Lateral G**
Counterclockwise			
Lap #1	20.888	20.51	0.281
Lap #2	21.083	20.32	0.276
Lap #3	20.743	20.65	0.285
Lap #4	20.928	20.47	0.280
Lap #5	21.156	20.25	0.274
Average Lap Times:	20.960		
Clockwise			
Lap #1	21.312	20.10	0.270
Lap #2	21.016	20.38	0.278
Lap #3	21.286	20.13	0.271
Lap #4	20.212	21.19	0.300
Lap #5	21.243	20.17	0.272
Average Lap Times:	21.014		
Overall Average:	**20.987**	**20.42**	**0.279**

Static Circle Test
Wet Pavement Surface (628.3 feet in circumference)

TIRE: **BF Goodrich Touring T/A VR4**
SIZE: **P225/60R–16 97V**
CAR: **Ford Police Interceptor**

Lap #	**Lap Time**	**Speed**	**Lateral G**
Counterclockwise			
Lap #1	20.917	20.48	0.280
Lap #2	21.044	20.36	0.277
Lap #3	21.024	20.38	0.277
Lap #4	20.793	20.60	0.284
Lap #5	21.076	20.33	0.276
Average Lap Times:	20.971		
Clockwise			
Lap #1	20.561	20.84	0.290
Lap #2	21.150	20.25	0.274
Lap #3	20.886	20.51	0.281
Lap #4	21.345	20.07	0.269
Lap #5	21.420	20.00	0.267
Average Lap Times:	21.072		
Overall Average:	**21.022**	**20.38**	**0.278**

Static Circle Test
Wet Pavement Surface (628.3 feet in circumference)

TIRE: **Firestone Firehawk PV41**
SIZE: **P225/60R–16 97V**
CAR: **Chevrolet Impala**

Lap #	**Lap Time**	**Speed**	**Lateral G**
Counterclockwise			
Lap #1	20.892	20.50	0.281
Lap #2	20.895	20.50	0.281
Lap #3	21.024	20.38	0.277
Lap #4	20.269	21.14	0.298
Lap #5	20.736	20.66	0.285
Average Lap Times:	20.763		
Clockwise			
Lap #1	20.258	21.15	0.299
Lap #2	20.230	21.18	0.300
Lap #3	20.189	21.22	0.301
Lap #4	20.576	20.82	0.290
Lap #5	20.470	20.93	0.293
Average Lap Times:	20.345		
Overall Average:	**20.554**	**20.85**	**0.290**

Static Circle Test
Wet Pavement Surface (628.3 feet in circumference)

TIRE: **Firestone Firehawk PV41**
SIZE: **P225/60R–16 97V**
CAR: **Ford Police Interceptor**

Lap #	**Lap Time**	**Speed**	**Lateral G**
Counterclockwise			
Lap #1	20.272	21.13	0.298
Lap #2	20.604	20.79	0.289
Lap #3	20.547	20.85	0.290
Lap #4	20.640	20.76	0.288
Lap #5	20.188	21.22	0.301
Average Lap Times:	20.450		
Clockwise			
Lap #1	20.373	21.03	0.295
Lap #2	20.675	20.72	0.287
Lap #3	20.616	20.78	0.288
Lap #4	20.924	20.47	0.280
Lap #5	20.855	20.54	0.282
Average Lap Times:	20.689		
Overall Average:	**20.569**	**20.83**	**0.290**

Static Circle Test
Wet Pavement Surface (628.3 feet in circumference)

TIRE: **General XP 2000 V4**
SIZE: **P225/60R–16 98V**
CAR: **Chevrolet Impala**

Lap #	**Lap Time**	**Speed**	**Lateral G**
Counterclockwise			
Lap #1	20.426	20.97	0.294
Lap #2	20.434	20.96	0.294
Lap #3	20.427	20.97	0.294
Lap #4	20.520	20.88	0.291
Lap #5	20.067	21.35	0.304
Average Lap Times:	20.375		
Clockwise			
Lap #1	20.227	21.18	0.300
Lap #2	20.081	21.33	0.304
Lap #3	19.967	21.45	0.308
Lap #4	19.817	21.62	0.312
Lap #5	19.903	21.52	0.310
Average Lap Times:	19.999		
Overall Average:	**20.187**	**21.22**	**0.301**

Static Circle Test
Wet Pavement Surface (628.3 feet in circumference)

TIRE: **General XP 2000 V4**
SIZE: **P225/60R–16 98V**
CAR: **Ford Police Interceptor**

Lap #	Lap Time	Speed	Lateral G
Counterclockwise			
Lap #1	20.511	20.89	0.291
Lap #2	20.562	20.83	0.290
Lap #3	20.625	20.77	0.288
Lap #4	20.674	20.72	0.287
Lap #5	20.543	20.85	0.291
Average Lap Times:	20.583		
Clockwise			
Lap #1	20.557	20.84	0.290
Lap #2	21.013	20.39	0.278
Lap #3	21.210	20.20	0.273
Lap #4	20.513	20.88	0.291
Lap #5	20.558	20.84	0.290
Average Lap Times:	20.770		
Overall Average:	**20.677**	**20.72**	**0.287**

Static Circle Test
Wet Pavement Surface (628.3 feet in circumference)

TIRE: **Goodyear Eagle RS–A**
SIZE: **P225/60R–16 97V**
CAR: **Chevrolet Impala**

Lap #	Lap Time	Speed	Lateral G
Counterclockwise			
Lap #1	20.669	20.73	0.287
Lap #2	20.247	21.16	0.299
Lap #3	20.642	20.75	0.288
Lap #4	20.258	21.15	0.299
Lap #5	20.224	21.18	0.300
Average Lap Times:	20.408		
Clockwise			
Lap #1	19.917	21.51	0.309
Lap #2	20.134	21.28	0.302
Lap #3	20.292	21.11	0.298
Lap #4	20.260	21.14	0.299
Lap #5	19.834	21.60	0.312
Average Lap Times:	20.087		
Overall Average:	**20.248**	**21.16**	**0.299**

Static Circle Test
Wet Pavement Surface (628.3 feet in circumference)

TIRE: **Goodyear Eagle RS–A**
SIZE: **P225/60R–16 97V**
CAR: **Ford Police Interceptor**

Lap #	**Lap Time**	**Speed**	**Lateral G**
Counterclockwise			
Lap #1	19.987	21.43	0.307
Lap #2	20.157	21.25	0.302
Lap #3	20.300	21.10	0.298
Lap #4	20.158	21.25	0.302
Lap #5	20.323	21.08	0.297
Average Lap Times:	20.185		
Clockwise			
Lap #1	20.327	21.07	0.297
Lap #2	20.635	20.76	0.288
Lap #3	20.563	20.83	0.290
Lap #4	20.528	20.87	0.291
Lap #5	20.473	20.92	0.293
Average Lap Times:	20.505		
Overall Average:	**20.345**	**21.06**	**0.296**

Static Circle Test
Wet Pavement Surface (628.3 feet in circumference)

TIRE: **Brand X**
SIZE: **P225/60R–16 97S**
CAR: **Chevrolet Impala**

Lap #	**Lap Time**	**Speed**	**Lateral G**
Counterclockwise			
Lap #1	21.572	19.86	0.263
Lap #2	21.867	19.59	0.256
Lap #3	22.257	19.25	0.247
Lap #4	22.123	19.36	0.251
Lap #5	21.462	19.96	0.266
Average Lap Times:	21.856		
Clockwise			
Lap #1	21.822	19.63	0.257
Lap #2	22.026	19.45	0.253
Lap #3	22.171	19.32	0.249
Lap #4	21.849	19.61	0.257
Lap #5	22.327	19.19	0.246
Average Lap Times:	22.039		
Overall Average:	**21.948**	**19.52**	**0.255**

Static Circle Test
Wet Pavement Surface (628.3 feet in circumference)

TIRE: **Brand X**
SIZE: **P225/60R–16 97S**
CAR: **Ford Police Interceptor**

Lap #	**Lap Time**	**Speed**	**Lateral G**
Counterclockwise			
Lap #1	22.292	19.22	0.247
Lap #2	22.353	19.16	0.245
Lap #3	22.255	19.25	0.248
Lap #4	22.545	19.00	0.241
Lap #5	22.707	18.87	0.238
Average Lap Times:	22.430		
Clockwise			
Lap #1	21.867	19.59	0.256
Lap #2	21.974	19.50	0.254
Lap #3	22.002	19.47	0.253
Lap #4	22.021	19.45	0.253
Lap #5	22.073	19.41	0.252
Average Lap Times:	21.987		
Overall Average:	**22.209**	**19.29**	**0.249**

Serpentine Test: Dry Pavement Surface

Test Objective

Determine each tire's transient response characteristics and performance on a dry pavement surface. The course used is straight and flat with 550 feet of asphalt and 150 feet of concrete. Pylons are set in a straight line and spaced 100 feet apart. The approach speed is 60 mph, and the driver is required to weave through the pylons while maintaining a speed as close to the approach speed as possible. (See illustration below.) Serious deficiencies in transient response will result in longer elapsed times, slower speeds, and a lower overall score on this portion of the evaluation.

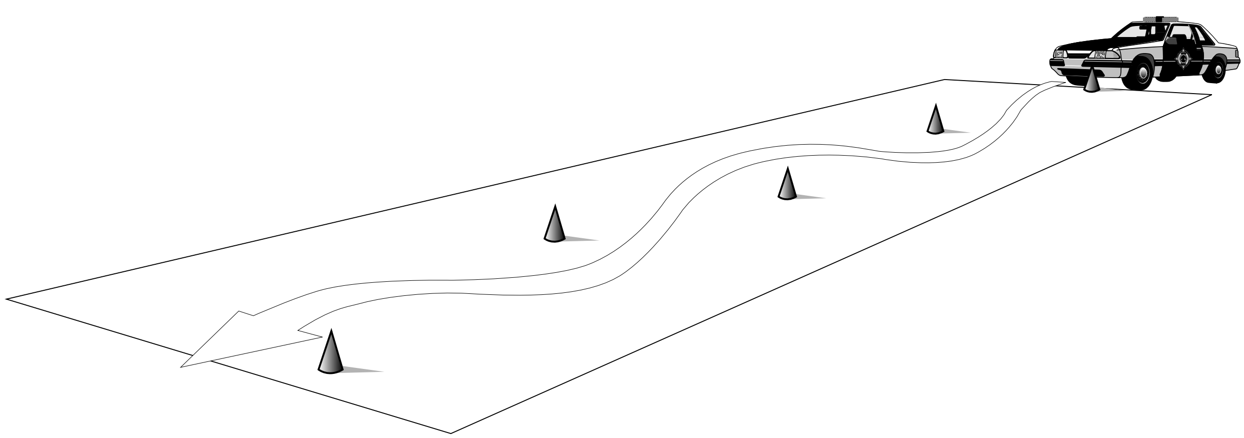
Test Methodology

Following a 2-mile tire warmup, each test vehicle equipped with the make and model of tire to be evaluated is driven through the serpentine course a minimum of 15 times. The average is for all 15 runs, while the final score for each tire is the average of the fastest 12 runs.

Formula

To determine the vehicle's speed, divide the length of the course (700 ft) by 1.4667 ft/s, then divide by the elapsed time.

Example:
700 ft ÷ 1.4667 ft/s ÷ elapsed time
(length of course)



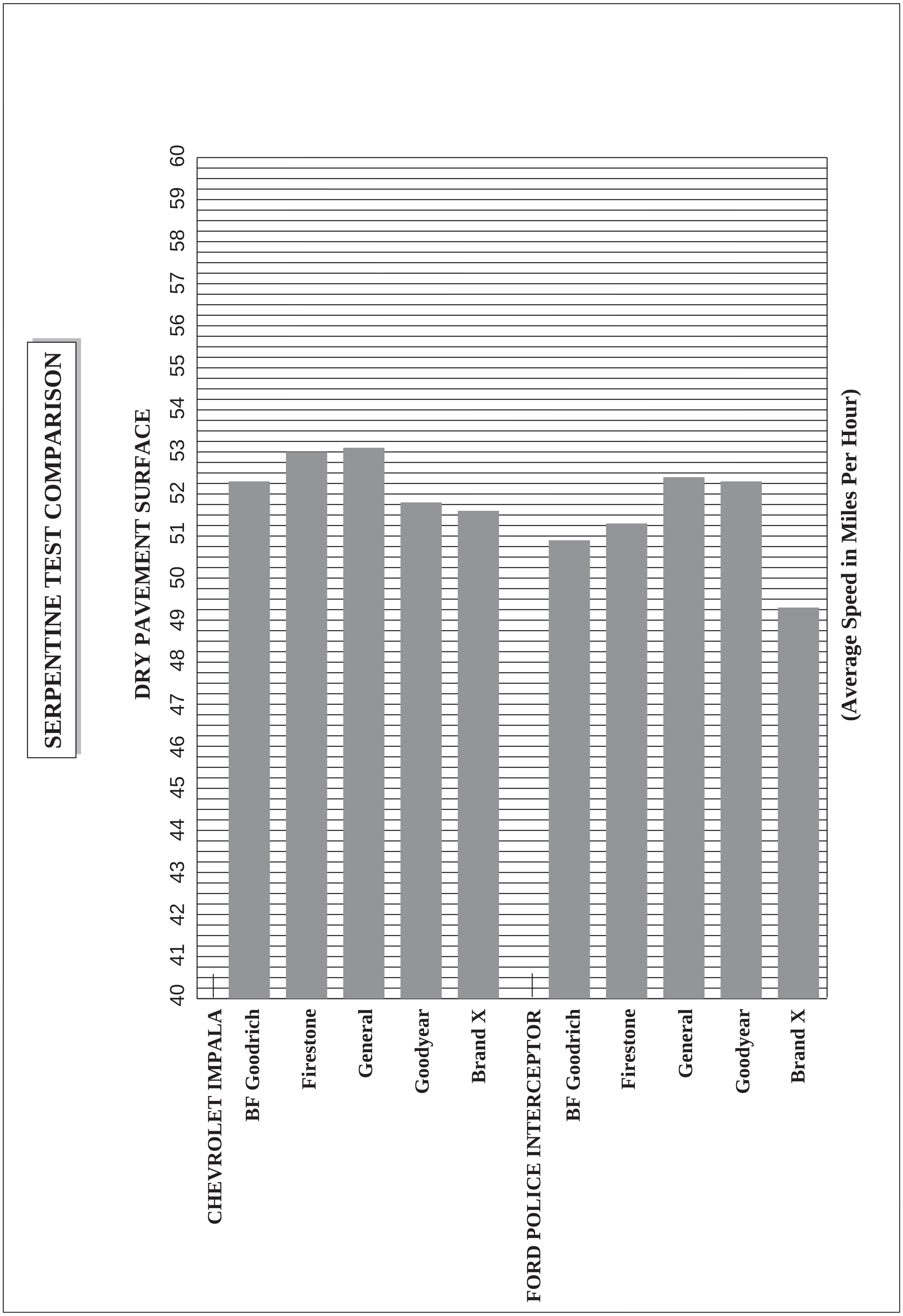
Summary Test Data

Serpentine Test
Dry Pavement Surface (700 feet in length)
Overall Scores

	Elapsed time (seconds)	Average speed (mph)	Percent difference*
CAR: **Chevrolet Impala**			
TIRE SIZE: **P225/60R–16**			
BF Goodrich Touring T/A VR4**	9.119	52.3	1.36%
Firestone Firehawk PV41**	9.013	53.0	0.18%
General XP 2000 V4**	8.997	53.1	0.00%
Goodyear Eagle RS–A**	9.219	51.8	2.47%
Brand X**	9.252	51.6	2.83%
CAR: **Ford Police Interceptor**			
TIRE SIZE: **P225/60R–16**			
BF Goodrich Touring T/A VR4**	9.381	50.9	3.04%
Firestone Firehawk PV41**	9.296	51.3	2.11%
General XP 2000 V4**	9.104	52.4	0.00%
Goodyear Eagle RS–A**	9.123	52.3	0.21%
Brand X**	9.676	49.3	6.28%

* The percent difference is obtained by subtracting the elapsed time of the tire of interest from the elapsed time of the best scoring tire (lowest score is best) and dividing that number by the elapsed time of the best scoring tire.

** See appendix A for details of statistical analysis.



SERPENTINE TEST COMPARISON
DRY PAVEMENT SURFACE
40 41 42 43 44 45 46 47 48 49 50 51 52 53 54 55 56 57 58 59 60
CHEVROLET IMPALA
BF Goodrich
Firestone
General
Goodyear
Brand X
FORD POLICE INTERCEPTOR
BF Goodrich
Firestone
General
Goodyear
Brand X
(Average Speed in Miles Per Hour)

Test Data

Serpentine Test
Dry Pavement Surface (700 feet in length)

TIRE: **BF Goodrich Touring T/A VR4**
SIZE: **P225/60R–16 97V**
CAR: **Chevrolet Impala**

Run #	**Elapsed Time (seconds)**	**Calculated Speed (mph)**
1	9.120	52.3
2	9.188	51.9
3	9.083	52.5
4	9.154	52.1
5	9.228	51.7
6	9.300	51.3
7	8.988	53.1
8	9.128	52.3
9	8.986	53.1
10	9.173	52.0
11	9.099	52.5
12	9.320	51.2
13	9.210	51.8
14	9.090	52.5
15	9.208	51.8
Average*	9.152	52.2
Final Score**	**9.119**	**52.3**

* Calculated from all 15 runs.

