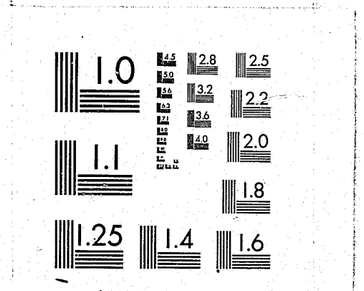


in pursuit of an improved police car

PREPARED BY THE AEROSPACE CORPORATION FOR THE LAW ENFORCEMENT ASSISTANCE ADMINISTRATION, WASHINGTON, D.C.

Today, the police officer's patrol car is his office on wheels. It's where he spends most of his time while on duty, for patrol and surveillance, pursuit and apprehension. The police officer also uses his vehicle as a place to interview witnesses, victims and suspects of crimes, to detain prisoners and to write reports.

More than basic transportation, the police car is a major tool in law enforcement and a symbol of authority to citizens. It also has become a communications terminal where important information is received and transmitted, usually by voice radio.

In the United States there are some 160,000 police patrol cars, representing a vast investment. To man one two-man car for 24 hours a day costs more than $200,000 annually.

The patrol car is a major item in police department budgets since a new fully-equipped police car costs more than $6,000 and lasts only three years on an average. Across the nation, the police community spends an estimated quarter of a billion dollars per year to replace police vehicles. On top of this is the cost of fuel -- a half billion dollars -- and the cost of maintenance -- $100 million annually. Accidents also add their toll.

OPPORTUNITY FOR IMPROVEMENT

Two national commissions have determined that today's police car could be a better performer as a tool for law enforcement agencies in fighting crime. The average police vehicle is a beefed-up family car, not specially designed to do the job intended. Innovation and evaluation can help change the police car into a more economical, safer and more productive weapon against crime.

Studies have defined possible improvements which could reasonably be made in the police car and have developed the following goals:

(1) **A more economical and safer police car through:**
- Increased fuel economy;
- Reduced vehicle replacement costs;
- Reduced maintenance costs;
- Reduced accident and injury rates.

(2) **A more productive police car through:**
- Increased availability of information to the officer;
- Decreased report preparation and filing time;
- Elimination of "missed messages";
- Improved communications and access to information while the officer is away from his vehicle;
- New body configuration specially designed for police use.

APPROACH

Concepts under study today may result in a more economical, safer and more productive police car.

For more economical police car operations, the most important concept is reduced vehicle weight. A compact car is being field tested, and new body designs which provide standard car interior space in a compact weight vehicle are being studied. Another concept being tested is the use of vehicle diagnostics to improve maintenance. Special devices and training aids to encourage economical driving habits also show promise.

For greater safety, several concepts appear useful. Among them are anti-lock brakes, carbon monoxide sensors, hands-free communication, improved rearward visibility, and improved seats and body restraints.

To help the police officer do a more productive job, a computer-controlled digital communication and data system is proposed. Computer-aided report writing will free the officer from many of his clerical tasks. Hand-held remote communication devices will extend the range of his work. And, improved data retrieval techniques will result in quicker and more efficient responses to stolen vehicle and property and wanted persons inquiries.

These concepts are being explored, and most will be tested under actual police conditions. This brochure will briefly describe what progress has been made thus far and what remains to be done in the pursuit of an improved vehicle for the police community.

Improvement of the total Criminal Justice System is a domestic challenge facing all Americans today. It requires a massive infusion of technical resources, innovative planning, bold leadership, and money to finance effective crime reduction programs at the state and local level.

In 1968, Congress addressed this challenge by creating the Law Enforcement Assistance Administration (LEAA). Directed "to assist State and local governments in strengthening and improving law enforcement and criminal justice at every level. . .," LEAA has dispensed more than $4 billion in Federal funds to support approximately 85,000 anticrime programs.

Projects funded by LEAA have touched virtually every aspect of criminal justice and range from police and court administration, to organized crime, to white collar crime and official corruption, to disorders and terrorism, to rehabilitation of offenders, to victimization, and to implementing criminal justice standards and goals.

In addition, LEAA offers a number of special services to those working to reduce crime. Among these are research reports, consultation services, technical assistance and training materials.

The development of a more effective police car is one major research effort funded by LEAA. In late 1974, the National Institute of Law Enforcement and Criminal Justice of LEAA began a program to apply new and innovative technologies to improve today's police car.

