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A STUDY OF HANDS-OFF DRIVER LICENSE ENFORCEMENT THROUGH RAPID COMMUNICATIONS

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Final Report

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16. Abstract

This report describes the study of methods of identifying and apprehending suspended and revoked drivers in a moving stream of traffic. Each enforcement method analysed in based on the use of communications technology to enable random mass screening of vehicle tag numbers in an effort to detect suspension and revocation violators. The term "Hands-off" is used to indicate that vehicles will only be stopped after a probable violator has been identified through the vehicle tag number and the technique would not detain or interfer with the legal driver. Five Hands-off techniques are presented and discussed that span a range of sophistication from, voice data entry and on board computer systems, to printed manual list of denied drivers. The study describes the supporting communication system and ADP system requirements for implementation of a pilot program and outlines a general program planning procedure. Additionally, technology that may in the future be adaptable for use in Hands-off enforcement is reviewed and discussed. Finally, a suggested State selection procedure is outlined for the determination of States that could participate in a demonstration hands-off driver license enforcement program.

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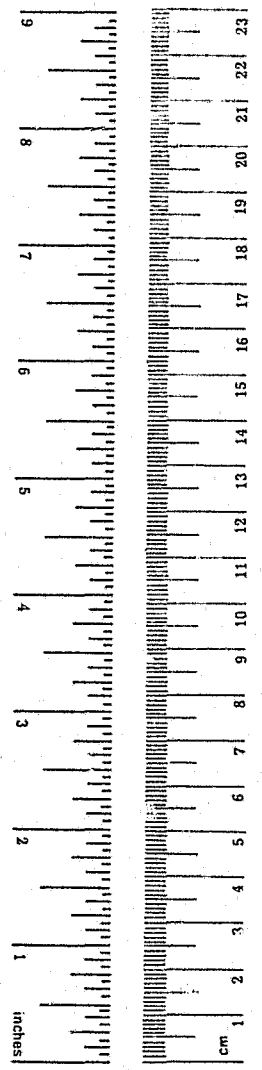
METRIC CONVERSION FACTORS

Approximate Conversions to Metric Measures

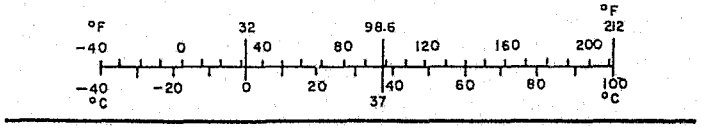
Symbol	When You Know	Multiply by	To Find	Symbol
	LENGTH			
in	inches	*2.5	centimeters	cm
ft	feet	30	centimeters	cm
yd	yards	0.9	meters	m
mi	miles	1.6	kilometers	km
	AREA			
in^2	square inches	6.5	square centimeters	cm^2
ft^2	square feet	0.09	square meters	m^2
yd^2	square yards	0.8	square meters	m^2
mi^2	square miles	2.6	square kilometers	km^2
	acres	0.4	hectares	ha
	MASS (weight)			
oz	ounces	28	grams	g
lb	pounds	0.45	kilograms	kg
	short tons (2000 lb)	0.9	tonnes	t
	VOLUME			
tsp	teaspoons	5	milliliters	ml
Tbsp	tablespoons	15	milliliters	ml
fl oz	fluid ounces	30	milliliters	ml
c	cups	0.24	liters	l
pt	pints	0.47	liters	l
qt	quarts	0.95	liters	l
gal	gallons	3.8	liters	l
ft^3	cubic feet	0.03	cubic meters	m^3
yd^3	cubic yards	0.76	cubic meters	m^3
	TEMPERATURE (exact)			
°F	Fahrenheit temperature	5/9 (after subtracting 32)	Celsius temperature	°C

*1 in = 2.54 (exactly). For other exact conversions and more detailed tables, see NBS Misc. Publ. 286, Units of Weights and Measures, Price $2.25, SD Catalog No. C13.10:286.



Approximate Conversions from Metric Measures

Symbol	When You Know	Multiply by	To Find	Symbol
	LENGTH			
mm	millimeters	0.04	inches	in
cm	centimeters	0.4	inches	in
m	meters	3.3	feet	ft
m	meters	1.1	yards	yd
km	kilometers	0.6	miles	mi
	AREA			
cm^2	square centimeters	0.16	square inches	in^2
m^2	square meters	1.2	square yards	yd^2
km^2	square kilometers	0.4	square miles	mi^2
ha	hectares (10,000 m^2)	2.5	acres	
	MASS (weight)			
g	grams	0.035	ounces	oz
kg	kilograms	2.2	pounds	lb
t	tonnes (1000 kg)	1.1	short tons	
	VOLUME			
ml	milliliters	0.03	fluid ounces	fl oz
l	liters	2.1	pints	pt
l	liters	1.06	quarts	qt
l	liters	0.26	gallons	gal
m^3	cubic meters	35	cubic feet	ft^3
m^3	cubic meters	1.3	cubic yards	yd^3
	TEMPERATURE (exact)			
°C	Celsius temperature	9/5 (then add 32)	Fahrenheit temperature	°F



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I. INTRODUCTION AND OVERVIEW

Driver license suspension and revocation have long been used as a method for removing problem drivers from the Nation's highways. The courts and State motor vehicle administrations have been given the authority to suspend or revoke an individual's driving privileges for a number of serious offenses, such as, driving while under the influence of alcohol or drugs, and in cases where the driver commits several lesser offenses within a short period of time. Financial responsibility is also grounds for suspension in many jurisdictions.

Typically, during the suspension period the driver is ordered not to operate a motor vehicle at anytime unless the conditions of the suspension include hardship provisions that may, for example, allow the individual to drive to and from work. However, a large percentage of suspensed and revoked drivers completely disregard the restrictions and operate motor vehicles during their suspension periods. Research has been performed in this area to determine the number of drivers who violate their suspensions, but valid and conclusive statistical answers have not yet been realized. Expert estimates of the violation rate range from 20% to 50% of all restricted drivers and informed estimates from local law enforcement officers has placed the percentage as high as 80%. It is the purpose of this study to examine techniques that may be of use to law enforcement agencies in the detection and apprehension of this large percentage of suspension and revocation violators.

Unfortunately, at this time there is not a more percise statement of the severity of the traffic safety problem regarding the suspended and revoked driver and such an analysis would be outside the scope of this project. Specifically, the objective of this study was to investigate current communications technology to determine if recent advances in the application of state-of-the-art communications in the law enforcement environment could be adopted to detection and apprehension of denied (suspended and revoked) drivers.

Obviously, this objective can and has been accomplished in the past by establishing road blocks and performing vehicle safety checks that include inspection of the operators drivers license. For the purposes of this study, however, the objective was to develop procedures and techniques that would not detain or interfere with the legal driver, could be randomly applied at nearly all locations, and would be more closely integrated with the regular duties of law enforcement officers.

Recent advances in law enforcement communications would suggest that a practical method of hands-off driver license enforcement could be developed with the previously stated attributes. By using randomly

observed vehicle registration (tag) numbers denied drivers can be detected and apprehended in a moving traffic stream. A similar procedure is being used daily on a limited scale by major police departments throughout the county. When a vehicle is to be stopped for a traffic violation, police officers will request a check of the registration number for want or warrants before approaching the vehicle. Expanding this concept for use in drivers license enforcement is operationally feasible if rapid communications links can be established between random traffic screening or observation locations and the central motor vehicle records site. Including driver license status information in all police tag checks could increase enforcement of suspensions and revocations for routine traffic stops as well as high volume screening programs. A system of this nature would, of course, be dependent on an efficient automated traffic records system to provide information retrieval in a timely manner.

Several communication techniques and methods of entering vehicle registration numbers were investigated for use in a hands-off program and they are presented in summary in this report. In addition, various alternative approaches to providing the necessary automated records support are presented. Of the techniques examined, two were selected as being the most practical from an implementation standpoint and are presented in the context of pilot project operational plans. The operational plans include estimates of implementation and operational cost. Estimates of project cost are based on sample data collected and experience gain reviewing operating conditions and procedures in two States. Additionally, this data has been used to develop a suggested selection procedure for States and locales that would express an interest in participating in a hands-off driver license enforcement program.

1. BACKGROUND OF PROBLEM AND APPROACH

The highway traffic safety programs undertaken by various governmental and private organizations are aimed at reducing traffic accidents and the deaths, injuries, and social costs caused by those accidents. The State driver licensing agencies play an important role in this effort by establishing qualification standards for licensing drivers and criteria for identifying and restricting problem drivers. Each State has developed mechanisms to restrict the problem drivers in an attempt to remove those drivers from our highway who might be most likely to cause accidents.

Driver license restrictions can take a variety of forms, including:

- Denial of license upon application
- Restriction on the use of the license to certain time periods, trip purposes, geographic areas, equipment, etc.

- Limitation of the driving privilege to specific types of vehicles
- Suspension of the driver license for a specified period of time
- Revocation of the driver license for an indefinite period of time.

