



National Law Enforcement and Corrections Technology Center

BULLETIN

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Michigan State Police Tests 2005 Patrol Vehicles

Patrol vehicles are among the most critical purchases that a law enforcement agency makes. For both large and small agencies, patrol vehicle purchases frequently represent the second largest expenditure, after personnel, in their annual operating budgets. Selecting a vehicle that balances both budgetary and performance requirements has become an increasingly challenging task for police fleet administrators. Many agencies are painfully aware of the consequences that result from being “penny wise and pound foolish,” where vehicles with inadequate performance, such as regular production passenger vehicles not specifically designed for police service, are selected because they cost less than police-package vehicles. Although some agencies have had limited success with nontraditional police vehicles, most agencies find that the increased maintenance costs resulting from such vehicles breaking down under the stress of police service quickly offset any initial savings.

For more than 25 years, the Michigan State Police (MSP) has conducted extensive evaluations of the performance capabilities of each new model year’s police vehicles as part of its annual vehicle procurement process. Since 1981, the National Institute of Justice (NIJ), through its National Law Enforcement and Corrections Technology Center (NLECTC) system, has sponsored these tests through a partnership with MSP. By disseminating these

results to State and local law enforcement agencies, NIJ helps these agencies select vehicles that maximize their budgets and ensures that evaluated vehicles provide reliable and safe performance under the increased demands of police service.

The 2005 model year patrol vehicles were evaluated from September 18 through 20, 2004. For the purposes of the MSP evaluation, police-package vehicles are those that are designed and manufactured for use in the full spectrum of law enforcement patrol service, including pursuits. A special-service vehicle is a vehicle that may be used by law enforcement agencies for specialized use (e.g., off-road, inclement weather, K-9, or commercial vehicle enforcement), but is not designed or manufactured to be used in high-speed or pursuit situations. By creating this distinction, it is hoped that it will be easier for agencies to realistically assess the capabilities of each vehicle.

Each vehicle is subjected to six major tests and evaluations. The results are weighted to reflect the relative importance of each attribute as related to MSP operational requirements. Exhibit 1 lists the tests and point scores. MSP scores each vehicle’s overall performance, reviews the manufacturer’s bid price, and calculates a final score for each vehicle using a sophisticated formula that combines both factors.

Exhibit 1 Tests and scoring

Test	Points
Vehicle dynamics	30
Acceleration	20
Top speed	15
Braking	20
Ergonomics and communications	10
Fuel economy	5
Total	100

Five police-package vehicles and five special-service vehicles were submitted for evaluation. Exhibit 2 provides a list and a description of each vehicle. This NLECTC bulletin contains a synopsis of the test results; a detailed report also is available. Page 8 of this bulletin contains information on how to obtain the report.

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 alter the weighting factors accordingly.

What's New for 2005

Chevrolet: For the 2005 model year, the Impala is once again available in both the 9C1 police package and the 9C3 unmarked police package. There are no significant changes to either version of the Impala from the 2004 model year. Both front-wheel-drive packages are equipped with the 3.8L (231 cid) V6 engine, rated at 200 horsepower.

After a 6-year absence, Chevrolet is reintroducing the Tahoe Police Package Vehicle (PPV) for the 2005 model year. The pursuit-capable Tahoe PPV is available only in 2-wheel-drive (2WD) and is equipped with the 5.3L (327 cid) V8 engine, rated at 285 horsepower. The available E85 option allows the Tahoe PPV to operate as a flexible fuel vehicle, using either regular unleaded gasoline or an ethanol/gasoline blend. The Tahoe also is available as a 4-wheel-drive (4WD) special-service package, which is equipped with a standard 4.8L (292 cid) V8 engine rated at 275 horsepower. The 5.3L (327 cid) V8 engine, which was tested, is an available option on the special-service package.

New for 2005 is the Silverado 2500 HD Crew Cab Extended Mobility Package. This four-door pickup is available only as a special-service package, initially available through the General Services Administration (GSA) schedule. Like the special-service Tahoe, it is available with 4WD. The Silverado has a standard 6.6L (402 cid) electronic direct injection diesel (EDID) engine.