A prototype car incorporating many concepts for improved police car economy, safety and productivity has been developed under the technical guidance of The Aerospace Corporation, a nonprofit, public service, systems engineering company. The police departments of New Orleans and Dallas will participate in a field test of the concepts.

Richard W. Velde
Administrator,
Law Enforcement Assistance Administration

Gerald M. Caplan
Director,
National Institute of
Law Enforcement and Criminal Justice

SAVING MONEY

Incorporating a compact car with a smaller engine, driver's aids to encourage more economical driving habits, vehicle diagnostics for better maintenance, and an improved ignition system can lead to an increase in gasoline mileage of up to 7.5 miles per gallon, approximately a 100% increase. This cuts annual gasoline costs for police cars by $250 million.

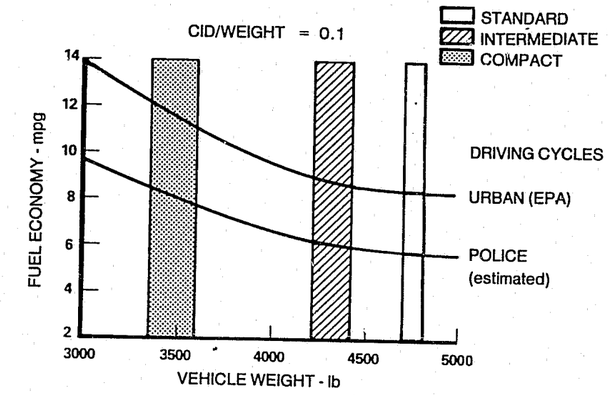
Other savings are possible. Maintenance and repair bills can decrease $260 per car or $42 million per year. Vehicle replacement costs should drop $1550 per car or $82 million.

GREATER SAFETY

Improved safety is another major goal of the LEAA police car program. A number of measures directed toward this goal can be implemented; for instance, improving a car's brakes. Four wheel anti-locking brakes make a car more stable and give it more control during braking, plus help it stop quicker under rain, snow or ice conditions.

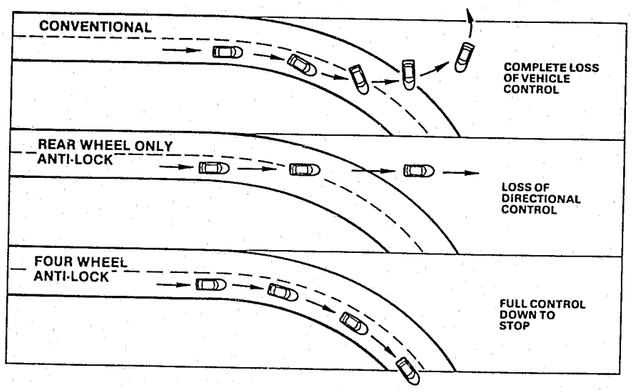
Another safety concern is exposure of an officer to the effects of deadly carbon monoxide inside his car. Of course, the ideal solution is to develop an improved exhaust system which won't let carbon monoxide get into the car and to inspect frequently enough to detect damage before it becomes dangerous. In the meantime, special electronic sensors will be used to protect the officers in the demonstration program and to determine the full extent of the problem.