Whether these actions are statutorily mandated or are taken within the discretionary authority of the licensing agency, they are instigated in an attempt to remove the problem driver from the highway where he would potentially endanger the lives or property of other citizens. Highway safety experts are continually questioning the effectiveness of these actions, and in particular are concerned about:

- Inadequate scientific proof that certain driver behavior histories, upon which license suspension actions have been based, lead to accident-prone driving
- Lack of evidence that suspension or revocations actually stop the dangerous driver from continuing to drive
- An inability to readily detect those driving under suspension or revocation unless they commit another violation.

The first concern must be addressed by behavior experts, and is outside the concerns of this study. However, the latter two concerns are directly related to the effectiveness of traffic safety enforcement programs in detecting and prosecuting those driving in violation of license restrictions, suspensions, or revocations. It is assumed that if a high percentage of such drivers were apprehended, even while they were otherwise obeying the law, then fewer people would drive while their licenses are suspended or revoked.

The disregard for license suspensions and revocations may be due to the lack of concentrated enforcement efforts directed toward these violations. Although the State licensing agencies initiate the actions against licenses of problem drivers, they must depend on law enforcement officials to apprehend those who continue to drive and the courts to administer appropriate punitive actions. With respect to the courts, a 1966 survey of traffic laws identified 25 States having mandatory jail sentences for the first conviction of driving while suspended, and another 7 mandated jail sentences for the second offense. All but 14 States also had provisions for extending the license suspension period. 1/ However, since many courts do not view

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1/ Automotive Safety Foundation; Suspension and Revocation of Drivers Licenses, A Comparative Study of State Laws, 1966.

this as a serious offense, they do not always impose these sentences. Nevertheless, most courts do have the power to appropriately deter violators if they were better advised of the danger the restricted licensee poses to others on the highways.

It is in the detection of those driving while under suspension or revocation that the enforcement program really breaks down. Some violators are caught when their other actions cause them to be apprehended by law enforcement officials. Police will often run a check for a valid driver's after they stop a driver, and if this can be done quickly, will charge those driving while suspended. However, this may not be the standard operating procedure of enough police departments, possibly because:

- Driver license information cannot be retrieved quickly enough
- The information retrieved is unreliable or out-of-date
- Courts do not impose sufficiently heavy penalties once a driver is charged
- Local police sometimes believe license enforcement is the responsibility of State enforcement agencies.

These factors and others were cited in a 1969 survey of police departments by the Northwestern University Traffic Institute, which showed that police departments generally lacked formal programs for enforcing driver license violations. [2/] Some agencies utilized road blocks, spot checks, or traffic checks for vehicle safety inspections and simultaneously checked for valid licenses, but mostly they relied on detection after an apprehension. This was often due to a lack of information on suspended or revoked drivers prior to an apprehension, except for printed lists of such drivers; the study deemed these lists useful only for small and often rural jurisdictions.

Police have indicated a realization of the seriousness of these offenses and a desire to identify such drivers. Thus if information on restricted drivers were readily available and accurate, police would probably identify more individuals driving under suspension or revocation and so charge them. However, this is still dependent upon the driver first committing some other violation and being apprehended by enforcement officials. The crime of driving under suspension is invisible in itself and is not one that attracts police attention. Therefore, the problem of enforcing suspension and revocation laws becomes one of providing the means by which law enforcement agencies can reliably detect the denied driver using existing visible identifiers.

[2/] Timberlake, William E.; A Study of Procedures Used to Deter Driving While Under Revocation or Suspension; Traffic Institute, Northwestern University.

Existing visible identifiers consist of the vehicle registration number, vehicle description and the physical description of the driver. Other methods of identifying denied drivers are available through the use of advanced electronic technology. Several alternatives are available if consideration is given to devices that can be attached to vehicles such as audio or accoustical emitters, electronic transponders, etc. A few years ago NHTSA commissioned a study of license enforcement techniques with emphasis on the problem of hands-off enforcement.[3/] This study concluded that several automatic vehicle identification systems were technically feasible and, in addition, researched extensively a visual drivers license concept. However, for the purposes of this study, consideration is given only to approaches that would not require the attachment to or alteration of private vehicles for purposes of driver license law enforcement. By concentrating on existing vehicle identifiers for driver license law enforcement the problems associated with design, development, and testing of identification technology and equipment can be avoided and the primary focus, the feasibility of the concept, can conceivably be tested without extraordinary cost.

Approaches considered for hands-offs drivers license law enforcement would utilize vehicle registration numbers observed and entered manually into automated state traffic records system. The traffic record systems would respond with an indication as to whether or not the vehicle owner or known operators of the vehicle were under supervision or revocation. Included in the response from the traffic records system would be a physical description of the suspended driver when a match was encountered. Inquiries of the traffic record system would be structured to include automatic searching of law enforcement files to check for stolen vehicle, wanted persons, stolen or missing license plates, and missing persons.

Several methods of observing and entering vehicle registration numbers were investigated which did require the review of current technology primarily in the area of mobile digital communications and optical scanners. Mobile digital communications terminal are currently in operation in several police agencies and as a result information is available on their capabilities and reliability in applications very similar to hands-off enforcement. Optical scanners, however, are not currently being used in an application directly comparable to the hands-off enforcement concept and therefore are only given consideration for the potential they may hold for automatic entry of tag numbers. A general discussion of mobile digital terminals and optical scanners is presented in Section II, Technology Assessment.

An important element in the determination of the feasibility of hands-off enforcement is the level of support required from automated traffic records systems. The concept of hands-off enforcement is based

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[3/] Exotech, Inc.; Improving the Enforcement of Driver License Denials, Suspensions and Revocations: 1970

on the assumption that a traffic records system consisting of current driver license, driver history and vehicle registration information, can respond rapidly with driver license data given only vehicle tag numbers as input. This assumption implies, that a direct method of cross referencing driver license and vehicle registration data be part of any system to be used in implementation of a hands-off enforcement program. It also implies that driver licensing data and vehicle registration information is kept current by updating frequently or as changes occur in the status of driver licenses and vehicle registrations. Long delays in updating the traffic records data base would render the information unreliable from an enforcement standpoint and preclude the implementation of an effective enforcement program. Therefore, determination of traffic record system support requirements have to be included as an integral part of the study of the feasibility of hands-off enforcement.

2. RELATED PROGRAMS

Law enforcement agencies perform activities related to hands-off driver license enforcement routinely each time a vehicle tag number is checked prior to stopping a vehicle for a traffic violation. These standard police operating procedures are followed to increase officer safety and generally are not part of a structured program to enforce driver licensing laws and apprehend suspended and revoked drivers. In December 1973, however, the Maryland State Police, Maryland Motor Vehicle Administration, and the Insurance Institute for Highway Safety implemented a program with one of its specific objectives the enforcement of suspension and revocation laws through mass screenings of vehicle tag numbers. The TAGS Vehicle Screening Project is currently in operation near the City of Baltimore and has evolved from a single van equipped with a small computer system for screening tag numbers to two standard State Police patrol vehicles with on-board minicomputer systems.

The minicomputer systems installed in the police vehicles, with only minor modifications to the vehicles, enable a state police officer to enter vehicle tag numbers randomly as the vehicle moves through traffic. Tag numbers entered are compared to the on-board database of suspended and revoked drivers resident in the minicomputer system. When a match occurs the description of the denied driver is displayed on the vehicle entry terminal via coded display lights. If the description displayed matches the driver of the vehicle observed, the vehicle is stopped and verification is obtained by radio before any enforcement action is taken.

To create the database used by the TAGS project in the mobile minicomputer systems the Maryland Motor Vehicle Administration creates a special computer tape from the traffic records system with denied driver and MVA warrant information cross referenced to vehicle tag numbers. Approximately 68% of the data file consist of vehicle owners. Non-owners are identified and associated to vehicle tag numbers by comparing the driver license number of denied drivers to a file

containing tickets that resulted in convictions. The ticket and conviction file contains the driver license soundex number and the vehicle tag number of the vehicle in which the violation occurred. Owners and non-owners can be associated to more than one vehicle and each vehicle tag number is linked to the denied driver recorded on the file.

On completion of processing by the Motor Vehicle Administration the computer tape containing the denied drivers and drivers with MVA warrants is taken to the State law enforcement date center where wanted person, stolen vehicle, repair order, and stolen plate information is added to the MVA tape file. Only recently stolen vehicles are added to the tape file which generally offer the greatest change of recovery. The combined MVA and State Police tape file is then converted to the minicomputer database structure and recorded on four track cassette tape which is used to load the patrol vehicle minicomputers. The minicomputer database tapes are created from scratch every six months and updated twice a week by MVA and the State Police. Through a very innovative indexing scheme the minicomputers, with limited memory, can easily accomodate over 80,000 tag numbers and still maintain less than a two second query response time. At present the TAGS minicomputer data base contains approximately the following volume of tag data:

- Denied drivers, 50,000
- MVA warrants, 3,470
- Special persons (wants, warrants) 2,619
- Recently stolen vehicles, 287
- Repair orders, 22,688
- Stolen plates, 74.

Another unique feature of the database structure is that a driver record can exist in the database for more than one reason. A denied driver, for example, can also be wanted on a police warrant in which case the more serious offense would be indicated on the TAGS records for all associated tag numbers.