** Calculated from the fastest 12 runs.

Serpentine Test
Dry Pavement Surface (700 feet in length)

TIRE: **BF Goodrich Touring T/A VR4**
SIZE: **P225/60R–16 97V**
CAR: **Ford Police Interceptor**

Run #	**Elapsed Time (seconds)**	**Calculated Speed (mph)**
1	9.269	51.5
2	9.444	50.5
3	9.350	51.0
4	9.464	50.4
5	9.374	50.9
6	9.418	50.7
7	9.366	51.0
8	9.603	49.7
9	9.642	49.5
10	9.621	49.6
11	9.390	50.8
12	9.359	51.0
13	9.331	51.1
14	9.320	51.2
15	9.481	50.3
Average*	9.429	50.6
Final Score**	**9.381**	**50.9**

* Calculated from all 15 runs.

** Calculated from the fastest 12 runs.

Serpentine Test
Dry Pavement Surface (700 feet in length)

TIRE: **Firestone Firehawk PV41**
SIZE: **P225/60R–16 97V**
CAR: **Chevrolet Impala**

Run #	Elapsed Time (seconds)	Calculated Speed (mph)
1	8.973	53.2
2	9.176	52.0
3	9.211	51.8
4	9.116	52.4
5	9.135	52.2
6	9.120	52.3
7	9.003	53.0
8	9.589	49.8
9	8.947	53.3
10	8.872	53.8
11	9.014	52.9
12	8.886	53.7
13	9.035	52.8
14	8.985	53.1
15	9.070	52.6
Average*	9.075	52.6
Final Score**	**9.013**	**53.0**

* Calculated from all 15 runs.

** Calculated from the fastest 12 runs.

Serpentine Test
Dry Pavement Surface (700 feet in length)

TIRE: **Firestone Firehawk PV41**
SIZE: **P225/60R–16 97V**
CAR: **Ford Police Interceptor**

Run #	**Elapsed Time (seconds)**	**Calculated Speed (mph)**
1	9.215	51.8
2	9.411	50.7
3	9.469	50.4
4	9.405	50.7
5	9.444	50.5
6	9.615	49.6
7	9.171	52.0
8	9.378	50.9
9	9.225	51.7
10	9.363	51.0
11	9.413	50.7
12	9.277	51.4
13	9.156	52.1
14	9.146	52.2
15	9.395	50.8
Average*	9.339	51.1
Final Score**	**9.296**	**51.3**

* Calculated from all 15 runs.

** Calculated from the fastest 12 runs.

Serpentine Test
Dry Pavement Surface (700 feet in length)

TIRE: **General XP 2000 V4**
SIZE: **P225/60R–16 98V**
CAR: **Chevrolet Impala**

Run #	Elapsed Time (seconds)	Calculated Speed (mph)
1	9.116	52.4
2	9.311	51.3
3	9.116	52.4
4	9.064	52.7
5	9.066	52.6
6	9.039	52.8
7	8.967	53.2
8	8.943	53.4
9	9.119	52.3
10	9.119	52.3
11	8.850	53.9
12	8.837	54.0
13	8.893	53.7
14	9.392	50.8
15	8.949	53.3
Average*	9.052	52.7
Final Score**	**8.997**	**53.1**

* Calculated from all 15 runs.

** Calculated from the fastest 12 runs.

Serpentine Test
Dry Pavement Surface (700 feet in length)

TIRE: **General XP 2000 V4**
SIZE: **P225/60R–16 98V**
CAR: **Ford Police Interceptor**

Run #	**Elapsed Time (seconds)**	**Calculated Speed (mph)**
1	9.198	51.9
2	9.092	52.5
3	9.287	51.4
4	9.272	51.5
5	9.351	51.0
6	9.418	50.7
7	9.075	52.6
8	9.076	52.6
9	9.038	52.8
10	9.103	52.4
11	9.171	52.0
12	9.044	52.8
13	9.071	52.6
14	9.083	52.5
15	9.020	52.9
Average*	9.153	52.2
Final Score**	**9.104**	**52.4**

* Calculated from all 15 runs.

** Calculated from the fastest 12 runs.

Serpentine Test
Dry Pavement Surface (700 feet in length)

TIRE: **Goodyear Eagle RS–A**
SIZE: **P225/60R–16 97V**
CAR: **Chevrolet Impala**

Run #	**Elapsed Time (seconds)**	**Calculated Speed (mph)**
1	9.384	50.9
2	9.404	50.8
3	9.112	52.4
4	9.187	51.9
5	9.065	52.6
6	8.953	53.3
7	9.400	50.8
8	9.581	49.8
9	9.005	53.0
10	9.352	51.0
11	9.498	50.2
12	9.094	52.5
13	9.585	49.8
14	9.275	51.5
15	9.396	50.8
Average*	9.286	51.4
Final Score**	**9.219**	**51.8**

* Calculated from all 15 runs.

** Calculated from the fastest 12 runs.

Serpentine Test
Dry Pavement Surface (700 feet in length)

TIRE: **Goodyear Eagle RS–A**
SIZE: **P225/60R–16 97V**
CAR: **Ford Police Interceptor**

Run #	**Elapsed Time (seconds)**	**Calculated Speed (mph)**
1	9.104	52.4
2	8.990	53.1
3	9.141	52.2
4	8.988	53.1
5	9.246	51.6
6	9.119	52.3
7	9.116	52.4
8	9.471	50.4
9	9.547	50.0
10	9.652	49.4
11	9.004	53.0
12	9.127	52.3
13	9.191	51.9
14	9.253	51.6
15	9.197	51.9
Average*	9.210	51.8
Final Score**	**9.123**	**52.3**

* Calculated from all 15 runs.

** Calculated from the fastest 12 runs.

Serpentine Test
Dry Pavement Surface (700 feet in length)

TIRE: **Brand X**
SIZE: **P225/60R–16 97S**
CAR: **Chevrolet Impala**

Run #	**Elapsed Time (seconds)**	**Calculated Speed (mph)**
1	9.236	51.7
2	9.483	50.3
3	9.878	48.3
4	9.395	50.8
5	9.382	50.9
6	9.570	49.9
7	9.350	51.0
8	9.173	52.0
9	9.083	52.5
10	9.647	49.5
11	9.182	52.0
12	9.232	51.7
13	9.327	51.2
14	9.079	52.6
15	9.103	52.4
Average*	9.341	51.1
Final Score**	**9.252**	**51.6**

* Calculated from all 15 runs.

** Calculated from the fastest 12 runs.

Serpentine Test
Dry Pavement Surface (700 feet in length)

TIRE: **Brand X**
SIZE: **P225/60R–16 97S**
CAR: **Ford Police Interceptor**

Run #	**Elapsed Time (seconds)**	**Calculated Speed (mph)**
1	9.877	48.3
2	9.864	48.4
3	9.913	48.1
4	9.598	49.7
5	9.852	48.4
6	9.788	48.8
7	9.588	49.8
8	9.755	48.9
9	9.497	50.3
10	9.985	47.8
11	9.500	50.2
12	9.523	50.1
13	9.766	48.9
14	9.693	49.2
15	9.687	49.3
Average*	9.726	49.1
Final Score**	**9.676**	**49.3**

* Calculated from all 15 runs.

** Calculated from the fastest 12 runs.

Serpentine Test: Wet Pavement Surface

Test Objective

Determine each tire's transient response characteristics and performance on a wet pavement surface. The course used is straight and flat with approximately 420 feet of asphalt surface. Pylons are set in a straight line and spaced 60 feet apart. The approach speed is 35 mph, and the driver is required to weave through the pylons while maintaining speed as close to the approach speed as possible. (See illustration below.)

Serious deficiencies in transient response during wet pavement maneuvering will result in longer elapsed times, slower speeds, and a lower overall score on this portion of the evaluation.

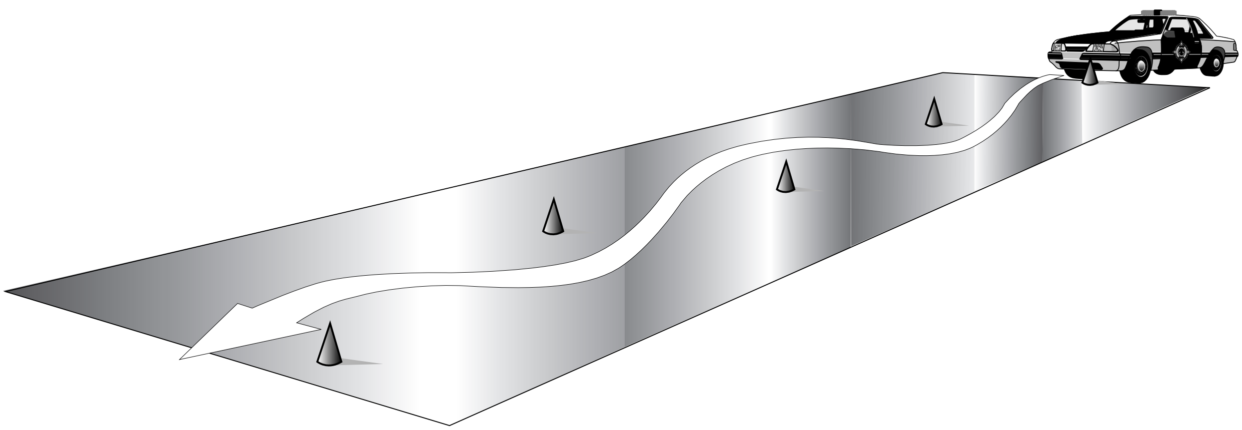
Test Methodology

Following a 2-mile tire warmup, each test vehicle equipped with the make and model of tire to be evaluated is driven through the serpentine course a minimum of 15 times. The average is for all 15 runs, while the final score for each tire is the average of the fastest 12 runs.

Formula

To determine the vehicle's speed, divide the length of the course (420 ft) by 1.4667 ft/s, then divide by the elapsed time.

Example:
420 ft ÷ 1.4667 ft/s ÷ elapsed time
(length of course)



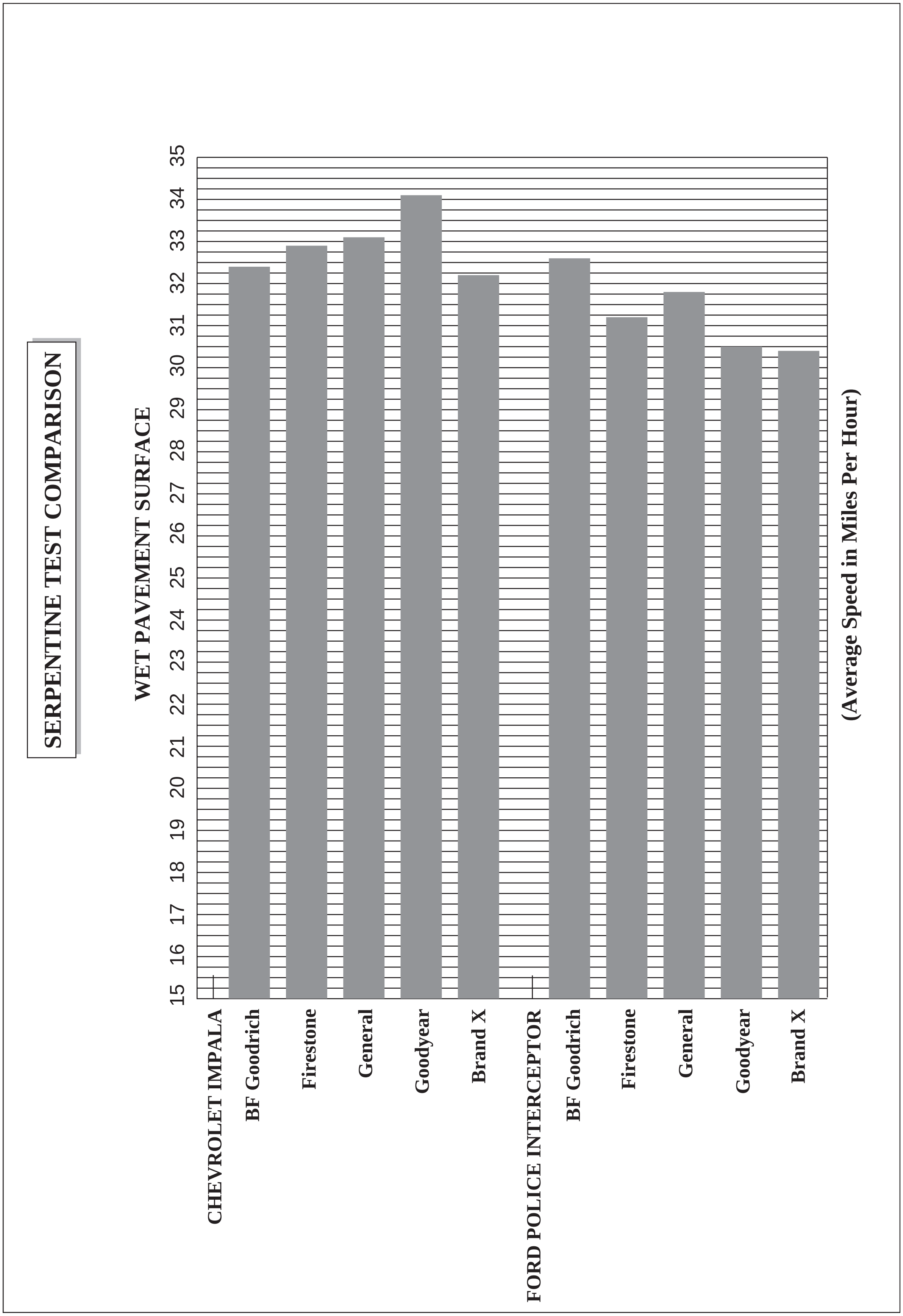
Summary Test Data

Serpentine Test
Wet Pavement Surface (420 feet in length)
Overall Scores

	Elapsed time (seconds)	Average speed (mph)	Percent difference*
CAR: **Chevrolet Impala**			
TIRE SIZE: **P225/60R–16**			
BF Goodrich Touring T/A VR4**	8.849	32.4	5.27%
Firestone Firehawk PV41**	8.704	32.9	3.55%
General XP 2000 V4**	8.658	33.1	3.00%
Goodyear Eagle RS–A**	8.406	34.1	0.00%
Brand X**	8.896	32.2	5.83%
CAR: **Ford Police Interceptor**			
TIRE SIZE: **P225/60R–16**			
BF Goodrich Touring T/A VR4**	8.779	32.6	0.00%
Firestone Firehawk PV41**	9.179	31.2	4.56%
General XP 2000 V4**	9.001	31.8	2.53%
Goodyear Eagle RS–A**	9.380	30.5	6.85%
Brand X**	9.430	30.4	7.42%

* The percent difference is obtained by subtracting the elapsed time of the tire of interest from the elapsed time of the best scoring tire (lowest score is best) and dividing that number by the elapsed time of the best scoring tire.

** See appendix A for details of statistical analysis.


SERPENTINE TEST COMPARISON
WET PAVEMENT SURFACE
15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35
CHEVROLET IMPALA
BF Goodrich
Firestone
General
Goodyear
Brand X
FORD POLICE INTERCEPTOR
BF Goodrich
Firestone
General
Goodyear
Brand X
(Average Speed in Miles Per Hour)

Test Data

Serpentine Test
Wet Pavement Surface (420 feet in length)

TIRE: **BF Goodrich Touring T/A VR4**
SIZE: **P225/60R–16 97V**
CAR: **Chevrolet Impala**

Run #	**Elapsed Time (seconds)**	**Calculated Speed (mph)**
1	9.149	31.3
2	9.398	30.5
3	8.976	31.9
4	8.951	32.0
5	9.000	31.8
6	8.842	32.4
7	8.749	32.7
8	8.911	32.1
9	8.998	31.8
10	9.056	31.6
11	8.589	33.3
12	8.882	32.2
13	8.794	32.6
14	8.786	32.6
15	8.711	32.9
Average*	8.919	32.1
Final Score**	**8.849**	**32.4**

* Calculated from all 15 runs.

** Calculated from the fastest 12 runs.

Serpentine Test
Wet Pavement Surface (420 feet in length)

TIRE: **BF Goodrich Touring T/A VR4**
SIZE: **P225/60R–16 97V**
CAR: **Ford Police Interceptor**

Run #	**Elapsed Time (seconds)**	**Calculated Speed (mph)**
1	8.991	31.8
2	8.779	32.6
3	9.040	31.7
4	8.775	32.6
5	8.851	32.4
6	8.664	33.1
7	8.845	32.4
8	8.986	31.9
9	8.842	32.4
10	8.912	32.1
11	8.836	32.4
12	8.811	32.5
13	8.734	32.8
14	8.635	33.2
15	8.658	33.1
Average*	8.824	32.5
Final Score**	**8.779**	**32.6**

* Calculated from all 15 runs.

** Calculated from the fastest 12 runs.

Serpentine Test
Wet Pavement Surface (420 feet in length)

TIRE: **Firestone Firehawk PV41**
SIZE: **P225/60R–16 97V**
CAR: **Chevrolet Impala**

Run #	Elapsed Time (seconds)	Calculated Speed (mph)
1	8.971	31.9
2	8.777	32.6
3	8.842	32.4
4	8.851	32.4
5	8.699	32.9
6	8.629	33.2
7	8.568	33.4
8	8.834	32.4
9	8.605	33.3
10	8.736	32.8
11	8.633	33.2
12	8.776	32.6
13	8.547	33.5
14	8.796	32.6
15	8.973	31.9
Average*	8.749	32.7
Final Score**	**8.704**	**32.9**

* Calculated from all 15 runs.