MPG vs Vehicle Weight



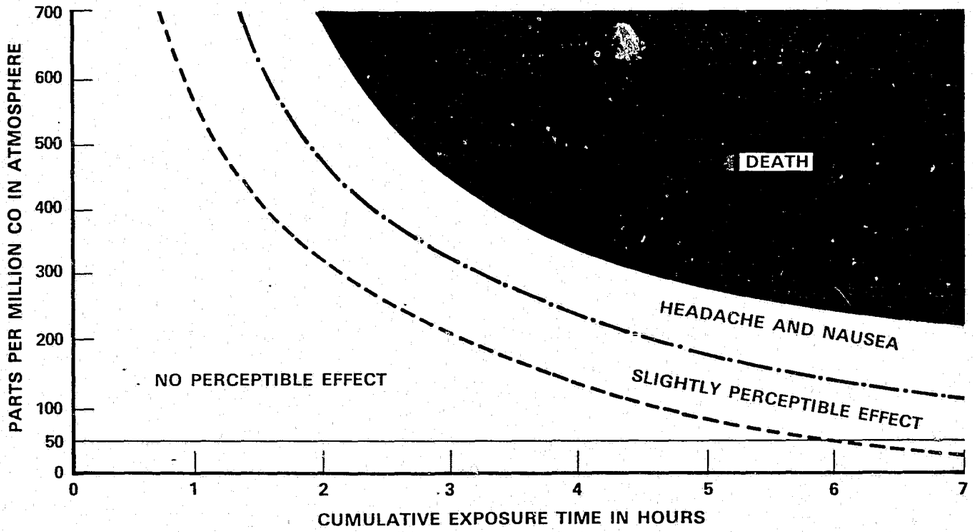
Braking System Comparison

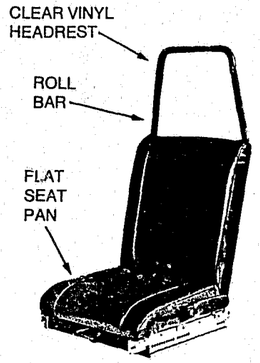
PANIC STOPS



Effect of CO on Humans

FEDERAL OCCUPATIONAL HEALTH AND ENVIRONMENTAL STANDARD — 50 PARTS PER MILLION — AVERAGE OVER 8 HOUR SHIFT





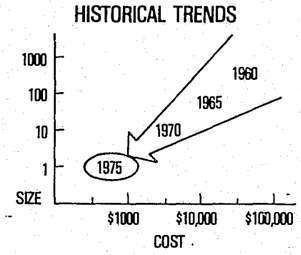
IMPROVED SEAT AND RESTRAINT SYSTEM

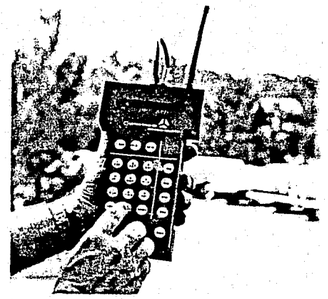
Police car seats and restraints also need improvement. They frequently don't have adequate wear resistance and are uncomfortable under constant use. Also, existing restraint systems are bypassed by many police officers because they find them to be inconvenient and cumbersome. An improved seat and restraint system has been designed to help eliminate these and other shortcomings.

Adequate rearward vision is important to the police officer on patrol. However, the police officer's rearward field of view is often obstructed by prisoners or prison screens in the back seat. A periscope rearview mirror has been installed to improve the officer's rearward visibility, by providing an unobstructed wide angle (70°) view from the car's roof.

A police officer must use his hands to operate the normal hand-held radio microphone. However, taking his hands away from the critical job of driving the vehicle, especially in times of high speed or emergency operation, exposes the officer to a higher accident probability. Hands-free communications systems are available which allow the driver to transmit and receive radio communications without

Microprocessor Technology





EFFECTIVENESS

DECREASED COMPLAINT RESPONSE TIME

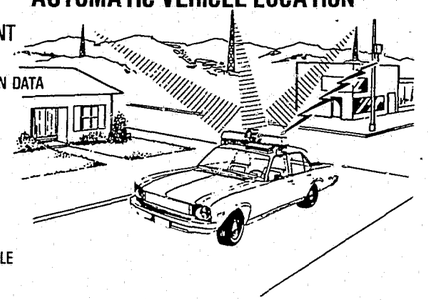
- INSTANTANEOUS POSITION DATA FOR ALL VEHICLES

SAFETY

REDUCED CRIMINAL THREAT TO OFFICER

- CONTINUAL AUTOMATIC TRANSMISSION OF VEHICLE LOCATION

AUTOMATIC VEHICLE LOCATION



removing his hands from the steering wheel.