It is important to note that the TAGS vehicle screening system does not record vehicle tag numbers entered during the screening operations. TAGS is designed so that test for denied drivers is a simple yes/no comparison to a list of known violators. If the vehicle tag number keyed into the system is not one of a denied driver or wanted person no data is recorded and no identification of the non violator is available. The system does maintain counts of the total number of tags checked and the number of matches that occurred. This data along with the number of matches that resulted in hits (verified violations) is being evaluated by the Insurance Institute for Highway Safety which designed, sponsors, and directs the TAGS program.

3. SUMMARY OVERVIEW OF OPERATIONAL ALTERNATIVES

Several methods of driver identification were considered for potential application in a hands-off driver license enforcement program. Each method considered involved the use of a combination of data processing and communication technology to identify drivers. Methods of driver identification that were found to be reasonably implementable with existing technology were used to formulate alternative hands-off enforcement techniques. These alternatives were then reviewed based on the following criteria:

- Ability to provide law enforcement with current and reliable data
- Manpower requirements and impact on regular patrol activities and duties
- Traffic record system support and interface requirements
- Implementation and operational cost
- Special equipment or procedures required.

The alternative enforcement techniques developed and compared to these criteria were the following:

- Voice Tag Query
- Mobile Digital Terminal Tag Query
- CTV Tag Query
- Self-Contained Query System
- Manual Look-up.

(1) Voice Tag Query

Voice tag query would consist of a system comprised of voice communications links to a central communications center equipped with on-line terminals connected to the Department of Motor Vehicles computer system and the State and local police information systems. Tag inquiries from the hands-off screening locations would be transmitted by voice to a communications center where the inquiries would be entered into the DMV and police systems. Replies from DMV and law enforcement systems would be relayed back to the screening sites using voice transmission. The primary advantage in this approach is that no additional equipment would be required and existing data systems would be utilized. The major disadvantages are, that in areas where voice channel congestion is a current problem the additional traffic load of increased voice tag inquiries may not be permissible. In

addition, there is the time delay caused by the communications operator acting as the intermediator between the data systems and the patrol officer.

Operationally, this delay could be a major problem for police officers in a moving traffic stream attempting to keep a vehicle in sight while waiting for a response to their query. Furthermore, the workload of the communications operator acting as intermediator would be substantial if several police units were participating. This would most likely preclude the operator from performing other functions, such as, dispatching calls-for-police services.

Implementation of the voice system alternative would depend on the ability of the law enforcement agency to provide a voice communications channel with low utilization and a dedicated operator for the periods of program operations. Additionally, the operator would have to have direct access to an on-line data terminal linked to the traffic records system. Exhibit I-1, following this page illustrates graphically the voice tag query alternative.

(2) Mobile Digital Terminal Tag Query

Mobile digital terminals provide for an effective method of entering vehicle registration numbers for screening in a hands-off enforcement system. Systems are operational in Florida, Minnesota, and California that provide patrol officers with the capability to enter vehicle registration numbers from mobile digital terminals and to receive digital reply messages. In Minneapolis, for example, where the majority of the patrol vehicles are now equipped with KUSTOM digital terminals the number of tag checks performed per week has risen substantially. An evaluation of the Minneapolis system completed in February of 1975, when thirty-five terminals were operational, found that the average infomation request required only 17 seconds with digital communications as opposed to 2 minutes 55 seconds using voice. The number of information requested increase from a weekly average of 529 voice request in 1973 to 8,189 digital request in 1974.[4/]

Report hits included stolen vehicles, persons driving while under suspension, and persons wanted for an NCIC warrant. Major factors affecting the establishment of a hands-off driver license enforcement program using mobile terminals are the traffic load on the communication channel being used for digital messages, the capacity of the communication processor, and the processing time

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4/ "An Evaluation of Two-Way Digital Communication As Used By the Minneopolis Police Department", Minnepolis Police Department, February, 1975.

ALTERNATIVE
HANDS-OFF DRIVERS LICENSE ENFORCEMENT TECHNIQUE

VOICE TAG QUERY

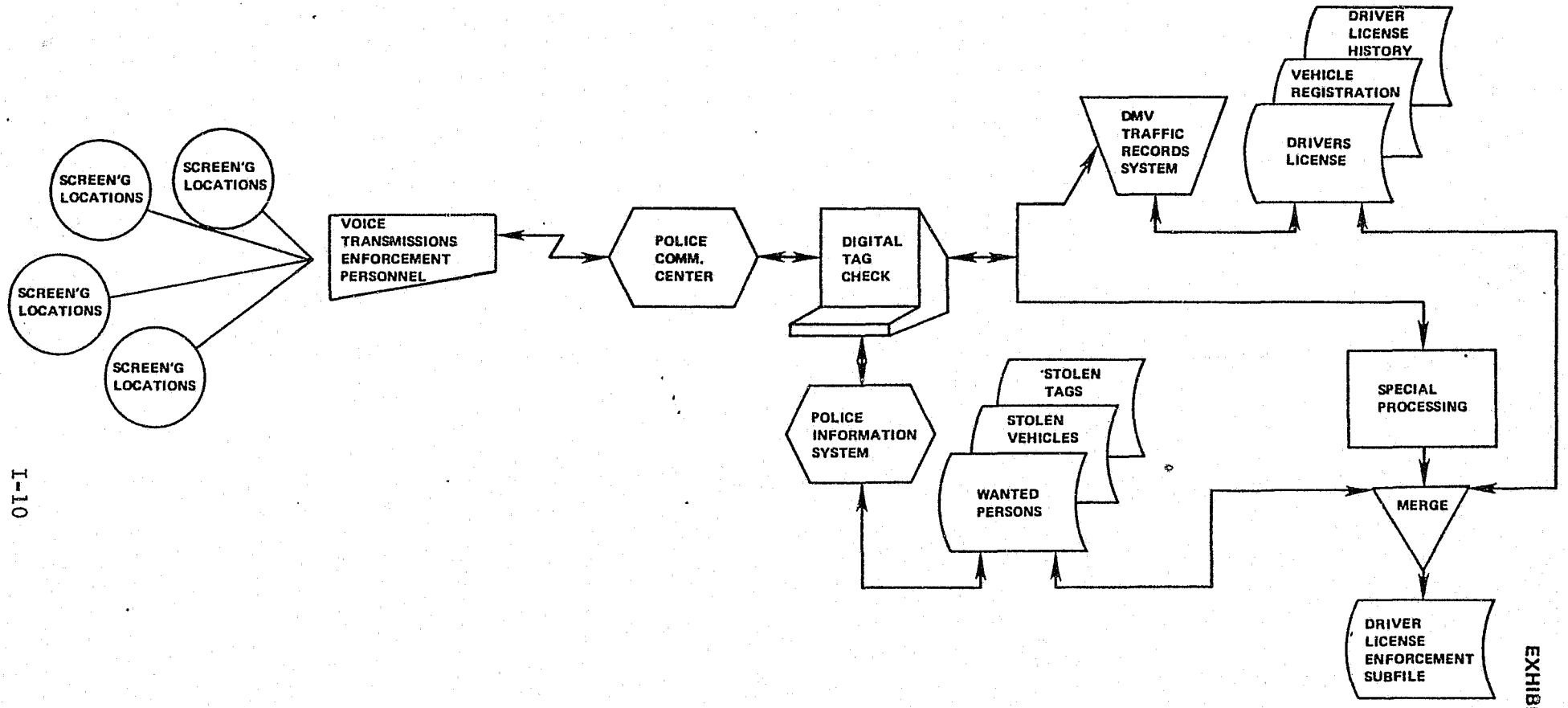


EXHIBIT I-1

required to search the data files to determine driver license status. These factors will have to be studied at each prospective demonstration site to determine duration of screening periods and maximum number of tag queries per period based on allowable response delay. Additionally, depending on the planned volume of tag screenings and the characteristics of the computer systems at the selected site, methods of files access should be evaluated to determine the most effective or practicable method of providing the data systems support required. Exhibits I-2, illustrates the mobile digital terminal alternative.

(3) CTV Tag Query

Closed circuit television used as a method of screening would consist of a system of stationary CTV cameras positioned to view an oncoming traffic stream and linked to a central monitoring center. At the center operators would enter tag numbers viewed in the monitors into terminals connected to the support data systems. As violators are identified, operators would transmit by voice vehicle descriptions and tag numbers of hits or matches to police units located downstream of the camera locations. The primary operational disadvantage in this approach is that it would restrict screening to stationary or possible fixed locations and would require that several police units remain at the downstream pick up points for the duration of the screening period. However, this technique may be very appropriate and effective, for restricted access highways, bridges, or tunnels. Additionally, locations where CTV is already used for traffic control could provide the means for testing the operational practicality of this concept at relatively low cost. Exhibit I-3, following Exhibit I-2, illustrates this alternative.

(4) Self Contained Query System

The self-contained query system is the term used in this report to describe a method of hands-off driver license enforcement tht utilizes an on-board computer system that contains a file of denied drives, wanted persons, stolen plates and stolen vehicles. The entire screening process could be performed without the use of point-to-point communications between the police vehicle and the traffic records center. In actual operation, however, voice communcation would be used to confirm the status of violators identified using on-board data.