** Calculated from the fastest 12 runs.

Serpentine Test
Wet Pavement Surface (420 feet in length)

TIRE: **Firestone Firehawk PV41**
SIZE: **P225/60R–16 97V**
CAR: **Ford Police Interceptor**

Run #	**Elapsed Time (seconds)**	**Calculated Speed (mph)**
1	8.964	31.9
2	9.202	31.1
3	8.927	32.1
4	9.507	30.1
5	9.471	30.2
6	9.042	31.7
7	9.344	30.6
8	9.071	31.6
9	9.019	31.8
10	9.850	29.1
11	9.700	29.5
12	9.321	30.7
13	9.206	31.1
14	9.325	30.7
15	9.254	30.9
Average*	9.280	30.9
Final Score**	**9.179**	**31.2**

* Calculated from all 15 runs.

** Calculated from the fastest 12 runs.

Serpentine Test
Wet Pavement Surface (420 feet in length)

TIRE: **General XP 2000 V4**
SIZE: **P225/60R–16 98V**
CAR: **Chevrolet Impala**

Run #	**Elapsed Time (seconds)**	**Calculated Speed (mph)**
1	8.556	33.5
2	8.794	32.6
3	8.695	32.9
4	8.703	32.9
5	8.840	32.4
6	8.981	31.9
7	8.685	33.0
8	8.790	32.6
9	8.766	32.7
10	8.627	33.2
11	8.763	32.7
12	8.579	33.4
13	8.618	33.2
14	8.682	33.0
15	8.435	33.9
Average*	8.701	32.9
Final Score**	**8.658**	**33.1**

* Calculated from all 15 runs.

** Calculated from the fastest 12 runs.

Serpentine Test
Wet Pavement Surface (420 feet in length)

TIRE: **General XP 2000 V4**
SIZE: **P225/60R–16**
CAR: **Ford Police Interceptor**

Run #	Elapsed Time (seconds)	Calculated Speed (mph)
1	8.996	31.8
2	9.249	31.0
3	9.030	31.7
4	9.245	31.0
5	9.094	31.5
6	9.243	31.0
7	8.882	32.2
8	9.390	30.5
9	8.924	32.1
10	8.967	31.9
11	9.034	31.7
12	8.974	31.9
13	8.876	32.3
14	9.050	31.6
15	8.947	32.0
Average*	9.060	31.6
Final Score**	**9.001**	**31.8**

* Calculated from all 15 runs.

** Calculated from the fastest 12 runs.

Serpentine Test
Wet Pavement Surface (420 feet in length)

TIRE: **Goodyear Eagle RS–A**
SIZE: **P225/60R–16 97V**
CAR: **Chevrolet Impala**

Run #	**Elapsed Time (seconds)**	**Calculated Speed (mph)**
1	8.471	33.8
2	8.327	34.4
3	8.014	35.7
4	8.350	34.3
5	8.436	33.9
6	8.321	34.4
7	8.515	33.6
8	8.777	32.6
9	8.604	33.3
10	8.501	33.7
11	8.442	33.9
12	8.510	33.6
13	8.582	33.4
14	8.579	33.4
15	8.404	34.1
Average*	8.456	33.9
Final Score**	**8.406**	**34.1**

* Calculated from all 15 runs.

** Calculated from the fastest 12 runs.

Serpentine Test
Wet Pavement Surface (420 feet in length)

TIRE: **Goodyear Eagle RS–A**
SIZE: **P225/60R–16 97V**
CAR: **Ford Police Interceptor**

Run #	**Elapsed Time (seconds)**	**Calculated Speed (mph)**
1	9.678	29.6
2	9.607	29.8
3	9.439	30.3
4	9.418	30.4
5	9.637	29.7
6	9.372	30.6
7	9.255	30.9
8	9.253	30.9
9	9.256	30.9
10	9.531	30.0
11	9.258	30.9
12	9.318	30.7
13	9.580	29.9
14	9.412	30.4
15	9.472	30.2
Average*	9.432	30.4
Final Score**	**9.380**	**30.5**

* Calculated from all 15 runs.

** Calculated from the fastest 12 runs.

Serpentine Test
Wet Pavement Surface (420 feet in length)

TIRE: **Brand X**
SIZE: **P225/60R–16 97S**
CAR: **Chevrolet Impala**

Run #	**Elapsed Time (seconds)**	**Calculated Speed (mph)**
1	8.901	32.2
2	9.005	31.8
3	9.113	31.4
4	8.817	32.5
5	8.936	32.0
6	8.730	32.8
7	9.064	31.6
8	9.108	31.4
9	8.777	32.6
10	8.709	32.9
11	9.034	31.7
12	8.973	31.9
13	9.365	30.6
14	8.977	31.9
15	8.824	32.5
Average*	8.956	32.0
Final Score**	**8.896**	**32.2**

* Calculated from all 15 runs.

** Calculated from the fastest 12 runs.

Serpentine Test
Wet Pavement Surface (420 feet in length)

TIRE: **Brand X**
SIZE: **P225/60R–16 97V**
CAR: **Ford Police Interceptor**

Run #	**Elapsed Time (seconds)**	**Calculated Speed (mph)**
1	9.583	29.9
2	9.412	30.4
3	9.640	29.7
4	9.329	30.7
5	9.600	29.8
6	9.343	30.6
7	9.738	29.4
8	9.652	29.7
9	9.272	30.9
10	9.532	30.0
11	9.556	30.0
12	9.514	30.1
13	9.198	31.1
14	9.324	30.7
15	9.498	30.1
Average*	9.479	30.2
Final Score**	**9.430**	**30.4**

* Calculated from all 15 runs.

** Calculated from the fastest 12 runs.

Stopping Distance Test: Dry Pavement Surface

Test Objective

Determine the performance characteristics of the test tires in a simulated “panic” stop of a patrol vehicle on a dry pavement surface. The course used has a straight, flat, granite asphalt surface. A center lane marks where the braking maneuvers are to be done. The approach speed is just over 60 mph. The test vehicle is in antilock brake system (ABS) mode when the driver applies the brakes as close to 60 mph as possible. Both the exact speed at brake application and the distance from brake application to complete stop are electronically recorded. Average deceleration rate is then determined. Deficiencies in tire adhesion will result in longer stopping distances and a relatively lower score on this portion of the evaluation.

Test Methodology

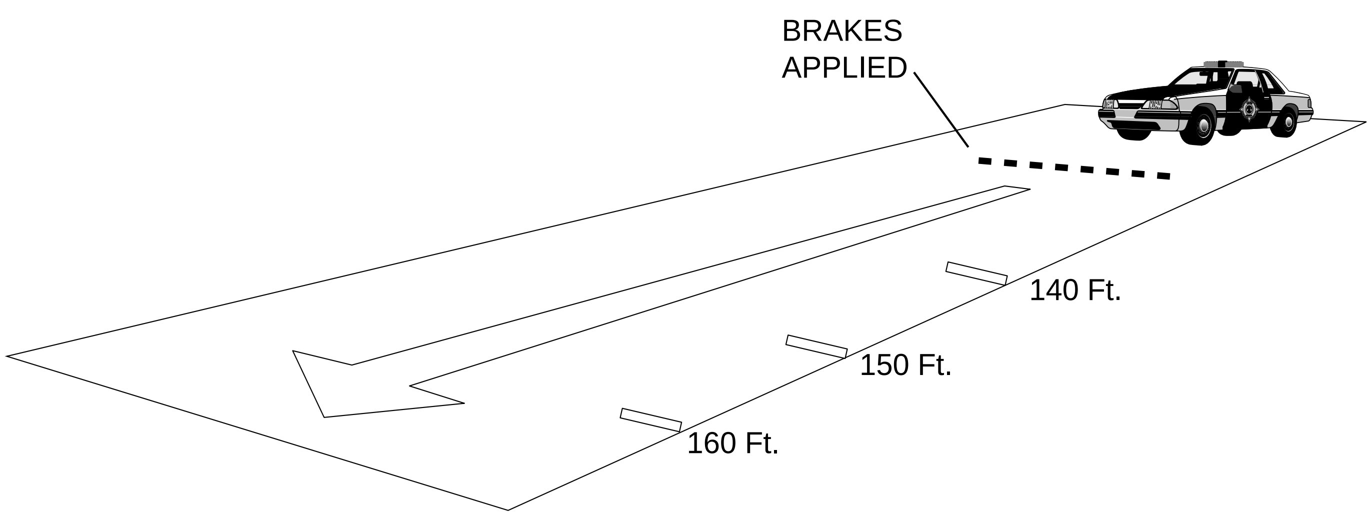
Following a 1-mile tire warmup, each test vehicle equipped with the make and model of tire to be evaluated makes a minimum of six measured panic stops with the ABS in operation. The final score for each tire on this portion of the evaluation is the average of the six measured stops.

Formula

To determine the deceleration rate, translate the initial speed into ft/s by multiplying the initial speed by 1.4667. Square this ft/s product and divide the resulting square by twice the listed stopping distance.

Example:

1. 60.50 mph x 1.4667 = 88.735 ft/s
2. 88.735 ft/s x 88.735 ft/s = 7,873.90 ft^2/s^2
3. 7,873.90 ft^2/s^2 ÷ (157.00 ft x 2) = 25.08 ft/s^2



Summary Test Data

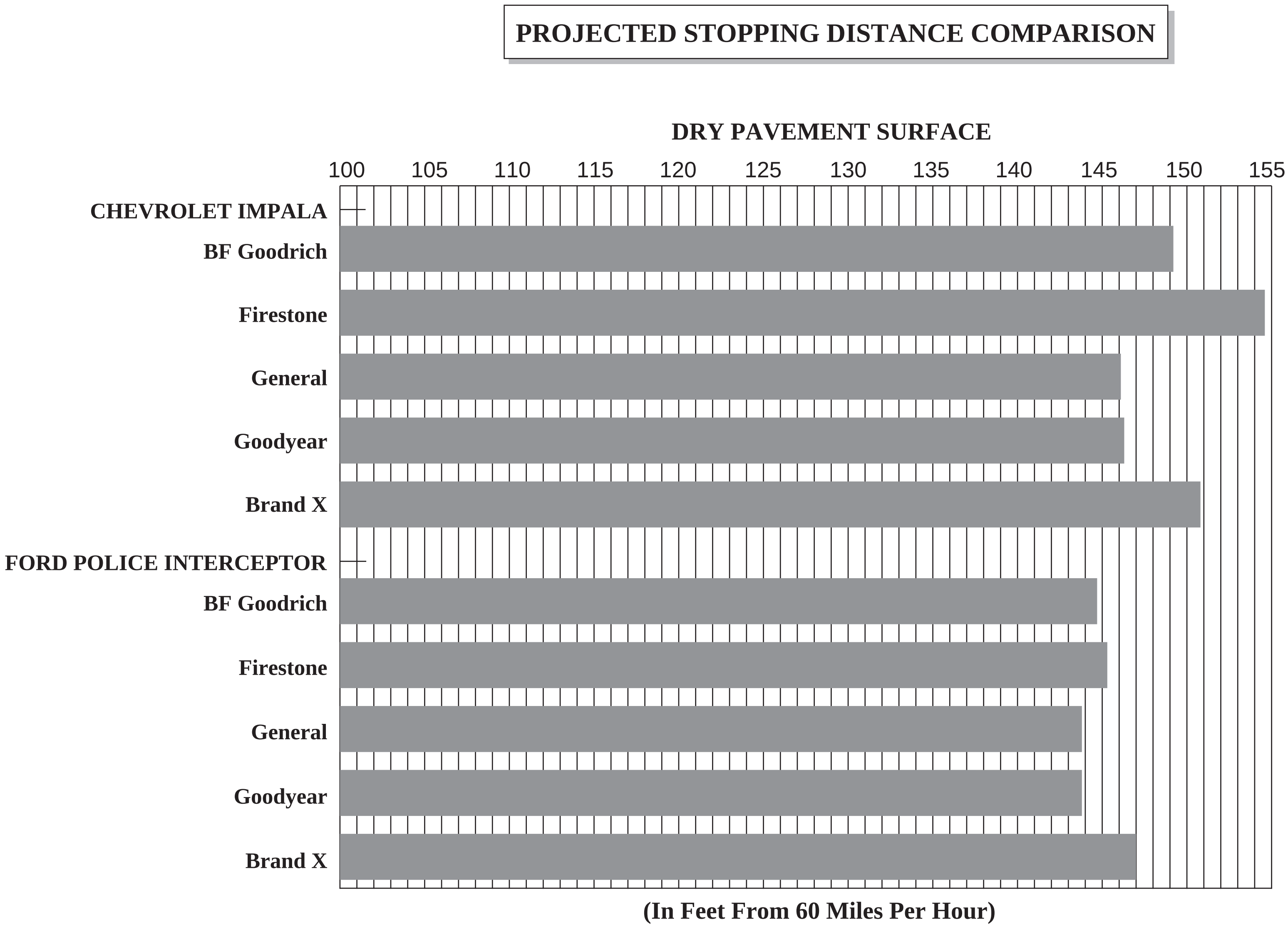
Stopping Distance Test
Dry Pavement Surface
Overall Scores

	Average deceleration rate (ft/s^2)	Stopping distance* (ft)	Percent difference**
CAR: **Chevrolet Impala** TIRE SIZE: **P225/60R–16**			
BF Goodrich Touring T/A VR4***	25.950	149.2	2.06%
Firestone Firehawk PV41***	25.051	154.6	5.46%
General XP 2000 V4***	26.497	146.1	0.00%
Goodyear Eagle RS–A***	26.473	146.3	0.09%
Brand X***	25.679	150.8	3.09%
CAR: **Ford Police Interceptor** TIRE SIZE: **P225/60R–16**			
BF Goodrich Touring T/A VR4***	26.753	144.7	0.66%
Firestone Firehawk PV41***	26.652	145.3	1.22%
General XP 2000 V4***	26.930	143.8	0.00%
Goodyear Eagle RS–A***	26.920	143.8	0.04%
Brand X***	26.340	147.0	2.19%

* Calculated stopping distance from 60 mph. Both vehicles are equipped with ABS.

** The percent difference is obtained by subtracting the average deceleration rate of the tire of interest from the average deceleration rate of the best scoring tire (highest score is best) and dividing that number by the average deceleration rate of the best scoring tire.

*** See appendix A for details of statistical analysis.


PROJECTED STOPPING DISTANCE COMPARISON
DRY PAVEMENT SURFACE
100
105
110
115
120
125
130
135
140
145
150
155
CHEVROLET IMPALA
BF Goodrich
Firestone
General
Goodyear
Brand X
FORD POLICE INTERCEPTOR
BF Goodrich
Firestone
General
Goodyear
Brand X
(In Feet From 60 Miles Per Hour)

Test Data

Stopping Distance Test
Dry Pavement Surface

TIRE: **Goodyear Eagle RS–A**
SIZE: **P225/60R–16 97V**
CAR: **Chevrolet Impala**

Run #	Initial speed (mph)	Stopping distance (ft)	Deceleration rate (ft/s^2)
1	60.1	150.0	25.901
2	59.9	144.6	26.689
3	60.1	148.4	26.180
4	60.1	152.0	25.560
5	59.5	148.3	25.677
6	59.7	149.2	25.694
Average score	59.9	148.8	**25.950**
Calculated stopping distance from 60.0 mph		**149.2 feet**	

Stopping Distance Test
Dry Pavement Surface

TIRE: **BF Goodrich Touring T/A VR4**
SIZE: **P225/60R–16 97V**
CAR: **Ford Police Interceptor**

Run #	Initial speed (mph)	Stopping distance (ft)	Deceleration rate (ft/s^2)
1	58.9	139.7	26.711
2	60.0	144.0	26.890
3	61.5	155.2	26.213
4	59.4	138.9	27.323
5	60.1	144.2	26.942
6	60.5	148.9	26.440
Average score	60.1	145.2	**26.753**
Calculated stopping distance from 60.0 mph		**144.7 feet**	

Stopping Distance Test
Dry Pavement Surface

TIRE: **Firestone Firehawk PV41**
SIZE: **P225/60R–16 97V**
CAR: **Chevrolet Impala**

Run #	Initial speed (mph)	Stopping distance (ft)	Deceleration rate (ft/s^2)
1	59.5	150.2	25.352
2	61.7	164.6	24.877
3	60.4	157.0	24.993
4	60.0	152.1	25.458
5	61.1	161.6	24.848
6	60.5	158.9	24.776
Average score	60.5	157.4	**25.051**
Calculated stopping distance from 60.0 mph		**154.6 feet**	

Stopping Distance Test
Dry Pavement Surface

TIRE: **Firestone Firehawk PV41**
SIZE: **P225/60R–16 97V**
CAR: **Ford Police Interceptor**

Run #	Initial speed (mph)	Stopping distance (ft)	Deceleration rate (ft/s^2)
1	60.7	149.1	26.580
2	60.3	147.6	26.497
3	60.0	141.7	27.327
4	59.5	145.8	26.117
5	60.7	146.0	27.144
6	60.2	148.5	26.249
Average score	60.2	146.5	**26.652**
Calculated stopping distance from 60.0 mph		**145.3 feet**	

Stopping Distance Test
Dry Pavement Surface

TIRE: **General XP 2000 V4**
SIZE: **P225/60R–16 98V**
CAR: **Chevrolet Impala**

Run #	**Initial speed (mph)**	**Stopping distance (ft)**	**Deceleration rate (ft/s^2)**
1	59.9	145.2	26.579
2	60.3	148.5	26.337
3	60.2	143.9	27.088
4	60.3	151.9	25.747
5	61.0	152.0	26.331
6	58.6	137.3	26.902
Average score	60.1	146.5	**26.497**
Calculated stopping distance from 60.0 mph		**146.1 feet**	

Stopping Distance Test
Dry Pavement Surface

TIRE: **General XP 2000 V4**
SIZE: **P225/60R–16 98V**
CAR: **Ford Police Interceptor**