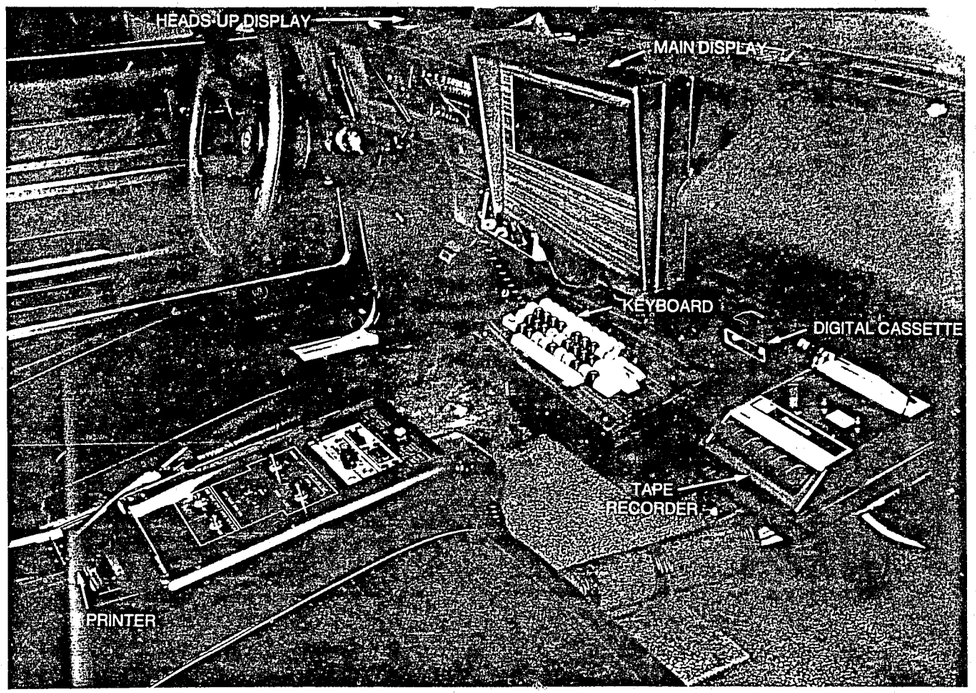
INCREASED PRODUCTIVITY

The rapid advance in computer technology the past few years, especially in lower cost and smaller equipment, has made possible many new ways to help police officers be more productive. Development of the so-called microprocessor -- "computer on a chip" -- has made it physically and economically possible to put a computer in a patrol car.

One important feature, made possible only by the presence of a programmable microcomputer, is the use of prompters to simplify the operation of an otherwise complex data system. Prompters are simply directions or instructions programmed into the microcomputer which are displayed in a predetermined sequence to help the officer interact with the data system. The microcomputer not only allows the storage of many such instructions but enables great flexibility in adding new instructions or changing existing instructions, allowing the data system to evolve along with improvements in equipment or procedure.

The microcomputer has other benefits, such as enabling police departments to automatically monitor how well the patrol car itself performs. Also, through the microcomputer, a police officer has access to a data file of stolen vehicle tag numbers, for instance, without the assistance of a dispatcher. This reduces communication channel congestion, provides data more rapidly, frees the dispatcher for other things, and encourages more information checks.

In many police forces, officers attend roll call before going on duty. These



meetings take time away from more important tasks. But, by using advanced computer techniques, part of the roll call can take place while the officer is already on the job in his patrol car and, thereby, help him be more productive.

Use of a hand-held communications terminal also can improve performance. The patrol officer carries the device when he leaves his car, enabling him to maintain contact with another officer in the car or with a dispatcher at headquarters, via either digital or audio communications.

This of course greatly expands the officer's range. Using such a device, he can search for stolen property by remotely checking a file in his car or relaying a request for information to a headquarters computer. Likewise, he can request information on a wanted person or stolen vehicle.

Another proposed improvement is a system to determine the location of a patrol car. Always knowing where each vehicle is located reduces the amount of time required for the police to respond to calls, because the patrol unit nearest the scene of a crime can be assigned by computer or the dispatcher.

Also, because a vehicle's location is known constantly, search and patrol patterns are more effective, and when a patrol officer in trouble pushes the emergency "officer needs help" button on either his hand-held communicator or his in-car terminal, the dispatcher knows the exact location of both the officer in trouble and all available back-up units. The nearest units can then be directed to the correct location for timely assistance.

GENERAL BENEFITS

Another system being tested in the program called "vehicle diagnostics" has across-the-board benefits in terms of a more economical, safer, more productive police vehicle. This system continuously monitors a vehicle by using special, small sensing devices that relay information through the central microprocessor back to a dispatcher or to the officer.