Dodge: For this model year, Dodge is introducing a new vehicle to replace the discontinued Intrepid police package. The 2005 Dodge Magnum will be available only as a special-service package for this model year, but it may be introduced as a police-package vehicle for the 2006 model year. The special-service Magnum is a rear-wheel-drive (RWD) vehicle, equipped with a 3.5L V6, rated at 250 horsepower. A 4-speed electronic automatic transmission is standard, as are 17-inch wheels and 4-wheel disc brakes with an antilock brake system (ABS).

Exhibit 2 Vehicles tested

Category	Vehicle	Engine
Police	Chevrolet Impala	3.8L (231 cid) SPFI V6
Special Service	Chevrolet Silverado 2500 HD (4-wheel drive)	6.6L (402 cid) EDID Turbo V8
Police	Chevrolet Tahoe PPV 2WD E85	5.3L (327 cid) SPFI V8
Police	Chevrolet Tahoe PPV 2WD	5.3L (327 cid) SPFI V8
Special Service	Chevrolet Tahoe (4-wheel drive)	5.3L (327 cid) SPFI V8
Special Service	Dodge Magnum	3.5L (214 cid) SPFI V6
Police	Ford Police Interceptor (3.27 axle ratio)	4.6L (281 cid) SMPI V8
Police	Ford Police Interceptor (3.55 axle ratio)	4.6L (281 cid) SMPI V8
Special Service	Ford Expedition (2-wheel drive)	5.4L (330 cid) SMPI V8
Special Service	Ford Explorer (2-wheel drive)	4.6L (281 cid) SMPI V8

cid = cubic inch displacement

L = liter

Turbo = turbocharged

EDID = electronic direct injection diesel

SPFI = sequential port fuel injection

MPFI = multiport fuel injection

SMPI = sequential multiport fuel injection

Ford: The 2005 model year Police Interceptor is basically unchanged from the 2004 version. The Police Interceptor is once again available with either the standard 3.27 rear-axle ratio or an optional 3.55 rear-axle ratio. An automatic fire suppression system with manual override will be available as an option for Police Interceptors manufactured later in the 2005 model year.

The Explorer and Expedition Sport Utility Vehicles (SUVs) are once again available as special-service packages, in a wide array of trim and equipment levels. Available options include either 4WD or all-wheel-drive (AWD) systems (not tested), a variety of gasoline and diesel engines, and several new exterior color options on each vehicle. The special-service Excursion SUV, which was supposed to be discontinued after the 2004 model year, also is available as a 2005 model, with no significant changes from the previous year. Ford did not submit the Excursion for testing.

Vehicle Dynamics Testing

Objective: To determine each vehicle's high-speed pursuit handling characteristics. The 2-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: All vehicles are driven over the course a total of 32 timed laps by four separate drivers, each driving an 8-lap series. The final score for the vehicle is the combined average of the 5 fastest laps of each of the four drivers.

Exhibit 3 shows the average results of the vehicle dynamics test.

Acceleration and Top-Speed Testing

Acceleration

Objective: To determine the time required for each test vehicle to accelerate from a standing start to 60 mph, 80 mph, and 100 mph.

Methodology: Using a Datron Non-Contact Optical Sensor in conjunction with a personal computer, each

vehicle is driven through four acceleration sequences—two northbound and two southbound—to allow for wind direction. The average of the four is the score on the competitive test.

Top Speed

Objective: To determine the actual top speed attainable by each test vehicle within a distance of 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 the 14 miles is the vehicle's score on the competitive test.

Exhibit 4 summarizes the acceleration and top-speed test results.

