

Michigan State Police Tests 1993 Patrol Vehicles

Not only is the selection and placement of equipment within a patrol vehicle an important decision, but the selection of the vehicle itself is critical.

Every year, the Michigan State Police (MSP), in cooperation with the Technology Assessment Program (TAP) of the National Institute of Justice (NIJ), tests new patrol vehicles. This year, the MSP tested six special service-package cars (two Mustangs, two Camaros, one Caprice station wagon and one Jeep Cherokee) and six police patrol-package cars (three Caprices, one Lumina, one Crown Victoria and one Taurus). The following synopsis is excerpted from the October 1992 TAP bulletin.

Each vehicle is subjected to six major tests and evaluations: vehicle dynamics, acceleration, top speed, braking, ergonomics and fuel economy. It should be noted that the MSP vehicle specifications, test categories and scoring reflect MSP needs. If your department employs this or a similar method, consider your own needs carefully and adjust the parameters accordingly.

Vehicle Dynamics Testing

Objective: To determine high-speed pursuit handling characteristics. The 1.635-mile road racing course contains hills, curves and corners; except for the absence of traffic, it simulates actual pursuit conditions. The evaluation measures each vehicle's blending of suspension components, acceleration capabilities and braking characteristics.

Methodology: Each vehicle is driven at least 12 timed laps by at least three drivers. The final score is the average of the fastest of at least nine timed laps. Results appear in table 1 (at right).

Acceleration and Top-speed Testing

1. Acceleration

Qualification test objective: To determine the ability of each vehicle to accelerate

from a standing start to 60 mph within 10.3 seconds, 80 mph within 17.8 seconds and 100 mph within 29.9 seconds.

Competitive test objective: To determine acceleration time to 100 mph.

Methodology: Using a fifth wheel in conjunction with a microprocessor and integrated printer, each vehicle is driven through four acceleration sequences—two northbound and two southbound to allow for wind direction. The average of the four times is used to derive scores on the competitive test.

2. Top Speed

Qualification test objective: To determine

the vehicle's ability to reach 110 mph within one mile.

Competitive test objective: To determine the actual top speed obtained within 14 miles from a standing start.

Methodology: Following the fourth acceleration run, the vehicle continues to accelerate to the top speed attainable within 14 miles from the start of the run. The highest speed attained within that distance is the vehicle's score on the competitive test. Results are summarized in table 2 (following page).

Braking Test

Qualification test objective: To determine the acceptability of each vehicle's braking performance for pursuit service. The ability of the vehicle to make a panic stop within its own lane and evidence of brake fade is evaluated.

Competitive test objective: To determine the deceleration rate on two 60-to-0 mph impending skid stops. Vehicles are scored on their average deceleration rate attained in comparison with the other vehicles in the test group.

Methodology: Each vehicle is first required to make four decelerations at 22 feet per second squared from 90-to-0 mph, with the driver using a decelerometer to maintain the deceleration rate. The vehicle then makes a 60-to-0 mph impending skid.

The exact initial velocity at the beginning of the deceleration and the exact distance required to make the stop are recorded by means of a fifth wheel with electronic digital speed and distance meters. From these figures, the average deceleration rate for the stops is calculated.

Following a four-minute cooling period, this sequence is repeated. The second sequence is followed by one 60-to-0 mph panic stop to determine the ability of the vehicle to stop in a straight line within its lane and to detect evidence of brake fade. Table 3 (following page) summarizes the results.

Table 1
Results of Vehicle Dynamics Testing

Make/Model	Average
Chevrolet Camaro (automatic) 5.7L PFI ABS	1:19.52*
Chevrolet Camaro (6-speed manual) 5.7L PFI ABS	1:20.12**
Chevrolet Caprice 5.7L TBI ABS	1:25.87*
Chevrolet Caprice (3.08:1 axle) 5.0L TBI ABS	1:28.91**
Chevrolet Caprice Station Wagon 5.7L TBI ABS	1:29.33**
Chevrolet Lumina 3.1L PFI ABS	1:29.95**
Chrysler Jeep Cherokee (4-wheel drive) 4.0L PFI ABS	1:27.00**
Ford Crown Victoria 4.6L PFI ABS	1:27.57*
Ford Mustang (automatic) 5.0L PFI-HO	1:23.39*
Ford Mustang (5-speed manual) 5.0L PFI-HO	1:22.28**
Ford Taurus 3.8L PFI ABS	1:26.86**

Note: Times are in minutes, seconds and hundredths of a second; e.g., 1:29.74 = 1 minute, 29 seconds, and 74/100ths of a second.

* Average time for fastest 12 laps.

** Average time for fastest 9 laps.

ABS = Anti-locking brake system

TBI = Throttle body injection

PFI = Multiport fuel injection

HO = High output

Ergonomics and Communications

Objectives: To rate the vehicle's ability to provide a suitable environment for patrol officers to perform their jobs, to accommodate the required communications and emergency warning equipment and to assess the relative difficulty of installing the equipment.

Methodology: At least four officers independently and individually score each vehicle on comfort and instrumentation.