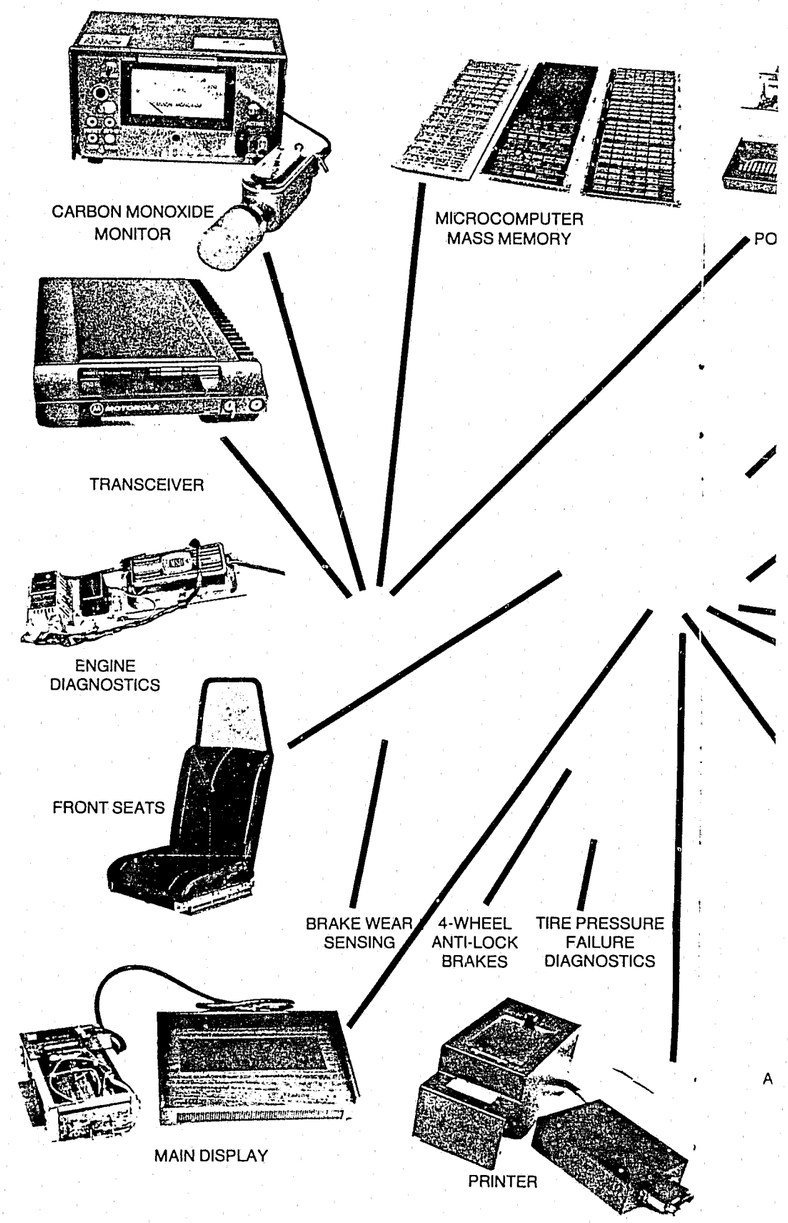
Vehicle diagnostics offers some significant advantages. From the standpoint of economy, a maintenance policy can be developed that is less expensive than a total preventative program. From the standpoint of safety, the police officer will always be able to anticipate dangerous conditions, such as low tire pressure and abnormal engine temperatures. From the standpoint of productivity, maintenance can be scheduled so there is minimum downtime.