To implement a system of this nature requires the installation of a specially built minicomputer or micro-processor in the police vehicle with a terminal device for entering the observed tag numbers. The on-board computer system would be preloaded periodicaly with a specially generated file for hands-off enforcement. This file would be constructed by extracting from the State traffic records system tag numbers of suspended and revoked drivers. Added to the denied driver file would be

ALTERNATIVE
HANDS–OFF DRIVER LICENSE ENFORCEMENT TECHNIQUE

MOBILE DIGITAL TERMINALS
TAG QUERY

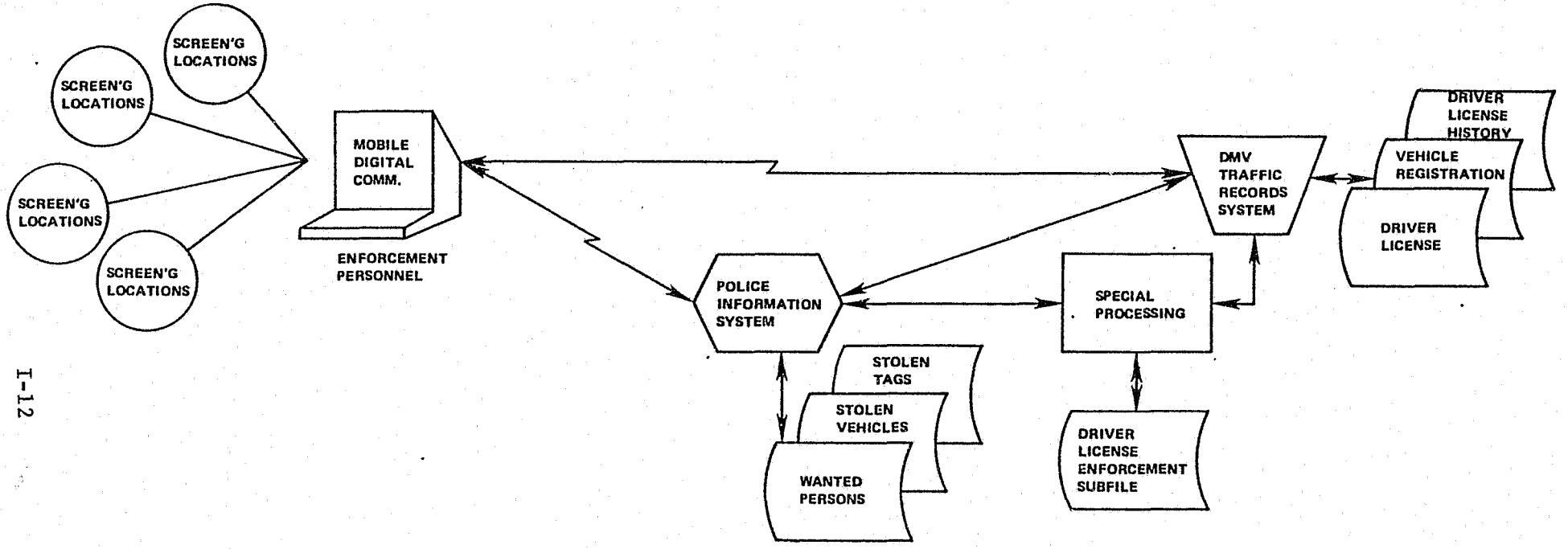


EXHIBIT I-2

ALTERNATIVE
HANDS–OFF DRIVER LICENSE ENFORCEMENT TECHNIQUE

CLOSED CIRCUIT TELEVISION

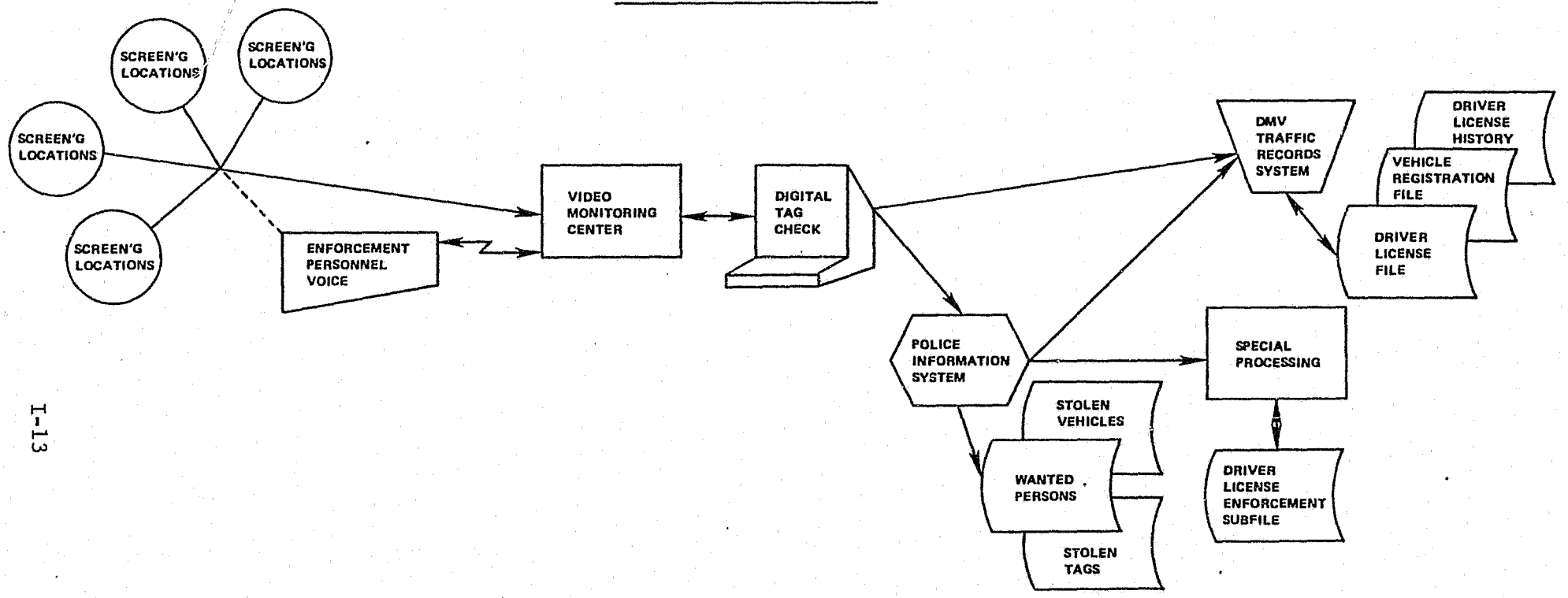


EXHIBIT I-3

the tag numbers associated with wanted and missing persons extracted from state and local law enforcement systems. The on-board computer system would then search this combined file for matches to tag numbers observed and entered through the terminal connected directly to the on-board computer. This alternative follows the general program design of the Maryland TAGS Vehicle Screening Project.

The primary advantages in this approach lie in the speed and volume of screenings that can be performed, (eliminates transmission delays) and the mobility that it provides for the police units. The primary disadvantages, at present, would be the cost of equipping patrol units with sophisticated mobile minicomputer systems and keeping the mobile files current. However, the continuing decrease in computer component cost may in the near future substantially reduce the equipment cost and make this approach a more viable alternative. Exhibit I-4, following this page, illustrates the self-contained query system alternative.

(5) Manual Look-up

Manual look-up refers to a system where computer generated list of denied drivers are prepared and distributed by geographical area to local law enforcement personnel. This technique would not lend itself to hands-off screening of a moving traffic stream but it could be used on a small area basis to spot denied drivers who are known to live or work in the area. Generation of the enforcement list would have to include a method of sorting the denied drivers into areas small enough to produce specific and manageable list that could be easily referenced in a patrol vehicle. Exhibit I-5, following this page, illustrates this alternatives.

In summary, several alternatives approaches to hands-off driver license enforcement have the potential for forming the basis of a successful program for enforcement of driver license suspension and revocation laws. The mobile digital terminal alternative can be readily implemented in locations where the systems are operational if the local traffic records system can provide the necessary on-line supporting data. A self-contained query system approach is an attractive alternative for locations that do not utilize mobile digital communication systems provided the on-board computer system could be manufactured at a reasonable cost. The technology exist as is being demonstrated by the Maryland TAGS program which uses an on-board computer system. The use of existing law enforcement voice communication systems for hands-off enforcement has the benefit of utilizing existing equipment but the disadvantage of not being able to support a large volume of queries. This is primarily due to the long transmission times required for voice message transmission. Manual lists of suspended and revoked drivers are cumbersome to use in a patrol vehicle, are difficult to keep current, and could not be