Exhibit 3 Results of vehicle dynamics testing

Make/Model	Average*
Chevrolet Impala 3.8L SPFI V6	01:44.74
Chevrolet Silverado 2500 HD (4-wheel drive) 6.6L EDID Turbo V8	**
Chevrolet Tahoe PPV 2WD E85 (2-wheel drive) 5.3L SPFI V8	01:46.70
Chevrolet Tahoe PPV 2WD (2-wheel drive) 5.3L SPFI V8	01:47.13
Chevrolet Tahoe (4-wheel drive) 5.3L SPFI V8	**
Dodge Magnum 3.5L SPFI V6	**
Ford Police Interceptor (3.27 axle ratio) 4.6L SMPI V8	01:42.81
Ford Police Interceptor (3.55 axle ratio) 4.6L SMPI V8	01:42.43
Ford Expedition (2-wheel drive) 5.4L SMPI V8	**
Ford Explorer (2-wheel drive) 4.6L SMPI V8	**

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

* Average of the 20 fastest laps out of 32 total laps (the overall average of 5 fastest laps for each of the four test drivers).

** The vehicle manufacturer has indicated that these vehicles are neither designed nor intended to be used as pursuit vehicles. Therefore, these vehicles were not subjected to vehicle dynamics testing.

Exhibit 4 Results of acceleration* and top-speed** testing

Speed (mph)	Chevrolet Impala	Chevrolet Silverado 2500 HD (4WD)	Chevrolet Tahoe PPV E85 (4WD)	Chevrolet Tahoe PPV (2WD)	Chevrolet Tahoe (4WD)	Dodge Magnum	Ford Police Interceptor (3.27 axle ratio)	Ford Police Interceptor (3.55 axle ratio)	Ford Expedition (2WD)	Ford Explorer (2WD)
0-20	2.01	2.85	1.76	1.78	2.19	1.91	1.82	1.80	1.88	1.81
0-30	3.18	4.27	2.95	2.97	3.57	3.22	3.11	2.99	3.32	3.09
0-40	4.52	5.94	4.20	4.24	4.94	4.75	4.50	4.40	4.88	4.59
0-50	6.41	8.08	6.06	6.12	6.82	6.65	6.19	6.10	7.24	6.50
0-60	8.76	10.97	8.19	8.27	9.46	9.10	8.42	8.15	9.80	9.01
0-70	11.36	14.48	10.48	10.57	12.16	12.01	10.88	10.62	12.57	11.77
0-80	14.68	19.13	13.62	13.69	15.26	15.34	13.98	13.94	16.41	15.47
0-90	19.51	32.06	18.36	18.38	21.52	19.43	18.25	17.86	21.88	20.73
0-100	25.29	N/A	23.69	23.86	N/A	24.96	23.30	22.91	N/A	27.58
Top Speed in mph	123	91	125	124	98	117	128	119	99	107

* The final score for each target speed is the combined average of the four resulting timed acceleration sequences (one from each driver) for each vehicle.

** All vehicles are equipped with electronic speed limiters.

N/A = Vehicle did not achieve or exceed 100 mph.

Braking Testing

Objective: To determine the deceleration rate attained by each test vehicle on 12, 60-to-0 mph impending skid (threshold) stops, with ABS in operation if the vehicle is so equipped. Each vehicle will be scored on the average deceleration rate it attains.

Methodology: Each vehicle makes two decelerations at specific, predetermined points on the test

road from 90 to 0 mph at 22 ft/sec², with the driver using a decelerometer to maintain the deceleration rate. Immediately after these heat-up stops are completed, the vehicle is turned around and makes six measured 60-to-0 mph impending skid (threshold) stops with ABS in operation, if the vehicle is so equipped, at specific, predetermined points. Following a 4-minute heat soak, the entire sequence is repeated. The exact initial velocity at the beginning of



Photo courtesy of Michigan State Police.

The 2005 Dodge Magnum is available as a special-service package vehicle. This all-new, RWD vehicle features a 3.5L V6 engine, a 4-speed electronic overdrive automatic transmission, and 4-wheel disc brakes with an antilock brake system.

each of the 60-to-0 mph decelerations and the exact distance required to make each stop are recorded by means of a Datron Non-Contact Optical Sensor in conjunction with a personal computer. The data resulting from the 12 stops will be used to calculate the average deceleration rate, which is the vehicle's score for this test. Exhibit 5 shows the results of the braking test.