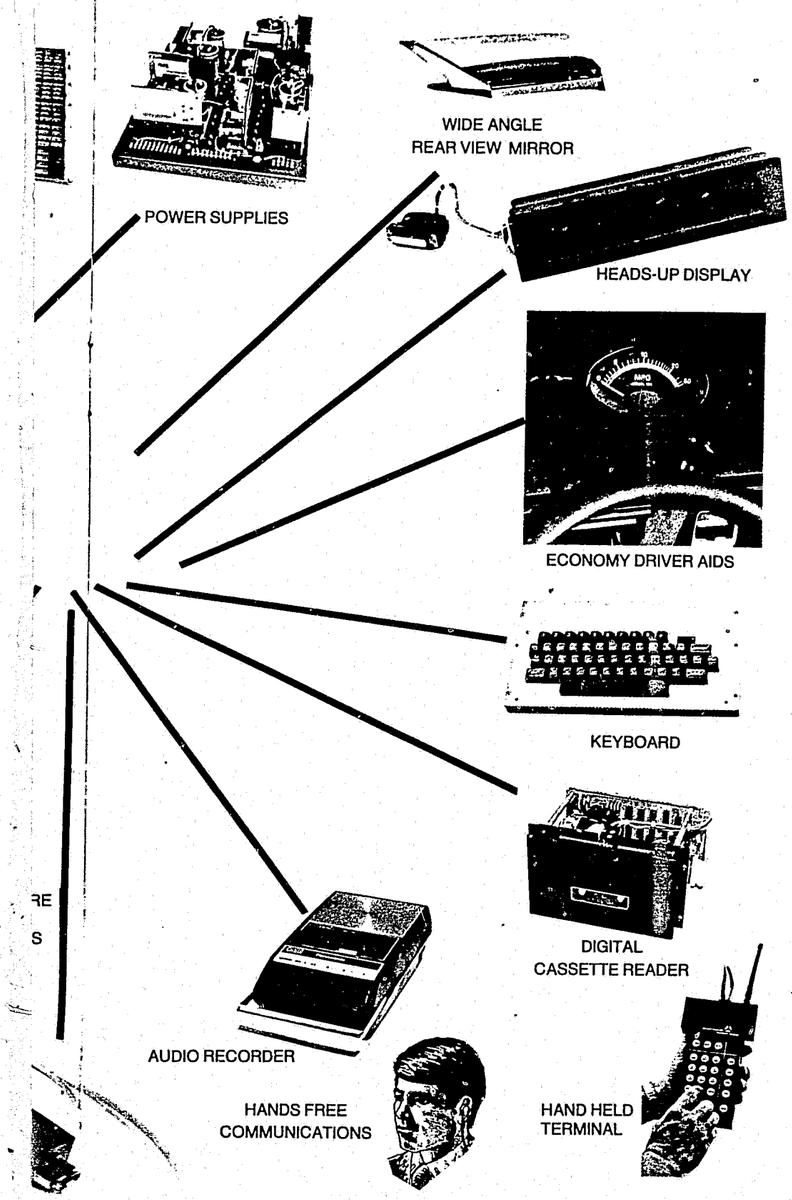
It's important to see how well these new concepts work in actual service. Can they stand up to the daily police environment? Will patrol officers use them? Do they provide significant improvement in the safety, economy and productivity of the police patrol car?

POLICE DEPARTMENT TESTING

In order to answer these questions, the concepts will be field tested in actual police operations. Twenty compact cars will be equipped with the concepts and tested later this year. Ten of these vehicles will be tested by the New Orleans Police Department and ten will be tested by the Dallas Police Department for a six-month period.

Trained professionals will conduct the tests which, it is hoped, will provide valuable statistics on patrol car performance, use and operations. These statistics are virtually non-existent today. Further valuable data on training and maintenance problems also will be obtained.

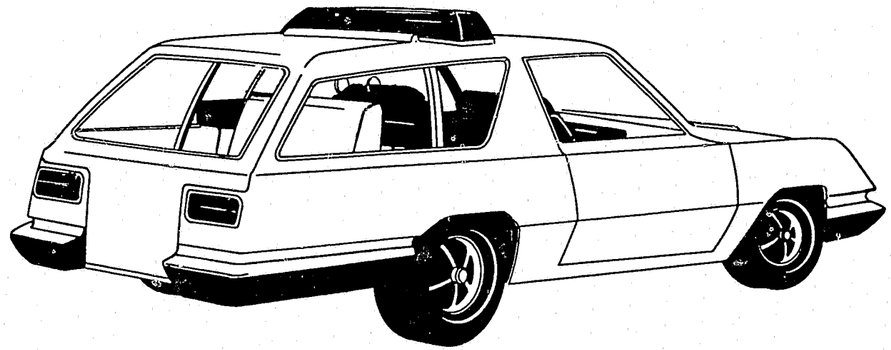




PROTOTYPE SYSTEM

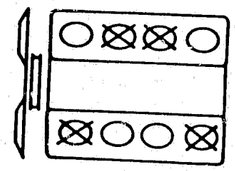
Prior to the development of the vehicles for the field test program, a prototype vehicle has been developed to demonstrate improved systems capabilities and to provide early identification and elimination of systems design problems. A 1975 Chevrolet Nova four-door sedan in the police configuration has been equipped with many concepts for improving police cars and is available for demonstration.

An important point to be remembered is that LEAA is not advocating a certain model as a perfect police car. Instead, it is evaluating the effectiveness of each of the concepts offered. In short, a mobile test bed has been developed which can help evaluate many separate and independent concepts and devices to improve today's police car.