Run #	**Initial speed (mph)**	**Stopping distance (ft)**	**Deceleration rate (ft/s^2)**
1	60.5	143.4	27.455
2	59.5	141.7	26.873
3	60.3	148.2	26.390
4	59.9	146.6	26.325
5	60.0	141.6	27.346
6	60.0	142.4	27.192
Average score	60.0	144.0	**26.930**
Calculated stopping distance from 60.0 mph		**143.8 feet**	

Stopping Distance Test
Dry Pavement Surface

TIRE: **Goodyear Eagle RS–A**
SIZE: **P225/60R–16 97V**
CAR: **Chevrolet Impala**

Run #	Initial speed (mph)	Stopping distance (ft)	Deceleration rate (ft/s^2)
1	59.8	148.1	25.972
2	59.8	145.5	26.436
3	60.3	144.3	27.103
4	60.7	153.2	25.868
5	59.2	141.0	26.735
6	60.0	144.9	26.723
Average score	60.0	146.2	**26.473**
Calculated stopping distance from 60.0 mph		**146.3 feet**	

Stopping Distance Test
Dry Pavement Surface

TIRE: **Goodyear Eagle RS–A**
SIZE: **P225/60R–16 97V**
CAR: **Ford Police Interceptor**

Run #	Initial speed (mph)	Stopping distance (ft)	Deceleration rate (ft/s^2)
1	60.5	145.8	27.003
2	60.5	144.7	27.208
3	60.0	143.9	26.909
4	60.0	144.3	26.834
5	59.8	144.3	26.656
6	60.0	143.9	26.909
Average score	60.1	144.5	**26.920**
Calculated stopping distance from 60.0 mph		**143.8 feet**	

Stopping Distance Test
Dry Pavement Surface

TIRE: **Brand X**
SIZE: **P225/60R–16 97S**
CAR: **Chevrolet Impala**

Run #	Initial speed (mph)	Stopping distance (ft)	Deceleration rate (ft/s^2)
1	60.0	151.3	25.593
2	60.7	154.7	25.618
3	59.4	146.7	25.870
4	60.1	150.5	25.815
5	60.1	150.3	25.849
6	60.3	154.4	25.330
Average score	60.1	151.3	**25.679**
Calculated stopping distance from 60.0 mph		**150.8 feet**	

Stopping Distance Test
Dry Pavement Surface

TIRE: **Brand X**
SIZE: **P225/60R–16 97S**
CAR: **Ford Police Interceptor**

Run #	Initial speed (mph)	Stopping distance (ft)	Deceleration rate (ft/s^2)
1	60.1	148.0	26.251
2	59.7	147.2	26.043
3	60.8	152.4	26.090
4	59.7	145.3	26.384
5	59.0	138.2	27.092
6	60.2	148.9	26.179
Average score	59.9	146.7	**26.340**
Calculated stopping distance from 60.0 mph		**147.0 feet**	

Stopping Distance Test: Wet Pavement Surface

Test Objective

Determine the performance characteristics of the test tires in a simulated "panic" stop of a patrol vehicle on a wet pavement surface. The course used has a straight, flat, granite asphalt surface. Pylons are set up to mark where the braking maneuvers are done. The approach speed is just over 60 mph. The vehicle is in ABS mode when the driver applies the brakes as close to 60 mph as possible. Both the exact speed at brake application and the distance from brake application to complete stop are electronically recorded. Average deceleration rate is then determined. Deficiencies in tire adhesion will result in longer stopping distances and a relatively lower score on this portion of the evaluation.

Test Methodology

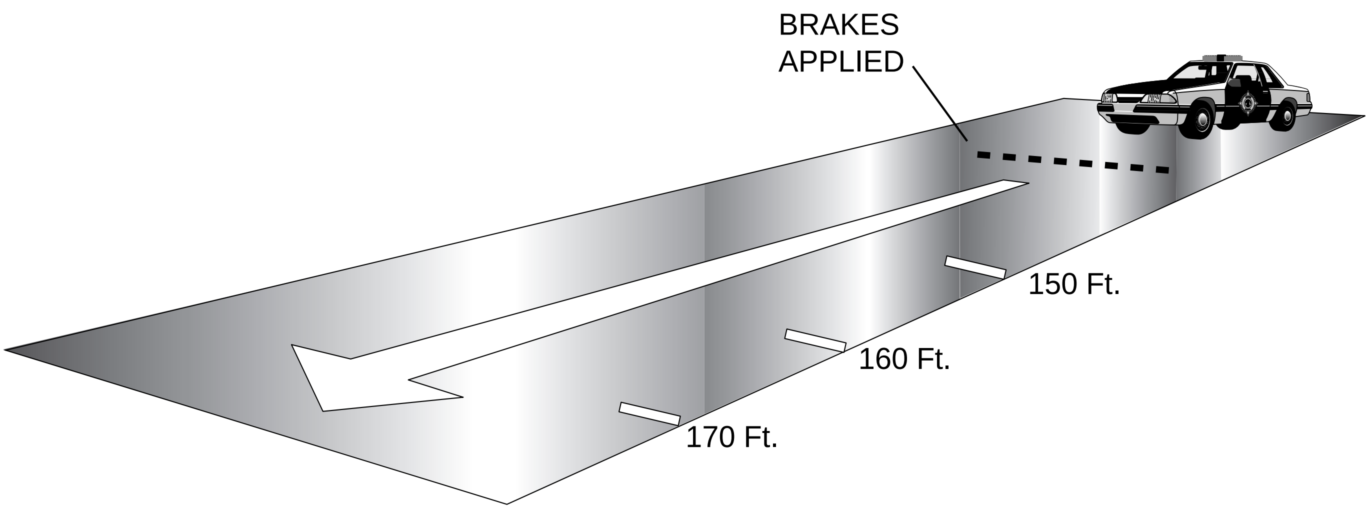
Following a 1-mile tire warmup, each test vehicle equipped with the make and model of tire to be evaluated makes a minimum of six measured panic stops, with the ABS in operation. The final score for each tire on this portion of the evaluation is the average of the six measured stops.

Formula

To determine the deceleration rate, translate the initial speed into ft/s by multiplying the initial speed by 1.4667. Square this ft/s product and divide the resulting square by twice the listed stopping distance.

Example:

1. 60.50 mph x 1.4667 = 88.735 ft/s
2. 88.735 ft/s x 88.735 ft/s = 7,873.90 ft^2/s^2
3. 7,873.90 ft^2/s^2 ÷ (157.0 ft x 2) = 25.08 ft/s^2



Summary Test Data

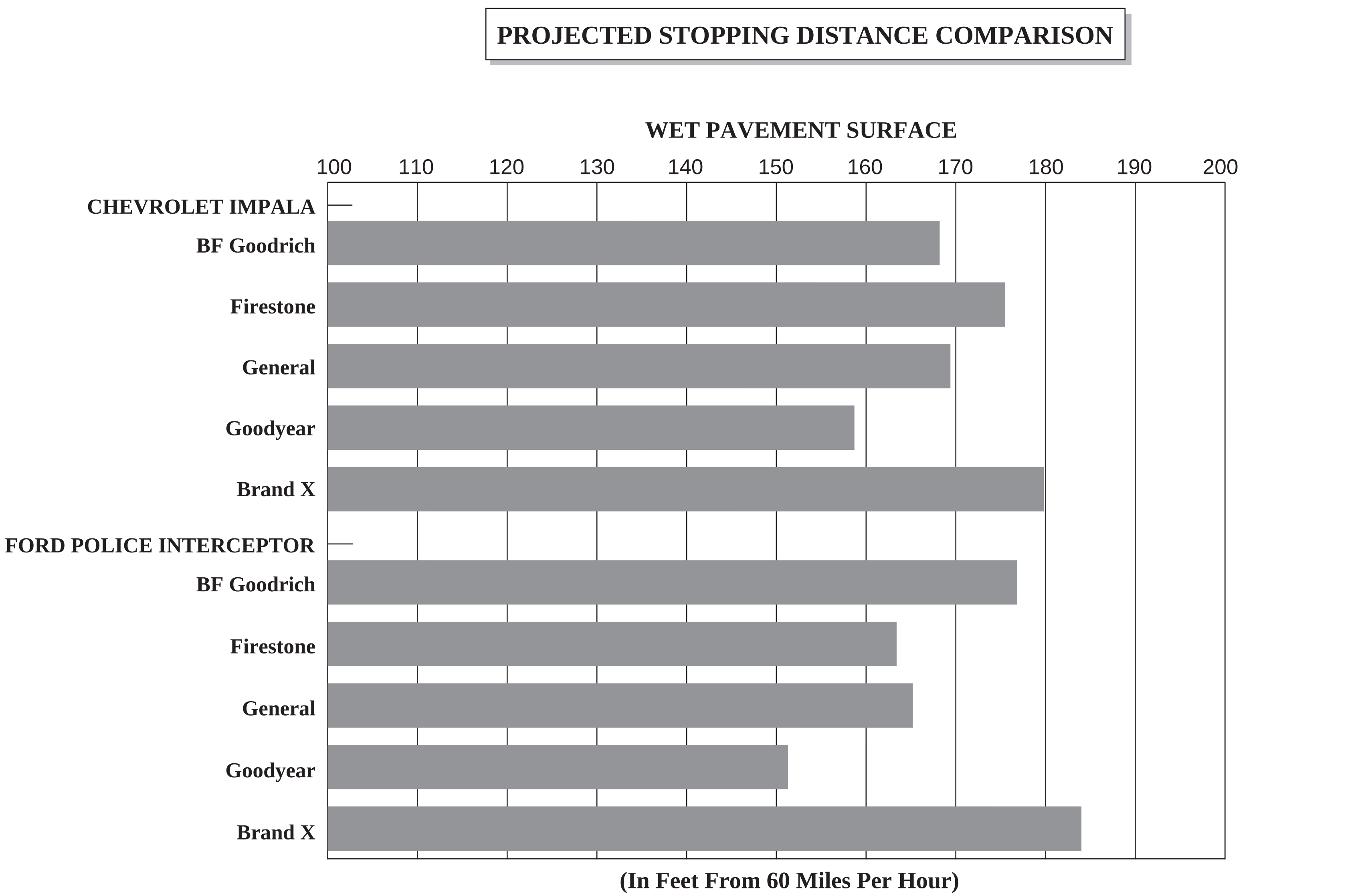
Stopping Distance Test
Wet Pavement Surface
Overall Scores

	Average deceleration rate (ft/s^2)	Stopping distance* (ft)	Percent difference**
CAR: **Chevrolet Impala**			
TIRE SIZE: **P225/60R–16**			
BF Goodrich Touring T/A VR4***	23.021	168.2	5.62%
Firestone Firehawk PV41***	22.063	175.5	9.55%
General XP 2000 V4***	22.857	169.4	6.30%
Goodyear Eagle RS–A***	24.393	158.7	0.00%
Brand X***	21.536	179.8	11.71%
CAR: **Ford Police Interceptor**			
TIRE SIZE: **P225/60R–16**			
BF Goodrich Touring T/A VR4***	21.898	176.8	14.45%
Firestone Firehawk PV41***	23.700	163.4	7.41%
General XP 2000 V4***	23.440	165.2	8.43%
Goodyear Eagle RS–A***	25.598	151.3	0.00%
Brand X***	21.043	184.0	17.79%

* Calculated stopping distance from 60 mph. Both vehicles are equipped with ABS.

** The percent difference is obtained by subtracting the average deceleration rate of the tire of interest from the average deceleration rate of the best scoring tire (highest score is best) and dividing that number by the average deceleration rate of the best scoring tire.

*** See appendix A for details of statistical analysis.


PROJECTED STOPPING DISTANCE COMPARISON
WET PAVEMENT SURFACE
100
110
120
130
140
150
160
170
180
190
200
CHEVROLET IMPALA
BF Goodrich
Firestone
General
Goodyear
Brand X
FORD POLICE INTERCEPTOR
BF Goodrich
Firestone
General
Goodyear
Brand X
(In Feet From 60 Miles Per Hour)

Test Data

Stopping Distance Test
Wet Pavement Surface

TIRE: **Goodrich Touring T/A VR4**
SIZE: **P225/60R–16 97V**
CAR: **Chevrolet Impala**

Run #	Initial speed (mph)	Stopping distance (ft)	Deceleration rate (ft/s^2)
1	61.4	168.3	24.094
2	61.0	173.7	23.042
3	59.7	171.6	22.340
4	60.9	174.6	22.848
5	60.0	171.6	22.565
6	60.3	168.3	23.238
Average score	60.6	171.4	**23.021**
Calculated stopping distance from 60.0 mph		**168.2 feet**	

Stopping Distance Test
Wet Pavement Surface

TIRE: **BF Goodrich Touring T/A VR4**
SIZE: **P225/60R–16 97V**
CAR: **Ford Police Interceptor**

Run #	Initial speed (mph)	Stopping distance (ft)	Deceleration rate (ft/s^2)
1	58.6	178.8	20.658
2	59.8	178.7	21.524
3	59.2	163.9	22.999
4	61.1	182.6	21.990
5	61.1	179.9	22.320
Average score	60.0	176.8	**21.898***
Calculated stopping distance from 60.0 mph		**176.8 feet**	

* Due to a malfunction in the data collection equipment, which was discovered after the completion of the testing, valid data for only five stops were recorded.

Stopping Distance Test
Wet Pavement Surface

TIRE: **Firestone Firehawk PV41**
SIZE: **P225/60R–16 97V**
CAR: **Chevrolet Impala**

Run #	**Initial speed (mph)**	**Stopping distance (ft)**	**Deceleration rate (ft/s^2)**
1	59.6	175.6	21.758
2	59.1	170.6	22.022
3	60.6	168.7	23.414
4	60.5	170.5	23.091
5	58.8	176.2	21.106
6	58.6	176.0	20.986
Average score	59.5	172.9	**22.063**
Calculated stopping distance from 60.0 mph		**175.5 feet**	

Stopping Distance Test
Wet Pavement Surface

TIRE: **Firestone Firehawk PV41**
SIZE: **P225/60R–16 97V**
CAR: **Ford Police Interceptor**

Run #	**Initial speed (mph)**	**Stopping distance (ft)**	**Deceleration rate (ft/s^2)**
1	59.7	162.6	23.577
2	59.3	158.6	23.848
3	60.2	163.7	23.812
4	59.6	161.1	23.716
5	61.0	173.1	23.121
6	60.0	160.5	24.126
Average score	60.0	163.3	**23.700**
Calculated stopping distance from 60.0 mph		**163.4 feet**	

Stopping Distance Test
Wet Pavement Surface

TIRE: **General XP 2000 V4**
SIZE: **P225/60R–16 98V**
CAR: **Chevrolet Impala**

Run #	Initial speed (mph)	Stopping distance (ft)	Deceleration rate (ft/s^2)
1	58.5	165.5	22.242
2	60.9	172.1	23.180
3	59.0	163.1	22.956
4	59.1	162.9	23.063
5	59.0	163.9	22.844
Average score	59.3	165.5	**22.857***
Calculated stopping distance from 60.0 mph		**169.4 feet**	

* Due to a malfunction in the data collection equipment, which was discovered after the completion of the testing, valid data for only five good stops were recorded.

Stopping Distance Test
Wet Pavement Surface

TIRE: **General XP 2000 V4**
SIZE: **P225/60R–16 98V**
CAR: **Ford Police Interceptor**

Run #	Initial speed (mph)	Stopping distance (ft)	Deceleration rate (ft/s^2)
1	60.6	164.8	23.968
2	60.0	165.6	23.383
3	61.1	174.3	23.038
4	60.9	170.7	23.370
Average score	60.7	168.9	**23.440***
Calculated stopping distance from 60.0 mph		**165.2 feet**	

* Due to a malfunction in the data collection equipment, which was discovered after the completion of the testing, valid data for only four good stops were recorded.

Stopping Distance Test
Wet Pavement Surface

TIRE: **Goodyear Eagle RS–A**
SIZE: **P225/60R–16 97V**
CAR: **Chevrolet Impala**

Run #	Initial speed (mph)	Stopping distance (ft)	Deceleration rate (ft/s²)
1	59.6	160.9	23.746
2	60.5	164.5	23.933
3	60.1	154.7	25.114
4	60.6	160.3	24.641
5	60.7	161.7	24.509
6	58.8	152.3	24.418
Average score	60.1	159.1	**24.393**
Calculated stopping distance from 60.0 mph		**158.7 feet**	

Stopping Distance Test
Wet Pavement Surface

TIRE: **Goodyear Eagle RS–A**
SIZE: **P225/60R–16 97V**
CAR: **Ford Police Interceptor**

Run #	Initial speed (mph)	Stopping distance (ft)	Deceleration rate (ft/s²)
1	59.3	145.7	25.960
2	58.9	147.6	25.281
3	60.6	153.4	25.750
4	58.7	144.5	25.648
5	60.6	157.7	25.048
6	58.6	142.6	25.902
Average score	59.5	148.6	**25.598**
Calculated stopping distance from 60.0 mph		**151.3 feet**	

Stopping Distance Test
Wet Pavement Surface

TIRE: **Brand X**
SIZE: **P225/60R–16 97S**
CAR: **Chevrolet Impala**

Run #	Initial speed (mph)	Stopping distance (ft)	Deceleration rate (ft/s^2)
1	60.8	189.6	20.971
2	60.1	178.0	21.826
3	60.4	177.8	22.070
4	60.1	182.3	21.312
5	59.4	176.5	21.502
Average score	60.2	180.8	**21.536***
Calculated stopping distance from 60.0 mph		**179.8 feet**	

* Due to a malfunction in the data collection equipment, which was discovered after the completion of the testing, valid data for only five good stops were recorded.