Ergonomics and Communications

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

Methodology: A minimum of four officers independently and individually score each vehicle on

comfort and instrumentation. Personnel from MSP's Communications Division who are responsible for new car preparation conduct the communications portion of the evaluation, based on the relative difficulty of the necessary installations. Each factor is graded on a 1-to-10 scale, with 1 representing totally unacceptable and 10 representing superior. The scores are averaged to minimize personal prejudice. Exhibit 6 shows a comparison of the exterior and interior dimensions of the vehicles evaluated. Exhibit 7 shows the results of the ergonomics and communications test.

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.

Exhibit 5 Results of braking test

Phase I	Chevrolet Impala	Chevrolet Silverado 2500 HD (4WD)	Chevrolet Tahoe PPV (2WD)	Chevrolet Tahoe (4WD)	Dodge Magnum	Ford Police Interceptor (3.27 axle ratio)	Ford Police Interceptor (3.55 axle ratio)	Ford Expedition (2WD)	Ford Explorer (2WD)
Avg. initial speed (mph)*	59.8	60.5	60.2	59.9	60.5	60.5	60.2	59.9	60.3
Avg. stopping dist. (ft)*	134.53	178.25	144.87	144.65	144.93	148.05	150.65	141.18	148.93
Avg. deceleration rate* (ft/sec ²)	28.6	22.1	26.9	26.7	27.2	26.6	25.9	27.4	26.3
Phase II									
Avg. initial speed (mph)*	60.0	60.4	60.2	60.2	60.8	60.0	60.3	60.5	60.4
Avg. stopping dist. (ft)*	137.00	172.90	145.15	164.62	147.45	145.87	147.22	145.20	151.20
Avg. deceleration rate* (ft/sec ²)	28.3	22.7	26.9	23.9	26.9	26.6	26.5	27.1	26.0
Avg. Deceleration Rate (ft/sec²)**	28.41	22.41	26.87	25.29	27.01	26.59	26.20	27.25	26.14
Projected stopping distance from 60 mph based on average deceleration rate (ft)	136.3	172.8	144.1	153.1	143.4	145.6	147.8	142.1	148.1

Note: All vehicles have antilock brake systems.

Note: The Chevrolet Tahoe PPV E85 (2WD) was not tested for braking. The vehicle is essentially the same as the Chevrolet Tahoe PPV (2WD).

* Figures represent the average of the six measured stops.

** Calculated from the average deceleration rate (ft/sec²) of 12 measured stops.

Exhibit 6 Summary of exterior and interior dimensions

Manufacturer/Model	Length (in)	Height (in)	Wheelbase (in)	Weight (lbs)	Head Room (front) (in)	Head Room (rear) (in)	Leg Room (front) (in)	Leg Room (rear) (in)
Chevrolet Impala	200.1	57.3	110.5	3,554	39.2	36.8	42.2	38.4
Chevrolet Silverado 2500 HD (4WD)	245.0	80.0	153.0	7,187	41.0	39.9	41.3	38.8
Chevrolet Tahoe	198.9	72.0/76.3 (a)	116.0	5,034/5,341 (a)	40.7	39.4	41.3	38.6
Dodge Magnum	197.7	58.3	120.0	3,904	38.7	38.1	41.6	40.2
Ford Police Interceptor	212.0	58.5	114.7	4,166/4,160 (b)	39.4	38.0	42.5	39.6
Ford Expedition	205.8	77.4	119.0	5,459	39.7	39.8	41.2	38.7
Ford Explorer (2WD)	189.5	71.4	114.0	4,344	39.9	38.9	42.4	37.2