ALTERNATIVE
HANDS–OFF DRIVER LICENSE ENFORCEMENT TECHNIQUE

SELF CONTAINED SYSTEM

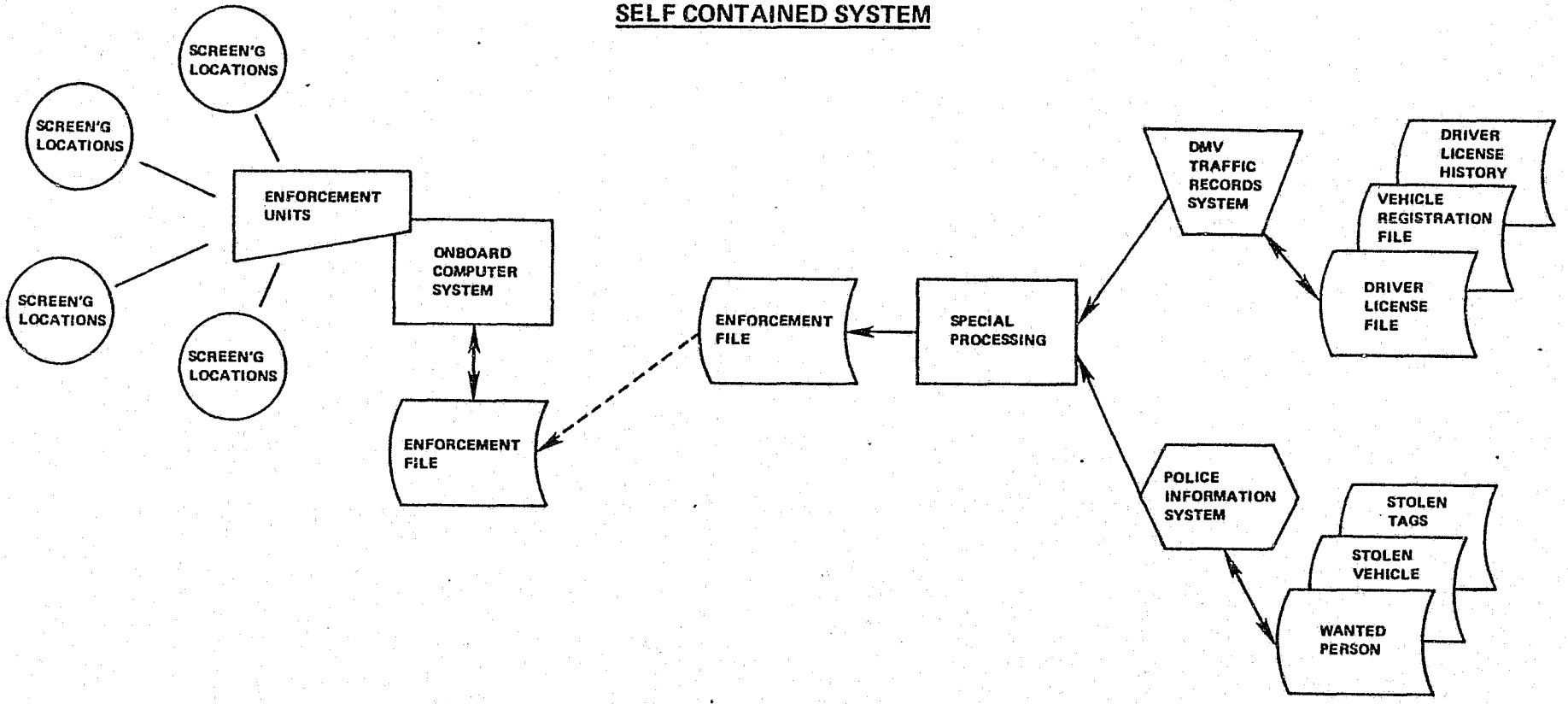


EXHIBIT I-4

ALTERNATIVE
HANDS–OFF DRIVER LICENSE ENFORCEMENT TECHNIQUE

MANUAL LOOK-UP

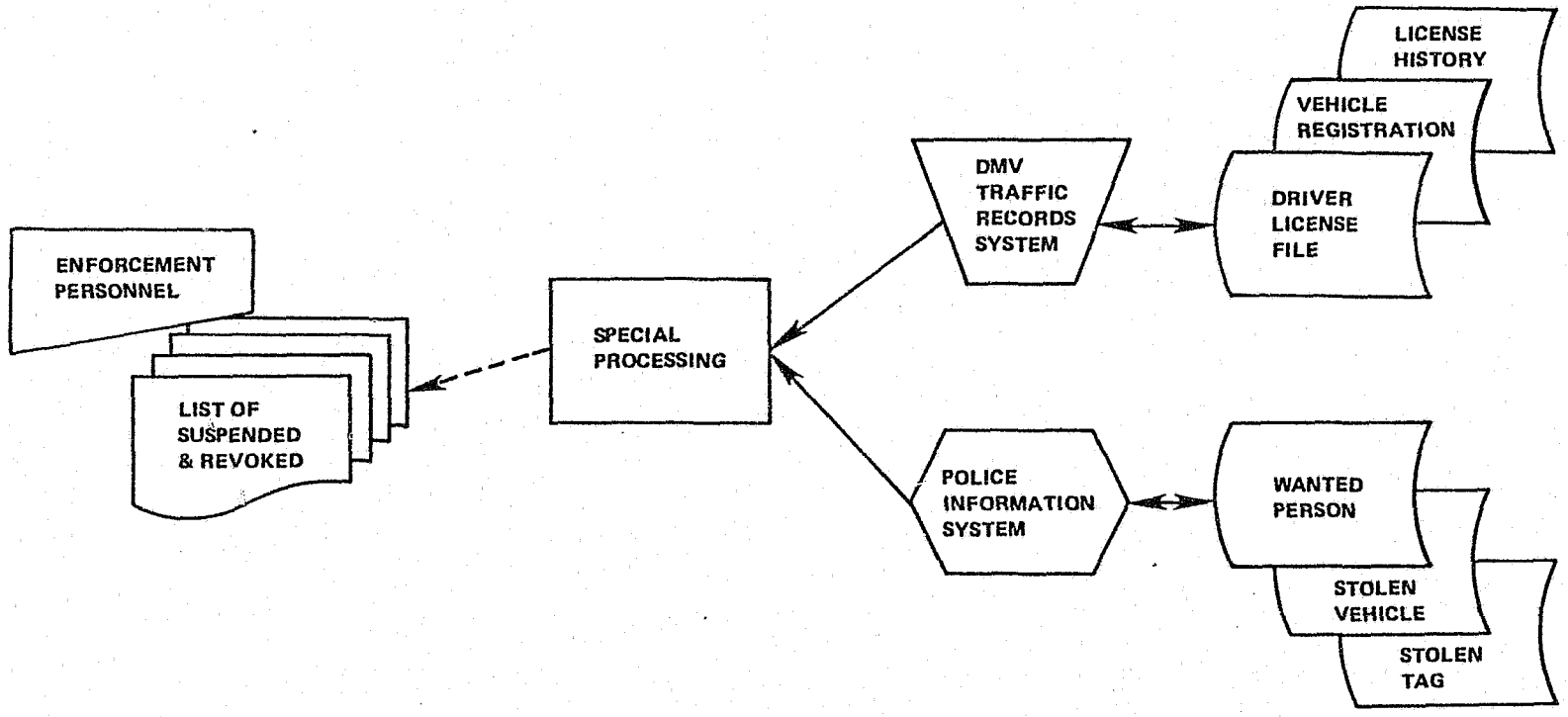


EXHIBIT I-5

used in a hands-off random screening program. Closed Circuit television systems used currently for traffic control present an attractive alternative for implementing a program on restricted access highways, on bridges, or in tunnels. Exhibit I-6, following this page summarizes the characteristics, advantages, and disadvantages of each alternative.

HANDS-OFF DRIVER LICENSE ENFORCEMENT

TECHNIQUE SUMMARY

	VOICE	DIGITAL	CTV	SELF CONTAINED	MANUAL
EQUIPMENT	EXISTING 2-WAY MOBILE RADIOS	EXISTING MOBILE DIGITAL TERMINALS OR SUPPLEMENTAL TERMINALS @ $3000	EXISTING CTV SYSTEMS OR PURCHASE OF PORTABLE CTV SYSTEM	ON BOARD COMPUTER SYSTEM COST TO PRODUCE EXISTING PROTYPES UNAVAILABLE	NONE
ADP SUPPORT REQUIREMENTS	ON-LINE TERMINALS TO DMV OR POLICE PROCESSOR WITH SPECIAL ENFORCEMENT SUBFILE	INTERFACE DIRECT TO DMV OR ACCESS TO SPECIAL ENFORCEMENT SUBFILE	ON-LINE ACCESS TO DMV OR POLICE PROCESSOR WITH SPECIAL ENFORCEMENT SUBFILE	SPECIAL PROCESSING OF DMV FILES AND CJIS INFORMATION TO GENERATE ON-BOARD COMPUTER FILE	SPECIAL PROCESSING OF DMV FILES AND CJIS INFORMATION TO PREPARE GEOGRAPHIC LIST OF DENIED DRIVERS
OPERATIONAL STRATEGIES SUPPORTED	FIXED LOCATIONS WITH DOWN STREAM PICK-UP OR MOBILE SCREENING, SINGLE POLICE UNIT	FIXED LOCATION WITH DOWN STREAM PICK-UP OR MOBILE SCREENING SINGLE POLICE UNIT	FIXED LOCATION WITH DOWN STREAM PICK-UP	FIXED LOCATION WITH DOWN STREAM PICK-UP OR MOBILE SCREENING SINGLE POLICE UNIT	MASS SCREENING NOT SUPPORTED
ADVANTAGES	NO ADDITIONAL EQUIPMENT REQUIRED	CAN BE IMPLEMENTED USING EXISTING DIGITAL TERMINAL. RAPID RESPONSE TIME. GREATER VOLUME OF QUERIES THAN VOICE	CAN BE IMPLEMENTED USING EXISTING TRAFFIC CONTROL CTV LOCATIONS.	HIGH QUERY RATE AND RAPID RESPONSE TIME. LITTLE IMPACT ON EXISTING COMMUNICATION SYSTEM. GREATER VOLUME OF QUERIES THAN DIGITAL	LOW COST, NO IMPACT ON EXISTING COMMUNICATIONS SYSTEM
DISADVANTAGES	NUMBER OF QUERIES LIMITED BY COMMUNICATIONS CHANNEL CONGESTION. LONG RESPONSE TIMES DUE TO OPERATOR INTERVENTION	ADDITIONAL PROGRAMMING OR EQUIPMENT MAY BE REQUIRED TO EXPAND ADP FACILITY TO HANDLE INCREASED DIGITAL MESSAGE LOAD	CONFINED TO FIXED LOCATIONS	HIGH COST ASSOCIATED WITH PURCHASE OF ON-BOARD MINI COMPUTER SYSTEM	CANNOT SUPPORT MASS SCREENING AND LIST ARE CUMBERSOME TO WORK WITH IN POLICE UNITS