Stopping Distance Test
Wet Pavement Surface

TIRE: **Brand X**
SIZE: **P225/60R–16 97S**
CAR: **Ford Police Interceptor**

Run #	Initial speed (mph)	Stopping distance (ft)	Deceleration rate (ft/s^2)
1	59.5	170.2	22.373
2	59.3	183.6	20.601
3	59.9	182.1	21.193
4	59.0	179.3	20.882
5	58.4	177.3	20.690
6	58.5	179.4	20.518
Average score	59.1	178.7	**21.043**
Calculated stopping distance from 60.0 mph		**184.0 feet**	

High-Speed-Handling Test

Test Objective

Determine each tire's high-speed-pursuit handling characteristics and performance on a 1.43-mile (7,553 feet) road-racing type course. The course contains high-speed curves, low-speed corners, and straightaways and, with the exception of other traffic, simulates actual pursuit conditions in the field. This evaluation is a test of the tire manufacturers' success in blending the transient response, cornering, and rapid deceleration characteristics of a tire. Serious deficiencies in any of these critical areas will result in longer lap times and a lower overall score on this portion of the evaluation.

Test Methodology

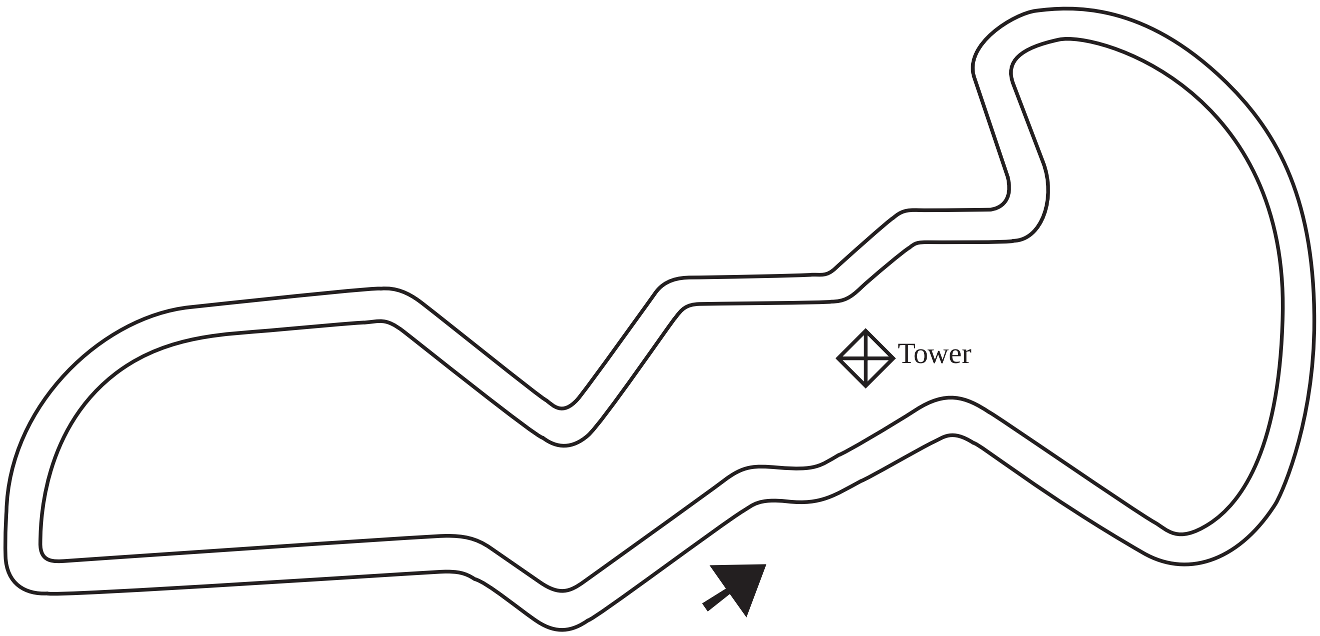
Following 2 warmup laps, each test vehicle equipped with the make and model of tire to be evaluated is driven over the course by three drivers for at least 15 timed laps. The final score for each tire will be the average of the fastest 4 laps by each of the drivers for a total of 12 laps.

Formula

To determine the average speed, divide the number of feet in the road course by the overall average, then divide by 1.4667 ft/s.

Example:
7,553 ft ÷ overall average ÷ 1.4667 ft/s

Test Facility Diagram
Federal Law Enforcement Training Center
Highway Response Course—Range #7
Glynco, Georgia



1.43 Miles

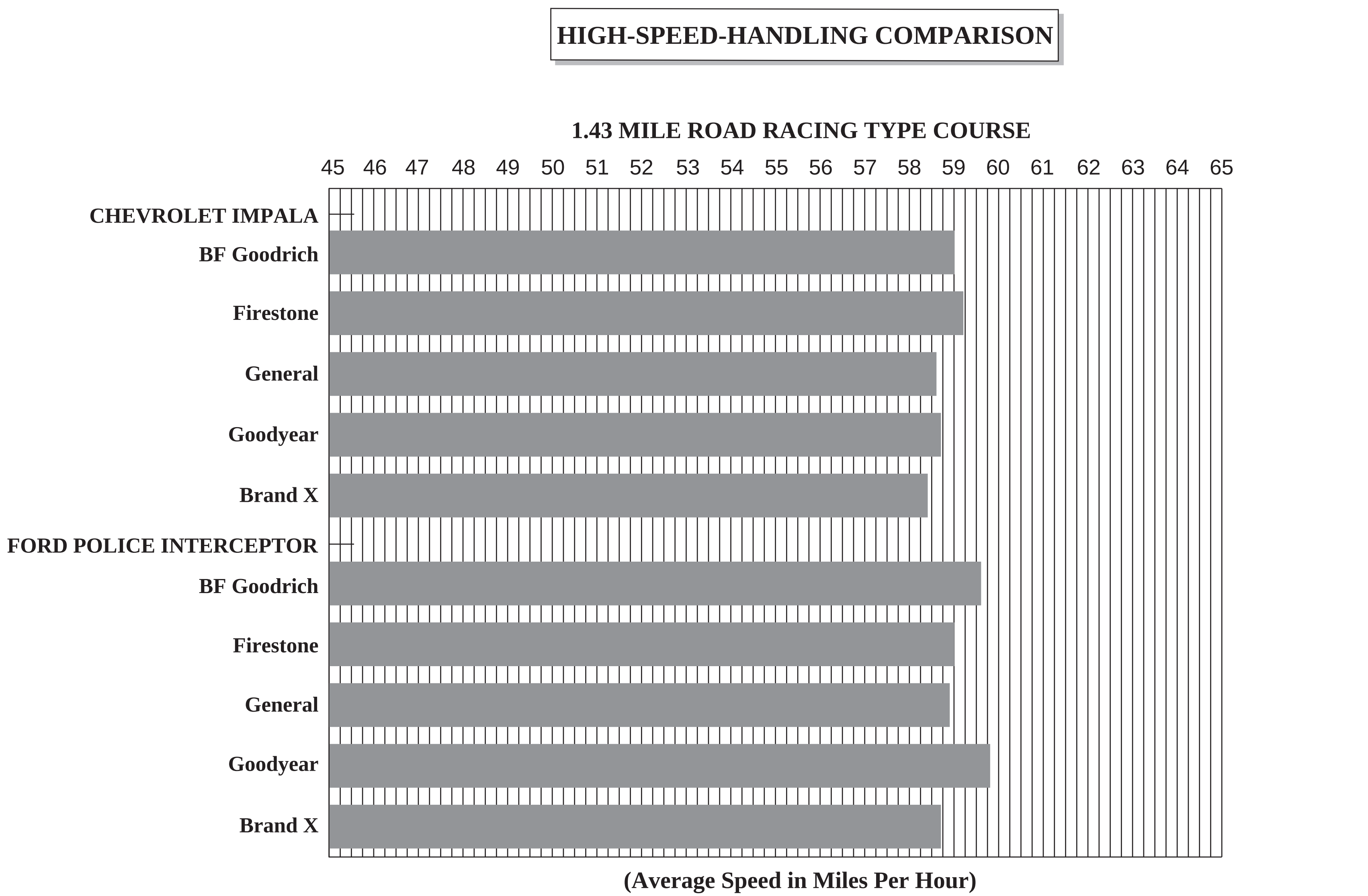
Summary Test Data

High-Speed-Handling Test
Overall Scores

	Average lap time (seconds)	Average speed* (mph)	Percent difference**
CAR: **Chevrolet Impala** TIRE SIZE: **P225/60R–16**			
BF Goodrich Touring T/A VR4**	87.296	58.99	0.30%
Firestone Firehawk PV41**	87.037	59.17	0.00%
General XP 2000 V4**	87.917	58.57	1.01%
Goodyear Eagle RS–A**	87.767	58.67	0.84%
Brand X**	88.193	58.39	1.33%
CAR: **Ford Police Interceptor** TIRE SIZE: **P225/60R–16**			
BF Goodrich Touring T/A VR4**	86.461	59.56	0.40%
Firestone Firehawk PV41**	87.268	59.01	1.33%
General XP 2000 V4**	87.494	58.86	1.60%
Goodyear Eagle RS–A**	86.120	59.80	0.00%
Brand X**	87.701	58.72	1.84%

* The percent difference is obtained by subtracting the average lap time of the tire of interest from the average lap time of the best scoring tire (lowest score is best) and dividing that number by the average lap time of the best scoring tire.

** See appendix A for details of statistical analysis.



HIGH-SPEED-HANDLING COMPARISON
1.43 MILE ROAD RACING TYPE COURSE
45
46
47
48
49
50
51
52
53
54
55
56
57
58
59
60
61
62
63
64
65
CHEVROLET IMPALA
BF Goodrich
Firestone
General
Goodyear
Brand X
FORD POLICE INTERCEPTOR
BF Goodrich
Firestone
General
Goodyear
Brand X
(Average Speed in Miles Per Hour)

Test Data

High-Speed-Handling Test

CAR: **Chevrolet Impala**

Tire	Van Epps (seconds)	Richter (seconds)	VanDenBerg (seconds)	Overall average* (seconds)	Average speed (mph)
BF Goodrich	87.377	87.983	87.285		
Touring T/A VR4	87.509	87.958	86.836		
P225/60R–16 97V	87.970	87.678	86.877		
	87.284	87.212	86.507		
	87.971	87.542	86.805		
	87.622	**87.675**	**86.862**	**87.296**	**59.0**
Firestone	88.234	86.727	86.932		
Firehawk PV41	88.038	86.528	86.680		
P225/60R–16 97V	87.759	87.055	87.157		
	87.851	86.342	86.777		
	87.540	86.463	86.801		
	87.884	**86.623**	**86.869**	**87.037**	**59.2**
General	88.995	87.935	87.287		
XP 2000 V4	87.853	87.992	87.568		
P225/60R–16 98V	88.904	87.588	87.831		
	88.977	87.868	87.221		
	88.664	87.762	87.378		
	88.679	**87.829**	**87.457**	**87.917**	**58.6**
Goodyear	87.166	89.483	87.359		
Eagle RS–A	86.957	88.948	87.280		
P225/60R–16 97V	86.972	89.332	86.864		
	87.364	89.227	86.858		
	87.149	89.219	87.234		
	87.122	**89.242**	**87.119**	**87.767**	**58.7**
Brand X	88.629	88.523	88.374		
P225/60R–16 97S	87.868	88.295	88.244		
	89.492	88.243	88.129		
	88.365	87.703	88.058		
	88.340	88.070	88.589		
	88.539	**88.167**	**88.279**	**88.193**	**58.4**

* Overall average calculated from the best 4 laps for each driver (12 laps total).

High-Speed-Handling Test

CAR: **Ford Police Interceptor**

Tire	Van Epps (seconds)	Richter (seconds)	VanDenBerg (seconds)	Overall average* (seconds)	Average speed (mph)
BF Goodrich	86.699	87.307	85.570		
Touring T/A VR4	85.756	88.123	86.079		
P225/60R–16 97V	86.262	87.612	85.355		
	86.096	87.721	86.813		
	86.127	87.159	86.493		
	86.188	**87.584**	**86.062**	**86.461**	**59.6**
Firestone	86.699	87.658	86.596		
Firehawk PV41	87.602	87.464	87.082		
P225/60R–16 97V	86.950	88.118	87.155		
	87.724	88.104	86.984		
	87.642	88.119	86.318		
	87.323	**87.893**	**86.827**	**87.268**	**59.0**
General	88.202	87.582	87.391		
XP 2000 V4	87.756	87.427	87.371		
P225/60R–16 98V	87.687	87.759	87.137		
	87.971	88.067	87.247		
	87.340	87.364	87.292		
	87.791	**87.640**	**87.288**	**87.494**	**58.9**
Goodyear	86.628	86.137	86.475		
Eagle RS–A	86.452	85.805	85.840		
P225/60R–16 97V	86.423	86.366	85.536		
	86.212	86.708	86.255		
	86.514	86.025	85.875		
	86.446	**86.208**	**85.996**	**86.120**	**59.8**
Brand X	88.658	88.136	86.981		
P225/60R–16 97S	87.510	88.282	87.211		
	87.776	88.379	87.331		
	87.901	87.945	87.581		
	87.769	88.483	87.192		
	87.923	**88.245**	**87.259**	**87.701**	**58.7**

* Overall average calculated from the best 4 laps for each driver (12 laps total).

Tire Wear Measurements

Test Objective

Determine each tire's wear characteristics when subjected to the entire performance evaluation. Tread depth measurements are taken of the new right front tire of each test set of each brand, model, and size of tire tested. (New, for the purpose of this evaluation, means after a specific break-in procedure, but before any testing). The right front tire was chosen for these measurements because it typically exhibits the most wear in the test situations used in this evaluation. Tread depth measurements are taken for a second time prior to the final test phase, which is the high-speed-handling evaluation. Finally, measurements are taken for a third time at the conclusion of the high-speed-handling evaluation, which completes the testing.

Test Methodology

Following a specific tire break-in routine, but before any testing is done, tread depth measurements are taken of the new right front tire of each brand, model, and size of tires tested. The measurements are taken in four places across the tread of the tire, from outside to inside, and in four areas around the circumference of the tire, 90 degrees apart, for a total of at least 16 measurements per right front tire. These same right front tires are once again measured prior to the high-speed handling, and for a third time at the conclusion of the high-speed handling, which is the final test phase, to determine the total amount of tread depth lost during the entire test procedure. The average tread depth total is the average of all of the individual tread depths measured on a given tire. The final score for each tire will be the average tread depth of the right front tire that was worn away during the testing process.

The tire wear measurements shown in this report resulted from extremely severe operating conditions. As such, the measurements may not be an accurate predictor of achievable tire mileage when used in normal police patrol service and should not be used to extrapolate actual tire life.

Summary Test Data

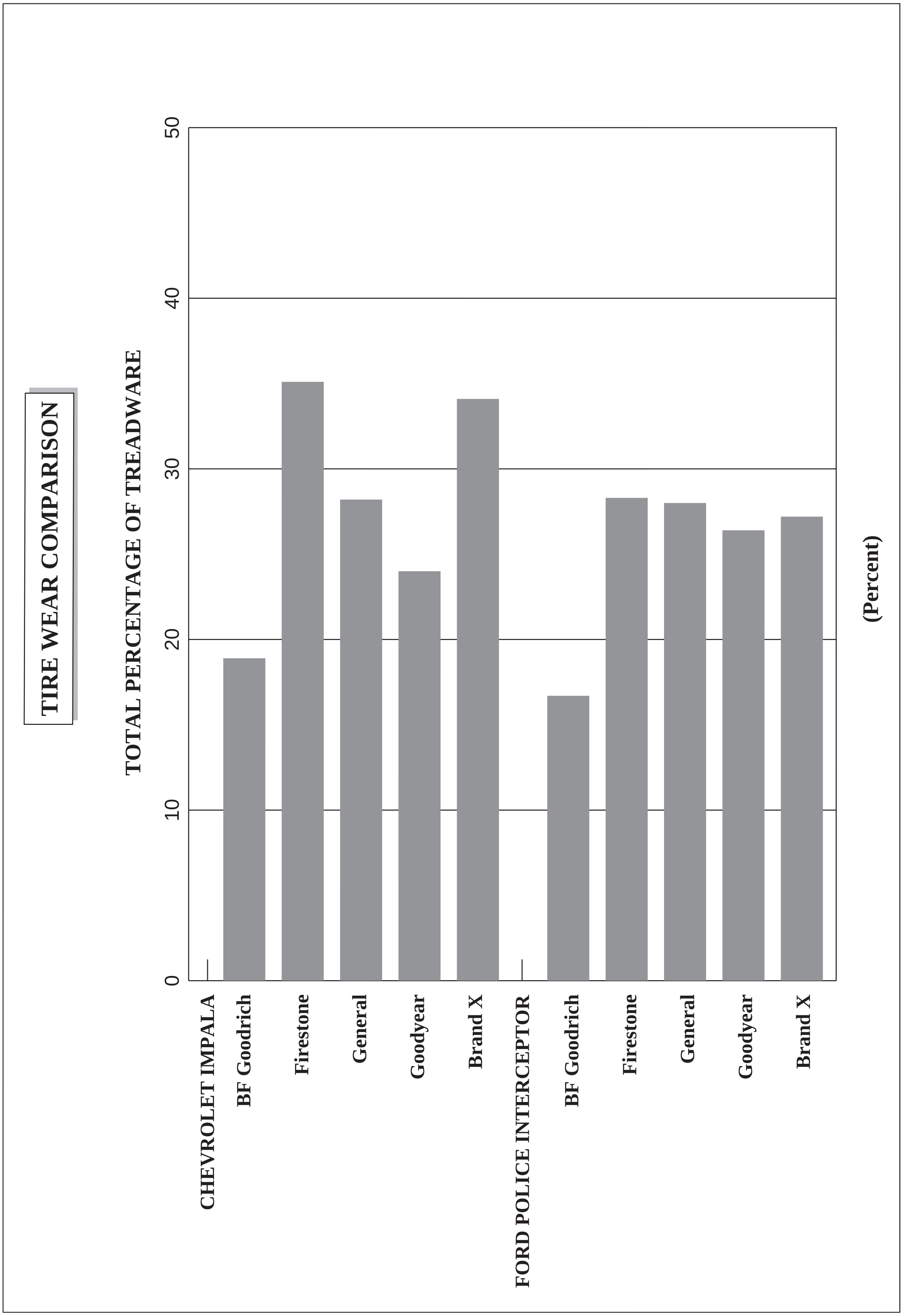
Tire Wear Measurements (in inches)
Overall Comparisons

	After Break-In (inch)	Before Handling Tests (inch)	After Handling Tests (inch)	Average Wear Measured* (inch)	Total Treadwear** (percent)
CAR: **Chevrolet Impala** TIRE SIZE: **P225/60R–16**					
BF Goodrich*** Touring T/A VR4	0.307	0.276	0.249	0.058	18.9%
Firestone*** Firehawk PV41	0.304	0.248	0.198	0.107	35.1%
General*** XP 2000 V4	0.309	0.260	0.222	0.087	28.2%
Goodyear*** Eagle RS–A	0.322	0.279	0.245	0.077	24.0%
Brand X***	0.302	0.249	0.199	0.103	34.1%
CAR: **Ford Police Interceptor** TIRE SIZE: **P225/60R–16**					
BF Goodrich*** Touring T/A VR4	0.309	0.278	0.257	0.052	16.7%
Firestone*** Firehawk PV41	0.308	0.264	0.221	0.087	28.3%
General*** XP 2000 V4	0.306	0.276	0.220	0.086	28.0%
Goodyear*** Eagle RS–A	0.321	0.294	0.237	0.085	26.4%
Brand X***	0.305	0.266	0.222	0.083	27.2%

* To determine the average wear measured, subtract the "after handling tests" tread depth from the "after break-in" tread depth. The resulting figure is the total amount of treadwear experienced during the entire test sequence.