BODY CONFIGURATION DESIGNED TO MEET THE UNIQUE NEEDS OF THE POLICE

DRIVE TRAIN SYSTEM DESIGNED TO MEET THE UNIQUE NEEDS OF THE POLICE



possible future improvements

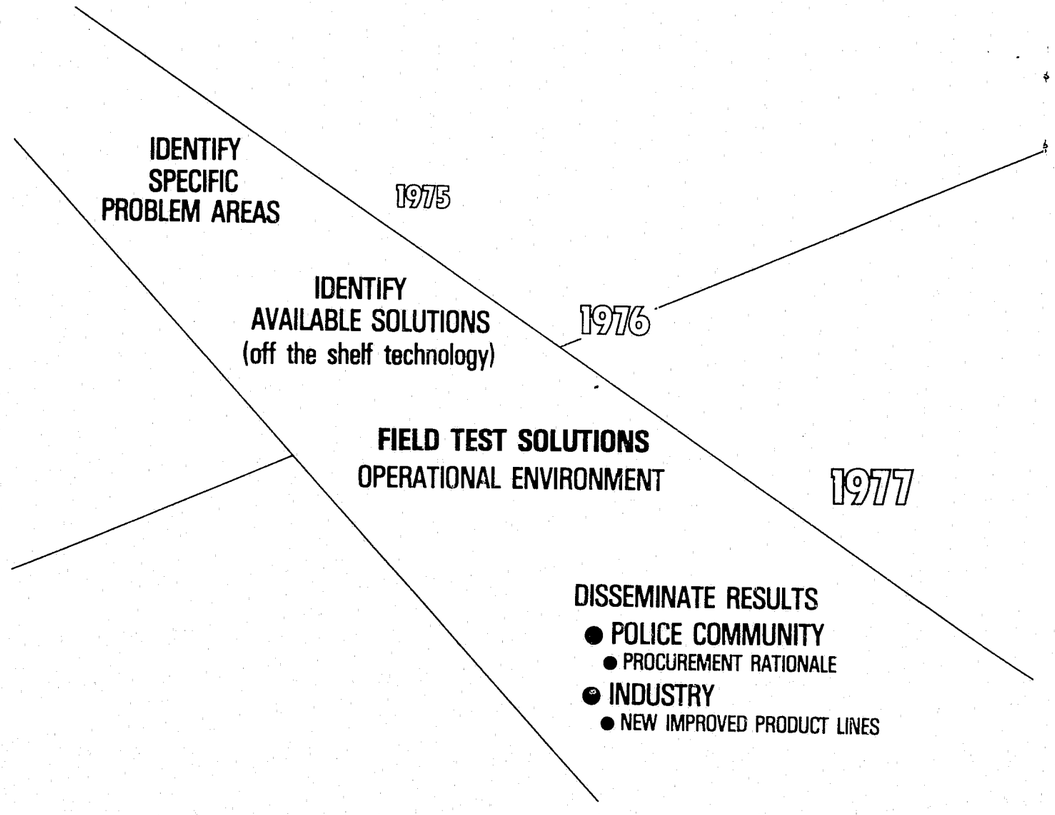
Use of today's compact car has many of the advantages of a low weight vehicle. In addition to greater fuel economy, lower acquisition, replacement and maintenance costs, it is more maneuverable in crowded areas and is available now.

There are some disadvantages. The major one: interior space may seem confining to some large police officers. It is also sometimes difficult to place an uncooperative prisoner into the rear compartment of a compact car.

A study undertaken to determine the usefulness of building a lightweight vehicle just for police work found that it is possible to provide standard car room with compact car weight.

Most police work, such as patrol, requires low-power engine operation, but the average police car occasionally needs high power in emergency situations. Police departments purchase a high-performance engine for this reason; however, low-power fuel economy is compromised for high maximum power. A study was undertaken to determine what concepts can offer the best of both worlds -- fuel conservation during low-power operation and high-power output capability. Many engine concepts were studied and two now appear applicable for police car use -- a high compression super-charger with water injection and a valve-controlled variable-cylinder engine, where either 8 or 4 cylinders could operate as required.

Each of these approaches can be used independently, but taken together these improvements in body configuration and drive train devices may lead to the police car of the future.



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