EXHIBIT I-6

II. TECHNOLOGY ASSESSMENT

Several of the alternative methods of hands-off driver license enforcement developed and reviewed during the course of this study make use of recent technological advances in the communications and data processing fields. In this section of the report a more detailed discussion of current applications of this technology is presented with the operational implications that must be considered for a hands-off enforcement application. In addition, this section includes a review of existing technology that may in the near future be adoptable for use in a hands-off enforcement program.

1. EXISTING TECHNOLOGY APPLICATIONS

Mobile digital communication technology holds the most potential for application in hands-off enforcement of the current technologies examined. The use of mobile digital systems has expanded beyond the law enforcement environment to include emergency medical, fire services, highway maintenance and industrial fleet communications. Police applications of mobile digital have been evaluated and accepted as a viable supplement to voice communications. Users of mobile digital terminals (MDT) include the Kansas City, San Francisco, Oakland, Palm Beach, Cleveland, Minnesota and Huntington Beach Police Departments.

The characteristics of MDTs that make them attractive for hands-off enforcement are: (1) increased speed over voice communications, (2) improved accuracy because the signal has to be extremely distorted for the terminal not to be able to discern the message bit pattern, and (3) the capability to directly access a computerized data base. The significant increase in message transmission speed achievable with MDTs would greatly increase the number of tags that could be screened as compared to a similar system using voice communication. Improved accuracy through automatic retransmission of error message and the capability to directly access a traffic records system data base (without the delays caused by operator intervention), make mobile digital communication a likely candidate for use in hands-off enforcement.

The major components of a mobile digital communication system are an alphanumeric keyboard and display panel, a modulator/demodulator for interfacing to an existing mobile radio if not part of the terminal, and a minicomputer for message switching and logging messages. Data is entered via the alphanumeric keyboard and is converted by the encoder to an audio tone for transmission over a voice grade radio channel. The decoder at the receiving site converts the audio signal into a digital signal recognizable by standard data processing equipment.

Mobile digital terminal systems can be purchased in a variety of configurations for law enforcement applications. System

configurations depend on the level of digital communication capability required. The capabilities range from two-way full text message transmission, to one-way vehicle status reporting. Digital communications have been linked with computerized police dispatching to produce computer assisted dispatch (CAD) systems where responses to calls for police services are assigned by computer and dispatched with digital messages. The computer system determines the police beat the call originated in, assigns a car to respond from a list of available units, constructs a digital message describing the nature of the call, location, suspects, etc., and transmits the message to the units digital terminal. The police unit can, in addition to receiving dispatch messages, make inquiries into Federal, State and local law enforcement data base, and transmit digital messages from unit to base, and unit to unit.

In less sophisticated digital systems the police units are equipped with a status terminal with function keys to indicated changes in patrol status. Status conditions can include, enroute when traveling to the scene of a call, at scene of incident, available for assignment and out of service. With this type of system the status of each police unit can be displayed in the communications center to assist dispatchers in selecting and assigning units to respond to calls for service.

A field test of mobile digital terminals conductd in 1974 found that "of the 802 mobile to base and 833 base-to-mobile test, full screen message transmissions were accomplished successfully for 93.8 percent of the attempts, respectively."[5/] This test also determined that aproximately 50 percent of the error messages were recognizable because the majority of the data was handled correctly.

The cost of establishing a mobile digital communications for hands-off law enforcement would be prohibitive, but where existing systems are operational the technique could be integrated with established communications and provide law enforcement with this added benefit.

2. TECHNOLOGY WITH POTENTIAL APPLICATION IN HANDS-OFF ENFORCEMENT

There are several technologies that could eventually be applied as a solution to the problem of driver identification in hands-off enforcement. These technologies could be categorized as systems that, (1) require attachment to the vehicle of a transmitting or emitting device, (2) read a symbology attached to the vehicle or vehicle license plate, and (3) assist an operator in recording vehicle tag numbers.

5/ "Application of Mobile Digital Communication in Law Enforcement An Introductory Planning Guide"; California Institute of Technology, May 15, 1975.

Systems that would require attaachment of electronic and acoustical transponders as well as radioactive emitters were excluded from consideration. The reason for the elimination of this first category of systems is that in addition to the cost associated with installation of transmitting and receiving equipment, there is the legal question of installing equipment in private vehicles that would allow for the selective tracking or surveillance of vehicle movements as opposed to random screening of tag numbers.

The second category of identification systems invoves the use of electronic scanning devices to read a bar code symbology attached to the vehicle such as, the Unified Product Code, or to actually read the characters of the vehicle license plate. The first widespread use of electronic scanners to read bar code symbology occured in the railroad industry. In 1967 the Association of American Railroads adopted a standard automatic car identification label that measures 10 1/2 X 22 inches and contains 13 digits for identification on railroad equipment. Scanners located at trackside can read the labels of moving rail cars at speeds up to 80 mph. The use of bar code symbology has expanded significantly in the past few years to include applications such as inventory control, package sorting and distribution, library circulation control and retail product identification.

The Unified Product Code used in retailing for product identification with computerized check-outs in supermarkets was adopted because of its space efficiency. In the UPC symbology, four bar widths are used as a space saver to encode data. To read the code, a light source is direct at the symbol and the variation in light intensity reflected back to the scanner from a series of light and dark bars on the symbol is translated into a numerical value. Several types of scanners are in use that use either a low power laser or coventional light source to illuminate the symbol for scanning. Portable hand-held scanners usually incorporate a more conventional light source and require the operator to move the scanning wand across the symbol to be read. Fixed laser scanners move a small laser spot of light across the symbol up to several hundred times per second to capture the information correctly.

Portable scanners usually must be held in contact with or very close to the symbol to be read. As a result, portable scanners would not lend themselves to scanning a vehicle identification symbol in a moving traffic stream. Fixed scanners utilizing a laser light source can be used to read a bar code symbol on a vehicle passing within a few feet of the scanner. However, as scanning distance increases, the size of the symbol must increase as well as the power of the laser. The returning light reflected from the symbol must be strong enought to allow differentiation between symbol reflections and ambient light. At distance greater than a few feet the symbol would be too large to be practical.

Optical character readers or scanners that recognize specially printed characters are considerably more sophisticated and sensitive

than the light and dark sensing bar code scanners. The state-of-the-art has not advanced to the point where an optical character reader could recognize at a practical distance a moving vehicle tag number that may be covered with road grime, bent or deformed. Characters that are misaligned or smudged could not be recognized by existing optical character reader due to their character recognition sensitivity.

The third category of systems involves equipment that can be used to assist an operator in recording vehicle tag numbers. Mobile digital terminals discussed in the preceding sub-section can be included in this cateogry as well as voice data entry devices.

Voice data entry terminals can be used as a replacement for the more conventional keyboard data entry terminals in limited applications. A voice data entry system allows the operator to speak data directly into a computer system and issue voice commands to initiate recording, processing or display of data. Threshold Technology Inc., of Delron, New Jersey, has developed a voice recognition system that, in its standard configuration, can recognize from 30 to 50 utterances. Each spoken utterance is limited to two seconds in duration and is assigned by the operator a specific value. The values can be numbers, letters, codes or commands to initiate action by the computer system. Each operator using the system can speak his or her own language, dialectic or symbolic code as he or she establishes the voice entry codes in a one time training session.

To train the system to operator speaks each utterance 10 times and assigns it a value. The training session takes approximately 15 minutes and after the operator's vocabulary has been entered the system stores the voice patterns for continued use. On completion of the initial training session, the operator need only enter an identification number and begin speaking data into the system. The identification code enables the system to select the proper voice patterns from memory for comparison to the spoken input. Threshold voice recognition system weights approximately 50 lbs and measures 19"x25"x8. The system can be equipped with a wireless microphone to allow an operator to move away from the terminal and still speak data into the system. In actual industrial applications field test have proven the system to be 99% accurate.