** To determine "total treadwear" percentage, divide the "average wear measured" tread depth figure by the "after break-in" tread depth figure.

*** See appendix A for details of statistical analysis.


TIRE WEAR COMPARISON
TOTAL PERCENTAGE OF TREADWARE
0
10
20
30
40
50
CHEVROLET IMPALA
BF Goodrich
Firestone
General
Goodyear
Brand X
FORD POLICE INTERCEPTOR
BF Goodrich
Firestone
General
Goodyear
Brand X
(Percent)

Measurement Data

Tread Depth Measurements (all in inches)

TIRE: **BF Goodrich Touring T/A VR4**
SIZE: **P225/60R–16 97V**
CAR: **Chevrolet Impala**

Initial Measurements:	Groove #1	Groove #2	Groove #3	Groove #4	Overall Averages
Position 1	0.300	0.317	0.321	0.292	
Position 2	0.295	0.319	0.319	0.296	
Position 3	0.296	0.321	0.319	0.298	
Position 4	0.293	0.317	0.320	0.296	
Averages	**0.296**	**0.319**	**0.320**	**0.296**	**0.307**

Pre-HSH Measurements:	Groove #1	Groove #2	Groove #3	Groove #4	
Position 1	0.275	0.283	0.283	0.263	
Position 2	0.276	0.285	0.282	0.263	
Position 3	0.276	0.287	0.281	0.267	
Position 4	0.272	0.287	0.277	0.262	
Averages	**0.275**	**0.286**	**0.281**	**0.264**	**0.276**

Final Measurements:	Groove #1	Groove #2	Groove #3	Groove #4	
Position 1	0.249	0.251	0.255	0.237	
Position 2	0.248	0.254	0.257	0.242	
Position 3	0.252	0.256	0.252	0.240	
Position 4	0.248	0.255	0.253	0.240	
Averages	**0.249**	**0.254**	**0.254**	**0.240**	**0.249**

Total Tire Wear Recorded: **0.058**

Percent Wear Resulting From Test: **18.9%**

Tread Depth Measurements (all in inches)

TIRE: **BF Goodrich Touring T/A VR4**
SIZE: **P225/60R–16 97V**
CAR: **Ford Police Interceptor**

Initial Measurements:	**Groove #1**	**Groove #2**	**Groove #3**	**Groove #4**	**Overall Averages**
Position 1	0.302	0.319	0.319	0.300	
Position 2	0.298	0.318	0.317	0.300	
Position 3	0.299	0.318	0.319	0.298	
Position 4	0.299	0.319	0.319	0.296	
Averages	**0.300**	**0.319**	**0.319**	**0.299**	**0.309**

Pre-HSH Measurements:	**Groove #1**	**Groove #2**	**Groove #3**	**Groove #4**	
Position 1	0.282	0.295	0.280	0.260	
Position 2	0.280	0.293	0.284	0.267	
Position 3	0.273	0.288	0.280	0.256	
Position 4	0.277	0.289	0.283	0.260	
Averages	**0.278**	**0.291**	**0.282**	**0.261**	**0.278**

Final Measurements:	**Groove #1**	**Groove #2**	**Groove #3**	**Groove #4**	
Position 1	0.253	0.268	0.261	0.250	
Position 2	0.260	0.266	0.263	0.245	
Position 3	0.256	0.260	0.262	0.247	
Position 4	0.255	0.263	0.259	0.246	
Averages	**0.256**	**0.264**	**0.261**	**0.247**	**0.257**

Total Tire Wear Recorded: **0.052**

Percent Wear Resulting From Test: **16.7%**

Tread Depth Measurements (all in inches)

TIRE: **Firestone Firehawk PV41**
SIZE: **P225/60R–16 97V**
CAR: **Chevrolet Impala**

Initial Measurements:	**Groove #1**	**Groove #2**	**Groove #3**	**Groove #4**	**Overall Averages**
Position 1	0.282	0.331	0.330	0.274	
Position 2	0.280	0.327	0.330	0.276	
Position 3	0.284	0.329	0.331	0.276	
Position 4	0.283	0.329	0.336	0.272	
Averages	**0.282**	**0.329**	**0.332**	**0.275**	**0.304**

Pre-HSH Measurements:	**Groove #1**	**Groove #2**	**Groove #3**	**Groove #4**	
Position 1	0.239	0.279	0.269	0.205	
Position 2	0.236	0.275	0.273	0.206	
Position 3	0.235	0.279	0.273	0.204	
Position 4	0.248	0.274	0.272	0.203	
Averages	**0.240**	**0.277**	**0.272**	**0.205**	**0.248**

Final Measurements:	**Groove #1**	**Groove #2**	**Groove #3**	**Groove #4**	
Position 1	0.201	0.209	0.217	0.168	
Position 2	0.194	0.210	0.217	0.170	
Position 3	0.200	0.209	0.219	0.165	
Position 4	0.196	0.204	0.221	0.161	
Averages	**0.198**	**0.208**	**0.219**	**0.166**	**0.198**

Total Tire Wear Recorded: **0.107**

Percent Wear Resulting From Test: **35.1%**

Tread Depth Measurements (all in inches)

TIRE: **Firestone Firehawk PV41**
SIZE: **P2325/60R–16 97V**
CAR: **Ford Police Interceptor**

Initial Measurements:	**Groove #1**	**Groove #2**	**Groove #3**	**Groove #4**	**Overall Averages**
Position 1	0.283	0.330	0.333	0.282	
Position 2	0.286	0.330	0.335	0.283	
Position 3	0.287	0.332	0.333	0.280	
Position 4	0.289	0.330	0.331	0.281	
Averages	**0.286**	**0.331**	**0.333**	**0.282**	**0.308**

Pre-HSH Measurements:	**Groove #1**	**Groove #2**	**Groove #3**	**Groove #4**	
Position 1	0.259	0.296	0.288	0.221	
Position 2	0.263	0.296	0.288	0.217	
Position 3	0.258	0.294	0.289	0.206	
Position 4	0.260	0.293	0.286	0.209	
Averages	**0.260**	**0.295**	**0.288**	**0.213**	**0.264**

Final Measurements:	**Groove #1**	**Groove #2**	**Groove #3**	**Groove #4**	
Position 1	0.226	0.245	0.245	0.175	
Position 2	0.229	0.245	0.244	0.170	
Position 3	0.225	0.239	0.239	0.166	
Position 4	0.227	0.244	0.245	0.168	
Averages	**0.227**	**0.243**	**0.243**	**0.170**	**0.221**

Total Tire Wear Recorded: **0.087**

Percent Wear Resulting From Test: **28.3%**

Tread Depth Measurements (all in inches)

TIRE: **General XP 2000 V4**
SIZE: **P225/60R–16 98V**
CAR: **Chevrolet Impala**

Initial Measurements:	**Groove #1**	**Groove #2**	**Groove #3**	**Groove #4**	**Overall Averages**
Position 1	0.303	0.315	0.320	0.294	
Position 2	0.305	0.315	0.323	0.293	
Position 3	0.298	0.314	0.324	0.294	
Position 4	0.306	0.317	0.325	0.295	
Averages	**0.303**	**0.315**	**0.323**	**0.294**	**0.309**

Pre-HSH Measurements:	**Groove #1**	**Groove #2**	**Groove #3**	**Groove #4**	
Position 1	0.266	0.271	0.272	0.235	
Position 2	0.265	0.268	0.270	0.234	
Position 3	0.263	0.269	0.269	0.232	
Position 4	0.263	0.268	0.271	0.236	
Averages	**0.264**	**0.269**	**0.271**	**0.234**	**0.260**

Final Measurements:	**Groove #1**	**Groove #2**	**Groove #3**	**Groove #4**	
Position 1	0.237	0.224	0.224	0.205	
Position 2	0.233	0.225	0.223	0.202	
Position 3	0.231	0.224	0.229	0.208	
Position 4	0.232	0.224	0.223	0.204	
Averages	**0.233**	**0.224**	**0.225**	**0.205**	**0.222**

Total Tire Wear Recorded: **0.087**

Percent Wear Resulting From Test: **28.2%**

Tread Depth Measurements (all in inches)

TIRE: **General XP 2000 V4**
SIZE: **P225/60R–16 98V**
CAR: **Ford Police Interceptor**

Initial Measurements:	**Groove #1**	**Groove #2**	**Groove #3**	**Groove #4**	**Overall Averages**
Position 1	0.300	0.316	0.314	0.293	
Position 2	0.303	0.315	0.317	0.296	
Position 3	0.300	0.317	0.316	0.290	
Position 4	0.299	0.314	0.314	0.294	
Averages	**0.301**	**0.316**	**0.315**	**0.293**	**0.306**

Pre-HSH Measurements:	**Groove #1**	**Groove #2**	**Groove #3**	**Groove #4**	
Position 1	0.272	0.283	0.289	0.259	
Position 2	0.276	0.284	0.285	0.260	
Position 3	0.278	0.282	0.284	0.254	
Position 4	0.276	0.282	0.288	0.264	
Averages	**0.276**	**0.283**	**0.287**	**0.259**	**0.276**

Final Measurements:	**Groove #1**	**Groove #2**	**Groove #3**	**Groove #4**	
Position 1	0.237	0.218	0.214	0.210	
Position 2	0.232	0.224	0.221	0.205	
Position 3	0.239	0.226	0.211	0.201	
Position 4	0.236	0.221	0.220	0.210	
Averages	**0.236**	**0.222**	**0.217**	**0.207**	**0.220**

Total Tire Wear Recorded: **0.086**

Percent Wear Resulting From Test: **28.0%**

Tread Depth Measurements (all in inches)

TIRE: **Goodyear Eagle RS–A**
SIZE: **P225/60R–16 97V**
CAR: **Chevrolet Impala**

Initial Measurements:	**Groove #1**	**Groove #2**	**Groove #3**	**Groove #4**	**Overall Averages**
Position 1	0.293	0.343	0.346	0.300	
Position 2	0.292	0.342	0.350	0.300	
Position 3	0.299	0.344	0.348	0.301	
Position 4	0.300	0.347	0.347	0.300	
Averages	**0.296**	**0.344**	**0.348**	**0.300**	**0.322**

Pre-HSH Measurements:	**Groove #1**	**Groove #2**	**Groove #3**	**Groove #4**	
Position 1	0.265	0.295	0.299	0.257	
Position 2	0.257	0.295	0.299	0.260	
Position 3	0.265	0.297	0.300	0.261	
Position 4	0.264	0.293	0.299	0.259	
Averages	**0.263**	**0.295**	**0.299**	**0.259**	**0.279**

Final Measurements:	**Groove #1**	**Groove #2**	**Groove #3**	**Groove #4**	
Position 1	0.236	0.243	0.262	0.238	
Position 2	0.236	0.243	0.263	0.237	
Position 3	0.235	0.242	0.259	0.240	
Position 4	0.237	0.247	0.258	0.237	
Averages	**0.236**	**0.244**	**0.261**	**0.238**	**0.245**

Total Tire Wear Recorded: **0.077**

Percent Wear Resulting From Test: **24.0%**

Tread Depth Measurements (all in inches)

TIRE: **Goodyear Eagle RS–A**
SIZE: **P225/60R–16 97V**
CAR: **Ford Police Interceptor**

Initial Measurements:	**Groove #1**	**Groove #2**	**Groove #3**	**Groove #4**	**Overall Averages**
Position 1	0.295	0.346	0.346	0.302	
Position 2	0.296	0.347	0.343	0.301	
Position 3	0.295	0.343	0.342	0.298	
Position 4	0.293	0.343	0.347	0.301	
Averages	**0.295**	**0.345**	**0.345**	**0.301**	**0.321**

Pre-HSH Measurements:	**Groove #1**	**Groove #2**	**Groove #3**	**Groove #4**	
Position 1	0.278	0.317	0.317	0.271	
Position 2	0.277	0.319	0.316	0.270	
Position 3	0.271	0.312	0.312	0.273	
Position 4	0.279	0.313	0.312	0.271	
Averages	**0.276**	**0.315**	**0.314**	**0.271**	**0.294**

Final Measurements:	**Groove #1**	**Groove #2**	**Groove #3**	**Groove #4**	
Position 1	0.228	0.237	0.242	0.233	
Position 2	0.229	0.239	0.243	0.235	
Position 3	0.235	0.239	0.242	0.234	
Position 4	0.234	0.234	0.247	0.233	
Averages	**0.232**	**0.237**	**0.244**	**0.234**	**0.237**

Total Tire Wear Recorded: **0.085**

Percent Wear Resulting From Test: **26.4%**

Tread Depth Measurements (all in inches)

TIRE: **Brand X**
SIZE: **P225/60R–16 97S**
CAR: **Chevrolet Impala**

Initial Measurements:	**Groove #1**	**Groove #2**	**Groove #3**	**Groove #4**	**Overall Averages**
Position 1	0.301	0.304	0.291	0.308	
Position 2	0.302	0.303	0.291	0.315	
Position 3	0.297	0.300	0.294	0.310	
Position 4	0.305	0.296	0.295	0.312	
Averages	**0.301**	**0.301**	**0.293**	**0.311**	**0.302**

Pre-HSH Measurements:	**Groove #1**	**Groove #2**	**Groove #3**	**Groove #4**	
Position 1	0.277	0.248	0.227	0.253	
Position 2	0.275	0.248	0.226	0.259	
Position 3	0.266	0.239	0.226	0.246	
Position 4	0.275	0.246	0.220	0.246	
Averages	**0.273**	**0.245**	**0.225**	**0.251**	**0.249**

Final Measurements:	**Groove #1**	**Groove #2**	**Groove #3**	**Groove #4**	
Position 1	0.231	0.184	0.175	0.200	
Position 2	0.229	0.192	0.172	0.208	
Position 3	0.230	0.184	0.173	0.199	
Position 4	0.230	0.185	0.177	0.209	
Averages	**0.230**	**0.186**	**0.174**	**0.204**	**0.199**

Total Tire Wear Recorded **0.103**

Percent Wear Resulting From Test: **34.1%**

Tread Depth Measurements (all in inches)

TIRE: **Brand X**
SIZE: **P225/60R–16 97S**
CAR: **Ford Police Interceptor**

Initial Measurements:	**Groove #1**	**Groove #2**	**Groove #3**	**Groove #4**	**Overall Averages**
Position 1	0.319	0.291	0.300	0.311	
Position 2	0.320	0.293	0.298	0.311	
Position 3	0.320	0.295	0.298	0.308	
Position 4	0.318	0.295	0.295	0.311	
Averages	**0.319**	**0.294**	**0.298**	**0.310**	**0.305**

Pre-HSH Measurements:	**Groove #1**	**Groove #2**	**Groove #3**	**Groove #4**	
Position 1	0.286	0.261	0.253	0.264	
Position 2	0.292	0.256	0.253	0.261	
Position 3	0.288	0.261	0.258	0.255	
Position 4	0.288	0.257	0.255	0.265	
Averages	**0.289**	**0.259**	**0.255**	**0.261**	**0.266**

Final Measurements:	**Groove #1**	**Groove #2**	**Groove #3**	**Groove #4**	
Position 1	0.248	0.206	0.208	0.222	
Position 2	0.253	0.208	0.201	0.228	
Position 3	0.257	0.206	0.209	0.221	
Position 4	0.255	0.208	0.205	0.221	
Averages	**0.253**	**0.207**	**0.206**	**0.223**	**0.222**

Total Tire Wear Recorded **0.083**

Percent Wear Resulting From Test: **27.2%**

Overall Scores: All Test Categories

The following two pages contain the overall scores from each of the various test categories. For more discussion of the comparison on the performance of these tires, please refer to Appendix A: Analysis To Determine Statistical Significance.