Manufacturer/Model	Shoulder Room (front) (in)	Shoulder Room (rear) (in)	Hip Room (front) (in)	Hip Room (rear) (in)	Interior, Front (cubic feet)	Interior, Rear (cubic feet)	Interior, Combined (cubic feet)	Trunk Capacity/Max. Cargo* (cubic feet)	Fuel Capacity (gallons)
Chevrolet Impala	59.0	58.9	56.5	55.7	56.5	55.7	104.7	18.6 (c)	17.0
Chevrolet Silverado 2500 HD (4WD)	65.2	65.1	61.4	62.9	94.3	57.3	151.6	56.9 (d)	26.0
Chevrolet Tahoe	65.2	65.1	61.4	61.3	94.3	57.3	151.6	168.2	26.0
Dodge Magnum	58.7	57.6	56.2	56.1	55.0	51.0	106.0	27.3	18.0
Ford Police Interceptor	60.8	60.3	57.1	59.0	58.2	51.1	109.3	20.6	19.0
Ford Expedition	63.4	64.3	63.0	62.4	60.0	49.6	109.6	110.5	28.0
Ford Explorer (2WD)	59.1	58.9	55.0	54.2	81.8	44.5	126.3	88.0	22.5

* Sedans are measured for trunk capacity; SUVs and special-service vehicles are measured for maximum cargo (rear seats folded down).

(a) 2-wheel drive/4-wheel drive.

(b) 3.27 axle ratio/3.55 axle ratio.

(c) With compact spare tire.

(d) Cargo box (truckbed) only.



Photo courtesy of Michigan State Police.

Ford Motor Company submitted the Expedition (front left); the Explorer (back left); the Police Interceptor, 3.27 axle ratio (back right); and the Police Interceptor, 3.55 axle ratio (front right).

Methodology: The vehicles' scores are based on estimates of city fuel economy to the nearest $\frac{1}{10}$ of a mile per gallon from data supplied by the vehicle manufacturers. Exhibit 8 shows the estimated Environmental Protection Agency (EPA) fuel economy ratings, rounded to the nearest whole number, for city, highway, and combined driving conditions.

Exhibit 7 Results of ergonomics and communications test

Manufacturer/Model	Score
Chevrolet Impala	199.92
Chevrolet Silverado 2500 HD (4WD)	203.30
Chevrolet Tahoe PPV (2WD)	210.40
Chevrolet Tahoe (4WD)	209.70
Dodge Magnum	184.87
Ford Police Interceptor	202.09
Ford Expedition (2WD)	198.60
Ford Explorer (2WD)	186.90



Photo courtesy of Michigan State Police.

Chevrolet Motor Division of General Motors Corporation submitted (clockwise from top) the Tahoe 4WD special-service package, the Silverado 2500 HD, the Impala, the Tahoe PPV, and the Tahoe PPV E85 (RWD) for testing.



Exhibit 8 Fuel economy

Manufacturer/Model	EPA Miles Per Gallon		
	City	Highway	Combined
Chevrolet Impala 3.8L (231 cid) SPFI V6	20	29	23
Chevrolet Silverado 2500 HD (4-wheel drive) 6.6L (402 cid) EDID Turbo V8	N/A	N/A	N/A
Chevrolet Tahoe PPV E85 (2-wheel drive) 5.3L (327 cid) SPFI V8	14	18	16.5
Chevrolet Tahoe PPV (2-wheel drive) 5.3L (327 cid) SPFI V8	15	20	16.5
Chevrolet Tahoe (4-wheel drive) 5.3L (327 cid) SPFI V8	14	18	16.5
Dodge Magnum 3.5L (214 cid) SPFI V6	19	27	25.4
Ford Police Interceptor 4.6L (281 cid) SMPI V8	15	22	18
Ford Expedition (2-wheel drive) 5.4L (330 cid) SMPI V8	13	17	15
Ford Explorer (2-wheel drive) 4.6L (281 cid) SMPI V8	15	19	16

N/A = Information not available at press time.

If you would like a copy of the full report, write or call the National Law Enforcement and Corrections Technology Center, 2277 Research Boulevard, Mail Stop 8J, Rockville, MD 20850, 800-248-2742, or 301-519-5060; or download it from JUSTNET, www.justnet.org.

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