Voice entry of vehicle tag number, assuming six character tag numbers, would require approximately a four second input time per tag. The system can be equipped with a headset microphone that would leave a police officer's hands free to operate the vehicle and enable the system to be installed in one person patrol cars. In a hands-off operation a police officer could enter vehicle tag number for screening while the vehicle is moving without diverting his eye from traffic. After the tag number had been entered through the voice recognition system, the number could be compared to an onboard database as in the Maryland TAGS project or transmitted through a digital terminal to a central computer system as in the mobile digital terminal alternative. Exhibit II-1, following this page illustrates voice data entry integrated with the mobile digital terminal alternative.

POTENTIAL
HANDS-OFF DRIVER LICENSE ENFORCEMENT
TECHNIQUE

VOICE DATA INPUT

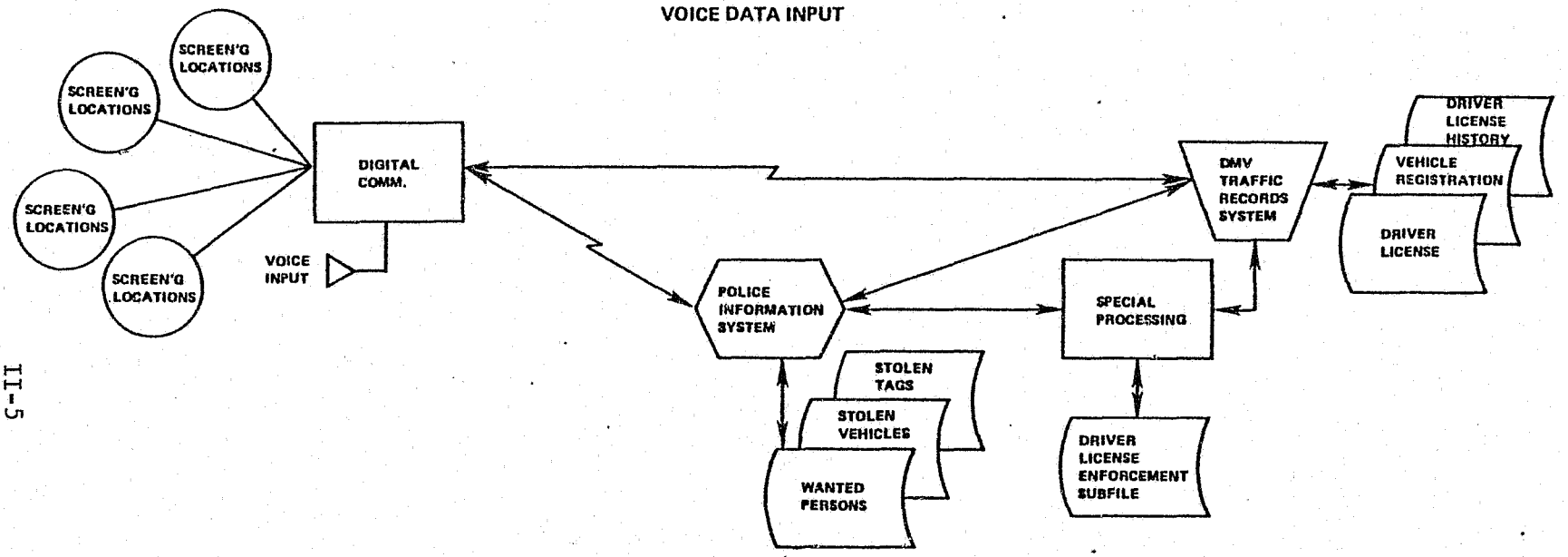


EXHIBIT II-1

3. OPERATIONAL IMPLICATIONS

The operational implications of hands-off driver license enforcement alternatives include the impact of increased congestion (i.e. waiting time) and the requirement for reevaluating communications channel discipline.

Law enforcement mobile radio communications traffic has increased significantly over the past 40 years. The growth has been, in many instances, restrained by FCC rulings and available technology. The first police vehicle radios operated in the frequency range of 1600-7900 KHZ (HF) and in the frequency range of 30-50 MHZ (lo-band). After World War II, the mobile radio manufacturers developed equipment that operate in the 150-160 MHZ range (hi-band). In the 1960s the FCC made available spectrum space previously assigned to television and new public safety radio channels were created in the 450-510 MHZ range (UHF). Finally, in the early 70s, the FCC made available spectrum space for public safety and other applications in the 950-960 MHZ frequency range.

Between each of these steps there was considerable channel crowding, resulting in confusion and delayed messages on many systems. The amount of channel congestion was primarily dependent on the number of mobile units using the channel and the intensity of the communications needs of the mobile units on duty.

In those regions of the country with fewer departments competing for channels, the channel allocations are easier to obtain and crowding is reduced. In those regions where channels are scarce, channels are busy and tight communications discipline must be exercised. However, the extensive use of the UHF frequency range in the last few years has made a significant reduction in channel congestion in many regions.

Since the channel congestion is not as severe in many parts of the country today, the additional channel loading of tag inquiries can be more easily accomodated. However, the use of an active mobile channel could be seriously disrupted by adding additional tag inquiry traffic.

(1) Voice Tag Inquiry

The voice tag inquiry consists of the field officer orally reading the vehicle tag number to the dispatcher and later receiving a response from the dispatcher on the status of that tag. If the police channel is already busy with regular dispatching and status reports, the addition of voice tag inquiries can have a large negative impact on the quality of service on the radio channel. The time required to transmit the voice tag inquiry will vary between 5 and 10 seconds, depending on the communications discipline on the channel.

The approximate impact on average waiting time for the next person desiring to use the radio channel as a function of the average amount of message traffic on the channel is presented in the table in Exhibit II-2. The average waiting time rises to inconvenient levels (greater than ten seconds) when the average channel loading (facility utilization) exceeds 50%.

(2) Digital Tag Inquiry

The use of digital transmission techniques can reduce the total channel loading by using less channel time (approximately 1.2 seconds) to transmit an individual message. For a constant volume of messages, the use of digital can reduce the average waiting time for all messages on a channel.

The resultant reduction in waiting time for a channel that transmits 75% of the messages by digital means is estimated in Exhibit II-3. A comparison among average channel loading, messages per minute, and approximate waiting time may be made for voice and voice plus digital by comparing Exhibit II-2 and II-3.

A different comparison is presented in Exhibit II-4 by comparing waiting time versus message volumes for voice only and for digital plus voice. The digital plus voice curve indicated is for the condition of 75% of the total messages being transmitted digitally. For systems with a lower percentage of digital traffic, the waiting time for a given message volume would increase and thus the curve would move closer to the voice only curve.

MOBILE RADIO CHANNEL LOADING 1/

VOICE ONLY

AVERAGE CHANNEL LOADING (FACILITY UTILIZATION)	VOICE MESSAGES/ MIN.	APPROXIMATE WAITING TIME FOR CHANNEL
10%	0.6	1.1 sec.
20	1.2	2.4
30	1.8	4.3
40	2.4	6.5
50	3.0	10
60	3.6	16

1 R. C. SOHN, "APPLICATION OF MOBILE DIGITAL COMMUNICATION IN LAW ENFORCEMENT-AN INTRODUCTORY PLANNING GUIDE" JET PROPULSION LABORATORY, 1975 CHAPTER 4