Overall Scores: All Test Categories

CAR: **Chevrolet Impala**
TIRE SIZE: **P225/60R-16**

Tire	Static circle dry (lateral G)	Static circle wet (lateral G)	Serpentine evaluation dry (mph)	Serpentine evaluation wet (mph)	Stopping distance dry (feet)	Stopping distance wet (feet)	High-speed handling (seconds)	Total treadwear from testing (percent)
BF Goodrich Touring T/A VR4	0.757	0.279	52.3	32.4	149.2	168.2	87.296	18.9%
Firestone Firehawk PV41	0.755	0.290	53.0	32.9	154.6	175.5	87.037	35.1%
General XP2000 V4	0.774	0.301	53.1	33.1	146.1	169.4	87.917	28.2%
Goodyear Eagle RS–A	0.774	0.299	51.8	34.1	146.3	158.7	87.767	24.0%
Brand X	0.740	0.255	51.6	32.2	150.8	179.8	88.193	34.1%

Overall Scores: All Test Categories

CAR: **Ford Police Interceptor**
TIRE SIZE: **P225/60R–16**

Tire	Static circle dry (lateral G)	Static circle wet (lateral G)	Serpentine evaluation dry (mph)	Serpentine evaluation wet (mph)	Stopping distance dry (feet)	Stopping distance wet (feet)	High-speed handling (seconds)	Total treadwear from testing (percent)
BF Goodrich Touring T/A VR4	0.757	0.278	50.9	32.6	144.7	176.8	86.461	16.7%
Firestone Firehawk PV41	0.739	0.29	51.3	31.2	145.3	163.4	87.268	28.3%
General XP2000 V4	0.757	0.287	52.4	31.8	143.8	165.2	87.494	28.0%
Goodyear Eagle RS–A	0.743	0.296	52.3	30.5	143.8	151.3	86.120	26.4%
Brand X	0.696	0.249	49.3	30.4	147.0	184.0	87.701	27.2%

Epilogue

The test results may be used in two ways. First, they may be used as is to determine the tires that best meet the needs of your department. In this case, you should emphasize some portions of the evaluation to reflect the needs of your department. Second, the overall test results may be used to adjust the manufacturer’s bid price for these tire brands.

The following pages contain a scoring and bid adjustment system, which you may find useful in making decisions about your patrol vehicle tires. All the data used in the example are fictitious. Likewise, the category weights used are arbitrary. They should be adjusted to represent the actual conditions your agency faces and those factors important to you. The category weights should total 100. The example given is biased toward a dry climate, in which one may encounter wet roads infrequently. It could as easily have been biased toward wet road conditions, as might be encountered in the Pacific Northwest.

Scoring/Bid Adjustment Methodology

Step I—Raw Scores

Raw scores are developed, through testing, for each tire in each of the eight evaluation categories. The raw scores are expressed in terms of percentage of lateral G, speed in mph, stopping distance in feet, time, or remaining tread depth.

Static circle -dry- (lateral G)	Static circle -wet- (lateral G)	Serpentine -dry- (mph)	Serpentine -wet- (mph)	Stopping distance -dry- (feet)	Stopping distance -wet- (feet)	High-speed handling (seconds)	Remaining tread depth (%)
0.763	0.702	63.92	34.12	151.64	159.44	91.724	0.982

Step II—Deviation Factor

In each evaluation category, the best tire's score establishes the benchmark against which each of the other test tire's score is compared. In the static circle and serpentine tests and the tire wear measurement section the highest score is best, whereas the lowest score is best in the stopping distance and high-speed-handling tests. The best scoring tire in each test category receives a "deviation factor" of 0. The deviation factor is then calculated for the other tires by determining the absolute difference between each tire's raw score and the best score in the category. This difference is then divided by the best score, resulting in the deviation factor.

Tire make and model	Serpentine -dry-
Tire A	63.92 0.021
Tire B	64.88 0.006
Tire C	65.26 0

Example:

Best score (Tire C)		Other tire score (Tire A)		Absolute difference		Best score		Deviation factor (Tire A)
65.26	–	63.92	=	1.34	÷	65.26	=	0.021

Step III—Weighted Category Score

The weighted category score of each tire is determined by multiplying the deviation factor (as determined in Step II) by the category weight.

Weighted Score	20	
Serpentine–dry–(mph)		
Raw score	63.92	
Deviation factor	0.021	0.021 x 20 = 0.420
Weighted category score	0.420	

Step IV—Total Weighted Score

The total weighted score for each tire is the sum of the eight weighted category scores for that tire.

	15	5	20	5	15	5	30	5	
Tire	Static circle -dry- (lateral G)	Static circle -wet- (lateral G)	Serpentine -dry- (mph)	Serpentine -wet- (mph)	Stopping distance -dry- (feet)	Stopping distance -wet- (feet)	High-speed handling (s)	Tread depth worn (%)	Total weighted score
Tire A	0.763	0.702	63.92	34.12	151.64	159.44	91.724	20.47	
	0.023	0	0.021	0	0.039	0.007	0.004	0.125	
	0.345	0	0.420	0	0.585	0.035	0.120	0.625	2.130

Step V—Bid Adjustment Figure

The bid adjustment figure that we chose to use in this example is 6 percent of the lowest bid price received. (This figure is arbitrary and may be adjusted upward or downward.) In this step and the following two steps, the lowest bid price received was $57.50 per tire, which results in a bid adjustment figure of $3.45.

Step VI—Actual Dollar Adjustment

The actual dollar adjustment for a tire is determined by multiplying that tire's total weighted score by the bid adjustment figure.

Total weighted score	x	Bid adjustment figure	=	Actual dollar adjustment
2.130		$3.45		$7.35

Step VII—Adjusted Bid Price

The actual dollar adjustment amount for each tire is added to that tire's actual bid price. The tire with the adjusted low bid price would be purchased, provided all other bid conditions are met. (The amount paid for the purchased tires is the actual bid price.)

Actual dollar adjustment	+	Actual dollar bid price	=	Adjusted bid price
$7.35		$59.95		$67.30

Appendix A: Analysis To Determine Statistical Significance

Summary of Static Circle Results

The static circle test was conducted under both dry and wet pavement surface conditions. For each condition, a number of combinations were tested using a single driver, two cars, and tires from five manufacturers. Each tire and car combination generated 10 data points, each of which represents a lap around the static circle.

The base measurement for each data point is the elapsed time required to navigate 1 lap around the static circle. Based on the size of the circle and the elapsed time, a determination of lateral G force is made. G force is probably more recognizable to the readers of this report, and as such, this analysis includes basic statistics on this derived measure.

T-tests were run between pairs to determine specific differences. All analyses were done using a 95-percent level of significance.

Dry Static Circle—Chevrolet Impala

	This Tire				
Compared To	**BF Goodrich**	**Firestone**	**General**	**Goodyear**	**Brand X**
BF Goodrich	*na*	=	+	+	–
Firestone	=	*na*	+	+	–
General	–	–	*na*	=	–
Goodyear	–	–	=	*na*	–
Brand X	+	+	+	+	*na*

Key: + Better than – Less than = Equal to

Dry Static Circle—Ford Police Interceptor

	This Tire				
Compared To	**BF Goodrich**	**Firestone**	**General**	**Goodyear**	**Brand X**
BF Goodrich	*na*	=	+	=	–
Firestone	=	*na*	+	=	–
General	–	–	*na*	=	–
Goodyear	=	=	=	*na*	–
Brand X	+	+	+	+	*na*

Key: + Better than – Less than = Equal to

Wet Static Circle—Chevrolet Impala

Compared To	This Tire: BF Goodrich	Firestone	General	Goodyear	Brand X
BF Goodrich	*na*	+	+	+	–
Firestone	–	*na*	+	+	–
General	–	–	*na*	=	–
Goodyear	–	–	=	*na*	–
Brand X	+	+	+	+	*na*

Key: + Better than – Less than = Equal to

Wet Static Circle—Ford Police Interceptor

Compared To	This Tire: BF Goodrich	Firestone	General	Goodyear	Brand X
BF Goodrich	*na*	+	+	+	–
Firestone	–	*na*	=	+	–
General	–	=	*na*	+	–
Goodyear	–	–	–	*na*	–
Brand X	+	+	+	+	*na*

Key: + Better than – Less than = Equal to

Summary of Serpentine Results

The serpentine tests were conducted under both dry and wet pavement surface conditions. For each pavement surface condition, a number of combinations were tested using a single driver, two cars, and tires from five manufacturers. Each tire and car combination generated 15 data points, each of which represents a run through the serpentine course.

The base measurement for each data point is the elapsed time required to navigate one trip through the serpentine course. Based on the length of the course and the elapsed time, average miles per hour is calculated. Miles per hour is probably more recognizable to the readers of this report, and as such, this analysis is based on this derived measure.

T-tests were run between pairs to determine specific differences. All analyses were done using a 95-percent level of significance.

Dry Serpentine—Chevrolet Impala

This Tire

Compared To	**BF Goodrich**	**Firestone**	**General**	**Goodyear**	**Brand X**
BF Goodrich	*na*	=	=	–	–
Firestone	=	*na*	=	–	–
General	=	=	*na*	–	–
Goodyear	+	+	+	*na*	=
Brand X	+	+	+	=	*na*

Key: + Better than – Less than = Equal to

Dry Serpentine—Ford Police Interceptor

This Tire

Compared To	**BF Goodrich**	**Firestone**	**General**	**Goodyear**	**Brand X**
BF Goodrich	*na*	-+	+	+	–
Firestone	–	*na*	+	=	–
General	–	–	*na*	=	–
Goodyear	–	=	=	*na*	–
Brand X	+	+	+	+	*na*

Key: + Better than – Less than = Equal to

Wet Serpentine—Chevrolet Impala

This Tire

Compared To	**BF Goodrich**	**Firestone**	**General**	**Goodyear**	**Brand X**
BF Goodrich	*na*	+	+	+	=
Firestone	–	*na*	=	+	–
General	–	=	*na*	+	–
Goodyear	–	–	–	*na*	–
Brand X	=	+	+	+	*na*

Key: + Better than – Less than = Equal to

Wet Serpentine—Ford Police Interceptor

Compared To	This Tire: BF Goodrich	Firestone	General	Goodyear	Brand X
BF Goodrich	*na*	–	–	–	–
Firestone	+	*na*	+	=	–
General	+	–	*na*	–	–
Goodyear	+	=	+	*na*	=
Brand X	+	+	+	=	*na*

Key: + Better than – Less than = Equal to

Summary of Stopping Distance Results

The stopping distance tests were conducted under both dry and wet pavement surface conditions. For each pavement surface condition, a number of combinations were tested using a single driver, two cars, and tires from five manufacturers. Each tire and car combination generated six data points, each of which represents maximum braking from target speeds of 60 mph.

The base measurement for each data point is the average rate of deceleration during the stop. The stopping distance also is recorded, however, this measure is affected not only by braking performance but also by the actual speed at the start of the test. This additional variability makes braking distance a poor measure for analysis. As such, only deceleration rate was considered in this analysis.

T-tests were run between pairs to determine specific differences. All analyses were done using a 95-percent level of significance.

Dry Stop Distance—Chevrolet Impala

Compared To	This Tire: BF Goodrich	Firestone	General	Goodyear	Brand X
BF Goodrich	*na*	–	=	=	=
Firestone	+	*na*	+	+	+
General	=	–	*na*	=	–
Goodyear	=	–	=	*na*	–
Brand X	=	–	+	+	*na*

Key: + Better than – Less than = Equal to

Dry Stop Distance—Ford Police Interceptor

This Tire

Compared To	**BF Goodrich**	**Firestone**	**General**	**Goodyear**	**Brand X**
BF Goodrich	*na*	=	=	=	=
Firestone	=	*na*	=	=	=
General	=	=	*na*	=	–
Goodyear	=	=	=	*na*	–
Brand X	=	=	+	+	*na*

Key: + Better than – Less than = Equal to

Wet Stop Distance—Chevrolet Impala

This Tire

Compared To	**BF Goodrich**	**Firestone**	**General**	**Goodyear**	**Brand X**
BF Goodrich	*na*	=	=	+	–
Firestone	=	*na*	=	+	=
General	=	=	*na*	+	=
Goodyear	–	–	–	*na*	–
Brand X	+	=	=	+	*na*

Key: + Better than – Less than = Equal to

Wet Stop Distance—Ford Police Interceptor

This Tire

Compared To	**BF Goodrich**	**Firestone**	**General**	**Goodyear**	**Brand X**
BF Goodrich	*na*	+	=	+	=
Firestone	–	*na*	=	+	–
General	=	=	*na*	+	–
Goodyear	–	–	–	*na*	–
Brand X	=	+	+	+	*na*

Key: + Better than – Less than = Equal to

Summary of High-Speed-Handling Tests

The high-speed-handling test was conducted only under dry pavement conditions. The measure used for this test was elapsed time per lap of the course. Three drivers participated in this testing. Each drove the course for 5 timed laps with each of the five tires. The analysis is based on the four best runs for each driver and each tire. As such, a total of 12 runs were analyzed for each tire on each car.

T-tests were run between pairs to determine specific differences. All analyses were done using a 95-percent level of significance.

High-Speed Handling—Chevrolet Impala

This Tire

Compared To	**BF Goodrich**	**Firestone**	**General**	**Goodyear**	**Brand X**
BF Goodrich	*na*	=	–	=	–
Firestone	=	*na*	–	=	–
General	+	+	*na*	=	–
Goodyear	=	=	=	*na*	=
Brand X	+	+	+	=	*na*

Key: + Better than – Less than = Equal to

High-Speed Handling—Ford Police Interceptor

This Tire

Compared To	**BF Goodrich**	**Firestone**	**General**	**Goodyear**	**Brand X**
BF Goodrich	*na*	–	–	+	–
Firestone	+	*na*	=	+	–
General	+	=	*na*	+	=
Goodyear	=	–	–	*na*	–
Brand X	+	+	=	+	*na*

Key: + Better than – Less than = Equal to

Summary of the Tire Wear Measurement Results

Tire wear was assessed by measuring groove depth in the tread. The right front tire of the test set from each tire manufacturer and for each of the two vehicles was measured in 16 locations; 4 positions radially, and 4 positions across the tire (4 tread grooves). The measurements were in 0.001 inch and were taken as follows:

1. Before any testing, but after a specific break-in routine.
2. After all testing except the high-speed-handling portion (see First Wear below).
3. After the high-speed-handling test (see Second Wear below).

Because the grooves are of different initial depths due to tread design and manufacturing process, the data that was evaluated was the wear between measurements. This serves to eliminate the effect of variable groove depth at the start of the test. Three sets of data were analyzed:

1. The wear incurred as a result of dry and wet static circle, serpentine, and stopping distance tests, but prior to the high-speed-handling test (First Wear).
2. The incremental wear measured as a result of the high-speed-handling test (Second Wear).
3. The total wear incurred after the break-in procedure through all of the testing (Total Wear).

T-tests were run between pairs to determine specific differences. All analyses were done using a 95-percent level of significance.

Before High-Speed Handling (Road Course)

First Wear—Chevrolet Impala

	This Tire				
Compared To	**BF Goodrich**	**Firestone**	**General**	**Goodyear**	**Brand X**
BF Goodrich	*na*	–	–	–	–
Firestone	+	*na*	+	+	=
General	+	–	*na*	+	=
Goodyear	+	–	–	*na*	–
Brand X	+	=	=	+	*na*

Key: + Better than – Less than = Equal to

First Wear—Ford Police Interceptor

Compared To	BF Goodrich	Firestone	General	Goodyear	Brand X
	This Tire				
BF Goodrich	*na*	–	=	+	–
Firestone	+	*na*	+	+	=
General	=	–	*na*	+	–
Goodyear	–	–	–	*na*	–
Brand X	+	=	+	+	*na*

Key: + Better than – Less than = Equal to

After High-Speed Handling (Road Course)

In general, the high-speed-handling (road course) test generated more uniform wear across the tire than was experienced before the high-speed-handling portion of the test. This outcome was to be expected since the high-speed-handling test is more balanced and less tire wear biased than the other tests. This also gave a good general feel for the durability of all of the test tires in high-speed-pursuit type driving.

Second Wear—Chevrolet Impala

Compared To	BF Goodrich	Firestone	General	Goodyear	Brand X
	This Tire				
BF Goodrich	*na*	–	–	–	–
Firestone	+	*na*	+	+	=
General	+	–	*na*	+	–
Goodyear	+	–	–	*na*	–
Brand X	+	=	+	+	*na*

Key: + Better than – Less than = Equal to

Second Wear—Ford Police Interceptor

This Tire

Compared To	**BF Goodrich**	**Firestone**	**General**	**Goodyear**	**Brand X**
BF Goodrich	*na*	–	–	–	–
Firestone	+	*na*	–	=	=
General	+	+	*na*	=	+
Goodyear	+	=	=	*na*	+
Brand X	+	=	–	–	*na*

Key: + Better than – Less than = Equal to

Overall Wear Measurements

Total Wear—Chevrolet Impala

This Tire

Compared To	**BF Goodrich**	**Firestone**	**General**	**Goodyear**	**Brand X**
BF Goodrich	*na*	–	–	–	–
Firestone	+	*na*	+	+	=
General	+	–	*na*	+	–
Goodyear	+	–	–	*na*	–
Brand X	+	=	+	+	*na*

Key: + Better than – Less than = Equal to

Total Wear—Ford Police Interceptor

This Tire

Compared To	**BF Goodrich**	**Firestone**	**General**	**Goodyear**	**Brand X**
BF Goodrich	*na*	–	–	–	–
Firestone	+	*na*	=	=	=
General	+	=	*na*	=	=
Goodyear	+	=	=	*na*	=
Brand X	+	=	=	=	*na*

Key: + Better than – Less than = Equal to

Rankings for Dry and Wet Performance, and for Tire Wear

Using the information in the preceding section related to statistical significance, an analysis was done to determine a general ranking for ***dry performance***, ***wet performance***, and ***overall wear*** for each tire on each car. The method used to develop the ranking relied directly on the statistical significance tables for each of the specific tests. A value of +1 was assigned for each "+", -1 for each "–", and no value for each "=" that a given tire received for a specific test on a specific car. What follow are the scores and the rankings for each of the tires in dry and wet conditions, as well as for overall tire wear.