Speed (mph)	Chevrolet Camaro (auto) 5.7L PFI	Chevrolet Camaro (manual) 5.7L PFI	Chevrolet Caprice 5.7L TBI	Chevrolet Caprice (3.08:1 axle) 5.0L TBI
0-20	1.49	1.64	1.78	2.17
0-30	2.38	2.40	2.94	3.68
0-40	3.44	3.38	4.47	5.57
0-50	4.63	4.70	6.49	8.12
0-60	6.18	6.10	8.77	11.14
0-70	7.89	8.33	11.60	15.14
0-80	10.12	10.33	15.48	20.23
0-90	12.89	12.94	19.84	26.93
0-100	15.82	16.12	25.86	35.28
Top speed in mph	154.00	147.10*	132.00	110.10

*Highest speed recorded before test equipment failure. Vehicle may be

	Chevrolet Camaro (auto) 5.7L PFI ABS	Chevrolet Caprice 5.7L TBI ABS
Phase I		
Initial speed (mph)	60.70	60.80
Stopping distance (ft)	128.80	144.10
Deceleration rate (ft/sec ²)	30.77	27.59
Phase II		
Initial speed (mph)	62.10	59.60
Stopping distance (ft)	138.70	137.50
Deceleration rate (ft/sec ²)	29.91	27.79
Average Deceleration Rate (ft/sec²)	30.34	27.69
Stopping distance from 60 mph based on average deceleration rate (ft)	127.60	139.80

Personnel from the Motor Transport Division, Police Car Prep Section, conduct the communications portion of the evaluation based on the relative difficulty of the necessary installations. Each factor is graded on a scale of 1 to 10, with 1 representing totally unacceptable and 10 representing superior. Scores are averaged to minimize personal prejudice. See table 4 (page 50) for the results. (Only one of each model was tested since the interior dimensions are essentially the same.)

Fuel Economy

Objective: To determine fuel economy potential. The scoring data are valid and reliable for comparison but may not necessarily be an accurate prediction of the car's actual fuel economy.

Methodology: The vehicles are scored based on estimates for city fuel economy to the nearest 1/10th mile per gallon, developed from data supplied by the vehicle manufacturers. Table 5 (page 50) shows the estimated EPA fuel economy.

Table 2
Results of Acceleration and Top-Speed Testing

Chevrolet Caprice (2.56:1 axle) 5.0L TBI	Chevrolet Caprice Station Wagon 5.7L TBI	Chevrolet Lumina 3.1L PFI	Chrysler Jeep Cherokee (4-wheel drive) 4.0L PFI	Ford Crown Victoria 4.6L PFI	Ford Mustang 5.0L PFI-HO	Ford Mustang (manual) 5.0L PFI-HO	Ford Taurus 3.8L PFI
2.30	1.83	2.07	2.01	1.94	1.84	1.67	1.88
3.98	3.16	3.51	3.43	3.56	3.27	2.50	3.12
5.88	4.97	5.52	5.00	5.19	4.64	3.61	4.83
8.65	7.25	8.04	7.26	7.19	6.11	4.99	7.02
11.86	9.99	11.18	9.84	9.57	7.98	6.59	9.55
15.76	13.61	15.18	13.00	12.51	10.42	8.90	12.94
21.58	18.39	20.56	18.45	16.29	13.18	11.36	17.20
30.52	24.22	27.94	25.22	21.61	17.33	14.32	22.35
41.56	32.15	38.23	34.15	27.91	22.34	18.45	29.89
121.00	112.00	115.00	115.00	123.00	135.10	137.00	123.00

able of higher top speed.

Table 3
Results of Braking Test

Chevrolet Caprice Station Wagon 5.7L TBI ABS	Chevrolet Lumina 3.1L PFI ABS	Chrysler Jeep Cherokee (4-wheel drive) 4.0L PFI ABS	Ford Crown Victoria 4.6L PFI ABS	Ford Crown Victoria 4.6L PFI Non-ABS	Ford Mustang (auto) 5.0L PFI-HO Non-ABS	Ford Taurus 3.8L PFI ABS	Ford Taurus 3.8L PFI Non-ABS
59.60	60.50	60.40	59.90	60.10	59.70	60.10	59.50
144.90	160.60	143.70	139.60	148.80	163.20	154.20	169.60
26.37	24.51	27.31	27.65	26.11	23.49	25.20	22.45
60.70	60.80	60.70	60.70	61.60	59.70	61.2	59.60
144.50	167.0	149.5	148.10	164.30	159.60	161.40	165.60
27.43	23.81	26.51	26.76	24.84	24.02	24.96	23.07
26.90	24.16	26.91	27.21	25.48	23.76	25.08	22.76
143.90	160.30	143.90	142.30	152.00	163.00	154.40	170.10

Table 4
Results of Ergonomics and Communications Test

Vehicle	Score*
Chevrolet Camaro	185.67
Chevrolet Caprice	230.87
Chevrolet Caprice Station Wagon	230.80
Chevrolet Lumina	173.93
Chrysler Jeep Cherokee	187.60
Ford Crown Victoria	207.13
Ford Mustang	170.33
Ford Taurus	205.47

Table 5
Fuel Economy

Make/Model	EPA mpg (city)
Chevrolet Camaro (automatic) 5.7L PFI	16.6
Chevrolet Camaro (6-speed manual) 5.7L PFI	16.7
Chevrolet Caprice 5.7L TBI	14.0
Chevrolet Caprice (3.08:1 axle) 5.0L TBI	17.4
Chevrolet Caprice (2.56:1 axle) 5.0L TBI	17.3
Chevrolet Caprice Station Wagon 5.7L TBI	16.5
Chevrolet Lumina 3.1L PFI	18.6
Chrysler Jeep Cherokee (4-wheel drive) 4.0L PFI	14.7
Ford Crown Victoria 4.6L PFI	16.7
Ford Mustang (automatic) 5.0L PFI-HO	17.3
Ford Mustang (5-speed manual) 5.0L PFI-HO	16.6
Ford Taurus 3.8L PFI	18.8

*Scores are the total points the automobile received for each of 29 attributes the MSP considers important in determining the acceptability of the vehicle as a patrol car—for example, front seat adjustability, clarity and instrumentation, and visibility front and back. The higher the number, the better the vehicle scored.