Dry Test Comparisons and Ranking

Chevrolet	BF Goodrich	Firestone	General	Goodyear	Brand X
Dry Static Circle	–1	–1	+3	+3	–4
Dry Serpentine	+2	+2	+2	–3	–3
Dry Stopping Distance	+1	–4	+2	+2	–1
High-Speed Handling	+2	+2	–1	0	–3
Sum of Dry Test Scores	**+4**	**–1**	**+6**	**+2**	**–11**
Ranking	**2**	**4**	**1**	**3**	**5**

Ford	BF Goodrich	Firestone	General	Goodyear	Brand X
Dry Static Circle	0	0	+3	+1	–4
Dry Serpentine	–2	+1	+3	+2	–4
Dry Stopping Distance	0	0	+1	+1	–2
High-Speed Handling	+3	–1	–2	+4	–3
Sum of Dry Test Scores	**+1**	**0**	**+5**	**+8**	**–13**
Ranking	**3**	**4**	**2**	**1**	**5**

Wet Test Comparisons and Ranking

Chevrolet	BF Goodrich	Firestone	General	Goodyear	Brand X
Wet Static Circle	–2	0	+3	+3	–4
Wet Serpentine	–3	+1	+1	+4	–3
Wet Stopping Distance	0	–1	–1	+4	–2
Sum of Wet Test Scores	**–5**	**0**	**+3**	**+11**	**–9**
Ranking	**4**	**3**	**2**	**1**	**5**

Ford	**BF Goodrich**	**Firestone**	**General**	**Goodyear**	**Brand X**
Wet Static Circle	–2	+1	+1	+4	–4
Wet Serpentine	+4	–1	+2	–2	–3
Wet Stopping Distance	–2	+1	0	+4	–3
Sum of Wet Test Scores	**0**	**+1**	**+3**	**+6**	**–10**
Ranking	**4**	**3**	**2**	**1**	**5**

Treadwear Comparisons and Ranking

Chevrolet	**BF Goodrich**	**Firestone**	**General**	**Goodyear**	**Brand X**
Total Wear Measured***	+4	–3	0	+2	–3
Ranking	**1**	**5**	**3**	**2**	**5**

Ford	**BF Goodrich**	**Firestone**	**General**	**Goodyear**	**Brand X**
Overall Wear Measured	+4	–1	–1	–1	–1
Ranking	**1**	**5**	**5**	**5**	**5**

Treadwear Comparisons and Ranking

Chevrolet	**BF Goodrich**	**Firestone**	**General**	**Goodyear**	**Brand X**
First Wear Measurement*	+4	–3	–1	+2	–2
Second Wear Measurement**	+4	–3	0	+2	–3
Total Wear Measured***	+4	–3	0	+2	–3
Sum of Wear Scores	**+12**	**–9**	**–1**	**+6**	**–8**
Ranking	**1**	**5**	**3**	**2**	**4**

Ford	BF Goodrich	Firestone	General	Goodyear	Brand X
First Wear Measurement*	+1	–3	+1	+4	–3
Second Wear Measurement**	+4	0	–3	–2	+1
Overall Wear Measured***	+4	–1	–1	–1	–1
Sum of Wear Scores	**+9**	**–4**	**–3**	**+1**	**–3**
Ranking	**1**	**5**	**3**	**2**	**3**

* Treadwear resulting from the dry and wet static circle, serpentine, and stopping distance tests, taken prior to the high-speed-handling test.

** Treadwear resulting from the high-speed-handling tests only. (This does not include the "First Wear Measurement" data.)

*** The composite total of both the "First Wear Measurement" and the "Second Wear Measurement," representing the total wear that resulted from the entire evaluation procedure.

Appendix B: About the National Institute of Justice

NIJ is the research and development agency of the U.S. Department of Justice and is the only Federal agency solely dedicated to researching crime control and justice issues. NIJ provides objective, independent, nonpartisan, evidence-based knowledge and tools to meet the challenges of crime and justice, particularly at the State and local levels. NIJ's principal authorities are derived from the Omnibus Crime Control and Safe Streets Act of 1968, as amended (42 U.S.C. Sections 3721–3722).

NIJ's Mission

In partnership with others, NIJ's mission is to prevent and reduce crime, improve law enforcement and the administration of justice, and promote public safety. By applying the disciplines of the social and physical sciences, NIJ—

- Researches the nature and impact of crime and delinquency.
- Develops applied technologies, standards, and tools for criminal justice practitioners.
- Evaluates existing programs and responses to crime.
- Tests innovative concepts and program models in the field.
- Assists policymakers, program partners, and justice agencies.
- Disseminates knowledge to many audiences.

NIJ's Strategic Direction and Program Areas

NIJ is committed to five challenges as part of its strategic plan:

1) rethinking justice and the processes that create just communities;
2) understanding the nexus between social conditions and crime;
3) breaking the cycle of crime by testing research-based interventions;
4) creating the tools and technologies that meet the needs of practitioners; and
5) expanding horizons through interdisciplinary and international perspectives.

In addressing these strategic challenges, the Institute is involved in the following program areas: crime control and prevention, drugs and crime, justice systems and offender behavior, violence and victimization, communications and information technologies, critical incident response, investigative and forensic sciences (including DNA), less-than-lethal technologies, officer protection, education and training technologies, testing and standards, technology assistance to law enforcement and corrections agencies, field testing of promising programs, and international crime control. NIJ communicates its findings through conferences and print and electronic media.

NIJ's Structure

The NIJ Director is appointed by the President and confirmed by the Senate. The NIJ Director establishes the Institute's objectives, guided by the priorities of the Office of Justice Programs, the U.S. Department of Justice, and the needs of the field. NIJ actively solicits the views of criminal justice and other professionals and researchers to inform its search for the knowledge and tools to guide policy and practice.

NIJ has three operating units. The Office of Research and Evaluation manages social science research and evaluation and crime mapping research. The Office of Science and Technology manages technology research and development, standards development, and technology assistance to State and local law enforcement and corrections agencies. The Office of Development and Communications manages field tests of model programs, international research, and knowledge dissemination programs. NIJ is a component of the Office of Justice Programs, which also includes the Bureau of Justice Assistance, the Bureau of Justice Statistics, the Office of Juvenile Justice and Delinquency Prevention, and the Office for Victims of Crime.

To find out more about the National Institute of Justice, please contact:

National Criminal Justice Reference Service
P.O. Box 6000
Rockville, MD 20849–6000
800–851–3420
E-mail: askncjrs@ncjrs.org

To obtain an electronic version of this document, access the NIJ Web site (http://www.ojp.usdoj.gov/nij). If you have questions, call or e-mail NCJRS.

Appendix C: About the Law Enforcement and Corrections Standards and Testing Program

The Law Enforcement and Corrections Standards and Testing Program is sponsored by the Office of Science and Technology of the National Institute of Justice (NIJ), U.S. Department of Justice. The program responds to the mandate of the Justice System Improvement Act of 1979, which directed NIJ to encourage research and development to improve the criminal justice system and to disseminate the results to Federal, State, and local agencies.

The Law Enforcement and Corrections Standards and Testing Program is an applied research effort that determines the technological needs of justice system agencies, sets minimum performance standards for specific devices, tests commercially available equipment against those standards, and disseminates the standards and the test results to criminal justice agencies nationwide and internationally.

The program operates through the following:

- ***The Law Enforcement and Corrections Technology Advisory Council (LECTAC)***, consisting of nationally recognized criminal justice practitioners from Federal, State, and local agencies, assesses technological needs and sets priorities for research programs and items to be evaluated and tested.
- ***The Office of Law Enforcement Standards (OLES)*** at the National Institute of Standards and Technology develops voluntary national performance standards for compliance testing to ensure that individual items of equipment are suitable for use by criminal justice agencies. The equipment standards developed by OLES are based on laboratory evaluation of commercially available products in order to devise precise test methods that can be universally applied by any qualified testing laboratory and to establish minimum performance requirements for each attribute of a piece of equipment that is essential to how it functions. OLES-developed standards can serve as design criteria for manufacturers or as the basis for equipment evaluation. The application of the standards, which are highly technical in nature, is augmented through the publication of equipment performance reports and user guides. Individual jurisdictions may use the standards in their own laboratories to test equipment, have equipment tested on their behalf using the standards, or cite the standards in procurement specifications.
- ***The National Law Enforcement and Corrections Technology Center (NLECTC)***, operated by a grantee, supervises a national compliance testing program conducted by independent laboratories. The standards developed by OLES serve as performance benchmarks against which commercial equipment is measured. The facilities, personnel, and testing capabilities of the independent laboratories are evaluated by OLES prior to testing each item of equipment. In addition, OLES helps NLECTC staff review and analyze data. Test results are published in consumer product reports designed to help justice system procurement officials make informed purchasing decisions.

Publications are available at no charge through NLECTC. Some documents are also available online through the Justice Technology Information Network (JUSTNET), the center's Internet/World Wide Web site. To request a document or additional information, call 800–248–2742 or 301–519–5060, or write:

National Law Enforcement and Corrections Technology Center
P.O. Box 1160
Rockville, MD 20849–1160

E-mail: asknlectc@nlectc.org

World Wide Web address: http://www.justnet.org

Appendix D: About the National Law Enforcement and Corrections Technology Center System

The National Law Enforcement and Corrections Technology Center (NLECTC) system exists to support the Nation's structure of State and local law enforcement and corrections. The United States has more than 18,000 law enforcement agencies, 50 State correctional systems, and thousands of prisons and jails. The fragmented nature of law enforcement and corrections impedes the dissemination of valuable new information, fosters a patchwork marketplace that discourages the commercialization of new technologies, and underscores the need for uniform performance standards for equipment and technologies.

The National Institute of Justice's (NIJ's) Office of Science and Technology (OS&T) created NLECTC in 1994 as a national system of technology centers that are clearinghouses of information and sources of technology assistance and that also attend to special needs, including technology commercialization and standards development.

The NLECTC system's purpose is to determine the needs of the law enforcement and corrections communities and assist them in understanding, using, and benefiting from new and existing technologies that, increasingly, are vital levers of progress in criminal justice. NIJ/OS&T and the NLECTC system are the only current programs developed by the Federal Government that focus solely on the development and transfer of technologies to State and local law enforcement and corrections.

NLECTC is a program of NIJ, the research and development arm of the U.S. Department of Justice. The system currently consists of a national center, five regional centers, and several specialty offices. Also contributing to the initiatives of the center system is the Office of Law Enforcement Standards. The centers are colocated with a host organization or agency that specializes in one or more areas of technology research and development.

The National Center, located in Rockville, Maryland, is the system's information hub. Regional centers are currently located in Alaska, California, Colorado, New York, and South Carolina. Specialty centers located around the country deal with border matters (California), commercialization of law enforcement and corrections technologies (West Virginia), rural law enforcement issues (Kentucky), and standards and testing (Maryland).

Each center shares roles with the other centers and has distinctive characteristics. All are focused on helping law enforcement and corrections take full advantage of technology's rapidly growing capacity to serve the purposes of crime control and the criminal justice system.

A national body of criminal justice professionals, the Law Enforcement and Corrections Technology Advisory Council (LECTAC), helps identify research and development priorities, thereby influencing the work of the NLECTC system. In addition, each NLECTC center has a regional advisory council of law enforcement and corrections officials. Together, LECTAC and the advisory councils help to keep the NLECTC system attentive to technology priorities and the needs of law enforcement and corrections. They help to link the end user with the developer to create technologies that adequately meet operational requirements and establish which potential technologies should be pursued for development.

All of the current regional centers have distinctive roles or focus areas that, in many cases, are aligned with the expertise of host organizations and agencies. The centers are currently operated under cooperative agreements or interagency agreements with host organizations and agencies whose employees staff the centers.

To receive more information or to add your name to the NLECTC mailing list, call 800–248–2742 or 301–519–5060, or write:

National Law Enforcement and Corrections Technology Center
P.O. Box 1160
Rockville, MD 20849–1160
E-mail: asknlectc@nlectc.org
World Wide Web address: http://www.justnet.org

The following is a list of NLECTC regional and affiliated facilities that assist NIJ in fulfilling its mission.

NLECTC–Northeast
26 Electronic Parkway
Rome, NY 13441–4514
(p) 888–338–0584
(f) 315–330–4315
E-mail: nlectc_ne@rl.af.mil

NLECTC–Southeast
5300 International Boulevard
North Charleston, SC 29418
(p) 800–292–4385
(f) 843–760–4611
E-mail: nlectc-se@nlectc-se.org

NLECTC–Rocky Mountain
2050 East Iliff Avenue
Denver, CO 80208
(p) 800–416–8086
(f) 303–871–2500
E-mail: nlectc@du.edu

NLECTC–West
c/o The Aerospace Corporation
2350 East El Segundo Boulevard
El Segundo, CA 90245–4691
(p) 888–548–1618
(f) 310–336–2227
E-mail: nlectc@law-west.org

NLECTC–Northwest
4000 Old Seward Highway
Suite 301
Anchorage, AK 99503–6068
(p) 866–569–2969
(f) 907–569–6939
E-mail: nlectc_nw@ctsc.net

Border Research and Technology Center
1010 Second Avenue
Suite 1920
San Diego, CA 92101
(p) 888–656–2782
(f) 888–660–2782
E-mail: info@brtc.nlectc.org

Rural Law Enforcement Technology Center (RULETC)
1908 North Main Street
Suite 115
Hazard, KY 41701
(p) 866–787–2553
(f) 606–436–6758
E-mail: ruletc@aol.com

Office of Law Enforcement Standards (OLES)
100 Bureau Drive
Stop 8102
Gaithersburg, MD 20899–8102
(p) 301–975–2757
(f) 301–948–0978
E-mail: oles@nist.gov

Office of Law Enforcement Technology Commercialization (OLETC)
2001 Main Street
Suite 500
Wheeling, WV 26003
(p) 888–306–5382
(f) 304–231–2310
E-mail: oletc@oletc.org

Appendix E: About the Office of Law Enforcement Standards

The Office of Law Enforcement Standards (OLES) was established as a matrix management organization in 1971 through a Memorandum of Understanding between the U.S. Departments of Justice and Commerce based on the recommendations of the President's Commission on Crime. OLES' mission is to apply science and technology to the needs of the criminal justice community, including law enforcement, corrections, forensic science, and the fire service. While its major objective is to develop minimum performance standards, which are promulgated as voluntary national standards, OLES also undertakes studies leading to the publication of technical reports and user guides.

The areas of research investigated by OLES include clothing, communication systems, emergency equipment, investigative aids, protective equipment, security systems, vehicles, weapons, and analytical techniques and standard reference materials used by the forensic science community. The composition of OLES' projects varies depending on priorities of the criminal justice community at any given time and, as necessary, draws on the resources of the National Institute of Standards and Technology.

OLES assists law enforcement and criminal justice agencies in acquiring, on a cost-effective basis, the high-quality resources they need to do their jobs. To accomplish this, OLES:

- Develops methods for testing equipment performance and examining evidentiary materials.
- Develops standards for equipment and operating procedures.
- Develops standard reference materials.
- Performs other scientific and engineering research as required.

Since the program began in 1971, OLES has coordinated the development of nearly 200 standards, user guides, and advisory reports. Topics range from performance parameters of police patrol vehicles, to performance reports on various speed-measuring devices, to soft body armor testing, to analytical procedures for developing DNA profiles.

The application of technology to enhance the efficiency and effectiveness of the criminal justice community continues to increase. The proper adoption of the products resulting from emerging technologies and the assessment of equipment performance, systems, methodologies, etc., used by criminal justice practitioners constitute critical issues having safety and legal ramifications. The consequences of inadequate equipment performance or inadequate test methods can range from inconvenient to catastrophic. In addition, these deficiencies can adversely affect the general population when they increase public safety costs, preclude arrest, or result in evidence found to be inadmissible in court.

Law Enforcement and Corrections Technology Advisory Council Member Directory

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Pennsylvania Department of Corrections
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St. Petersburg Junior College
St. Petersburg, Florida

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National Institute of Corrections
Longmont, Colorado

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Prescott, Arizona

Tom Burgoyne
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International Union of Police Associations
AFL–CIO
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Leavenworth Police Department
Leavenworth, Kansas

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International Brotherhood of Police Officers
Alexandria, Virginia

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Kansas City Missouri Police Department
Kansas City, Missouri

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Orleans Parish Criminal Sheriff's Office
New Orleans, Louisiana

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Charleston, South Carolina

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Office of Detention and Deportation
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Camden, New Jersey

Stanley Hook
Chief of Police
Smyrna Police Department
Smyrna, Georgia

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American Jail Association
Hagerstown, Maryland

Maj. Hugh C. Irwin
U.S. Park Police/Training Branch
Washington, D.C.

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Head
Naval Criminal Investigative Service
Forensic Sciences Division
Washington, D.C.

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Richmond, Virginia

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Salt Lake County Sheriff's Department
Salt Lake City, Utah

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Seattle Police Department
Seattle, Washington

Andrew Keyser
Chief Information Officer
Pennsylvania Department of Corrections
Camp Hill, Pennsylvania

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Inspection Division
Houston Police Department
Houston, Texas

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Henry C. Lee Institute of Forensic Science
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West Haven, Connecticut

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Warden
Allegheny County Jail
Pittsburgh, Pennsylvania

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Largo, Florida

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