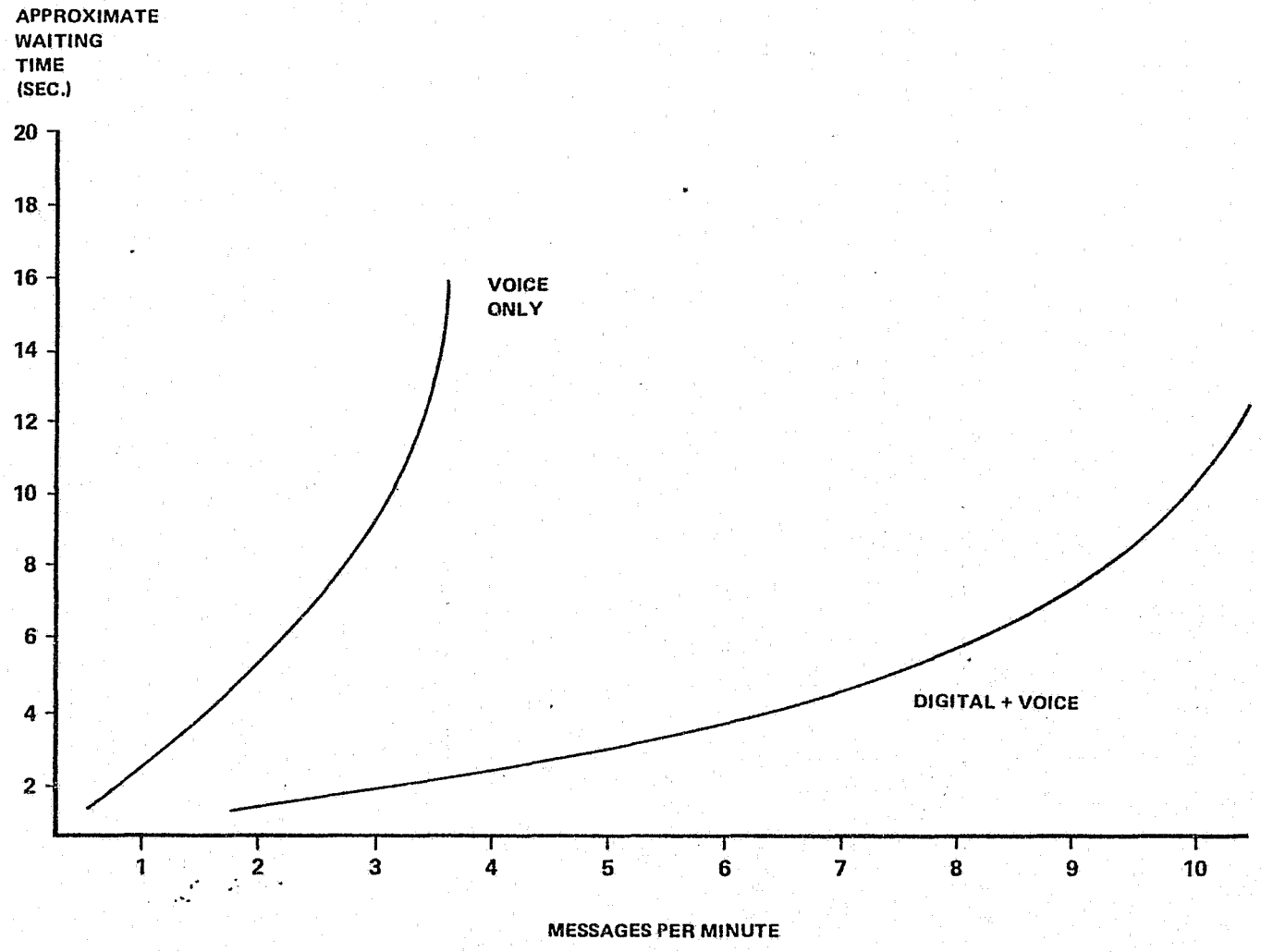
MOBILE RADIO CHANNEL LOADING 1/

VOICE PLUS DIGITIAL SYSTEM
(75% of traffic digital)

AVERAGE CHANNEL LOADING (FACILITY UTILIZATION)	DIGITAL & VOICE MESSAGES/ MIN.	APPROXIMATE WAITING TIME FOR CHANNEL
10%	1.8	0.9 sec.
20	3.6	2.0
30	5.4	3.5
40	7.2	5.2
50	9.0	7.9
60	10.8	12.0

1 IBID

MOBILE RADIO CHANNEL 1/
LOADING CHARACTERISTICS



1 IBID

EXHIBIT II-4

III. HANDS-OFF ENFORCEMENT TECHNIQUE REQUIREMENTS

During the course of this study five alternative techniques of hands-off driver license enforcement were considered for use in development of a vehicle screening procedure for driver license enforcement. Each of the alternatives can be used to implement enforcement programs. Furthermore, the alternatives can be implemented with existing technology. Each enforcement technique, however, has specific resource requirements that must be satisfied before implementation can be considered.

1. COMMUNICATIONS RESOURCE REQUIREMENTS

The voice tag query is dependent on the availability of an unused or under utilized communications channel. If existing voice channels are overcrowded to the point where the amount of voice traffic accounts for approximately 50 percent of the available channel time then voice tag query cannot be considered unless channel utilization can be lowered.

The mobile digital terminal alternative technique would make use of existing mobile two-way digital terminal systems and has a similar requirement for low channel utilization. Total message time for digital transmissions will also increase if utilization of the channel increases above 50 percent.

Digital communications has the added requirement of needing a communications processor with sufficient processing capabilities to handle the message traffic. The communications processor, which is usually a small minicomputer, can delay message transmission if the traffic load reaches a point where long queues begin to form in the processor. The result will be delays in returning output messages or replies to tag inqueries. In addition, the delay may not be caused entirely by the communications processor. If the digital system interfaces with other computer systems, such as Motor Vehicles, the delay can be caused by high work loads on the computer system that maintains the data for answering the inquiry. To determine whether a particular system will support mobile digital vehicle screening will require an analysis of each system in the communications path from the mobile unit to the system where the information is stored.

For the on-board computer-system alternative two-way communications are needed to verify with the MVA matches to on-board denied driver files. Since on-board files may not be the most current, it will be necessary to request confirmation of a match before enforcement action can be taken. Confirmations would be handled by existing voice communications.

2. ADP SUPPORT REQUIREMENTS

A major factor in determining if a State can institute a hands-off enforcement program will be the ability of the States' traffic record system to produce the required denied driver information. Each of the alternative techniques depend on the availability of accurate driver license status information linked to vehicle tag number.

For vehicle owners the problem of cross referencing between driver license and vehicle registration files appears relatively straightforward. In examining the problem in more detail, however, several problems can emerge depending on how the State's traffic record system developed or evolved. In several States vehicle registration and driver licensing systems developed separately and in some instances were or are the responsibility of separate agencies. The result of the separate development and operation in several cases is that when an attempt is made to cross references the two files no reliable common identifier can be found to establish the cross reference.

If for example, a State uses a driver license number derived from the last name, first name, date of birth and sex of the driver, it should be possible to access the vehicle registration file if it is included by name as well as title or registration number. If the systems were developed separately, however, the rules that specify how name data is recorded maynot be consistent. Driver license application requirements may specify that last name, full first and middle name and date of birth be complete. Vehicle registration requirements could be less strict and allow first initial, middle initial and full last name and not require date of birth. In addition, for joint ownership between husband and wife the registration requirements may permit first name of husband, first of wife and last name. The result is that name is not common to both files and cannot be used reliably to reference between the two files. To obtain the information necessary for cross referencing would require that additional information be collected and processed on each vehicle registered in the State or on each driver licensed in the State.

If driver license data can be cross referenced to vehicle registration for the denied vehicle owner the next problem to consider is relating the non-owner to vehicle registration. If automated files of traffic violations are maintained by the State a partial solution to the problem may be possible.

In States where traffic violations citations include the driver license identification number as well as vehicle registration the data is available to link a portion of the non-vehicle owners to vehicles they are known to have driven. The process would involve developing a computer program to select from the file of violations all citations for denied drivers. Vehicle owners and non-owners would be included in the process to identify vehicles owners as well as non-owners had access to. Each tag number encountered for a denied driver would be included as a tag number to screened in the hands-off program. This

procedure would not, however, identify vehicles accessable to non-owners who were suspended for reasons other traffic violations, such as financial responsibility.

If the State's traffic record system includes a driver history file as part of the driver license system violation data may be directly accessable through the driver history record.

For example, in NHTSA's conceptual State Traffic Records System vehicle registration numbers for non-owners could be obtained by, accessing the Driver History File which would contain the violation citation number for all past convictions, and then retrieving each citation to extract vehicle tag number.[6/]

Once vehicle owners and non-owners are linked to as many vehicles as possible, the next step in providing ADP support for hands-off enforcement is the selection of police data on wanted persons, stolen vehicles, stolen plates and missing persons. Screening of vehicles associated with police wants can be accomplishd by either directly including police tag numbers in the data file used for screening or by indirectly accessing the local police system.

If a State supports on-line access to vehicle and driver information and plans to use existing systems to support a hands-off program, then the police information on wanted tag numbers could be used to designate vehicle records in the traffic system as included in the screening. Another alternative would be to route all hands-off tag inquiries to the traffic records system for denied drivers and to the State police system for wanted person checks. There are advantages and disadvantages in each approach.

The advantages in combining denied driver data and police data as wanted tags are that the single file approach eliminates the need for accessing two separate information systems and would result in a faster inquiry response time. The disadvantage is that the law-enforcement agency would have to update wanted person information on two systems. The safeguards and procedures that are built into police systems for wanted person processing are usually very extensive. The purpose of safeguards is to prevent persons from being arrested on satisfied or clear warrants. If police warrant information on tags were placed in the traffic records system the same safeguards would have to be incorporated. However, the combined files could be made a part of the police information system which would take advantage of existing safeguards provided the system supported on-line inquiry.

The advantage of keeping the data separate is that the problems associated with updating another agency system on a constant basis is

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6/ "Design Manual For State Traffic Records Systems", Driver Data Subsystem, Volume II, Section I, National Highway Traffic Safety Administration, Washington, D.C., July 1973.

avoided. The efficiencies that could be gained from developing one hands-off enforcement file, however, suggest that the combine file approach would be the preferable alternative where practical. The combine file could be considered as a subfile of the driver license and police wanted person files.

The function of the specialized subfile would be to consolidate in one rapidly accessible file all tag numbers of suspended and revoked drivers, wanted persons, and stolen vehicles and tags. This subfile would be structured to be easily searched and would contain only the minimum data necessary to identify the violators. To generate the subfile data would be extracted from driver license, vehicle registration, and driver history files. This information would be supplemented with data from State and local criminal justics information systems (CJIS) and updated frequently to minimize inaccuracies. Exhibit III-1, following this page, illustrates the process for generating the special enforcement file.

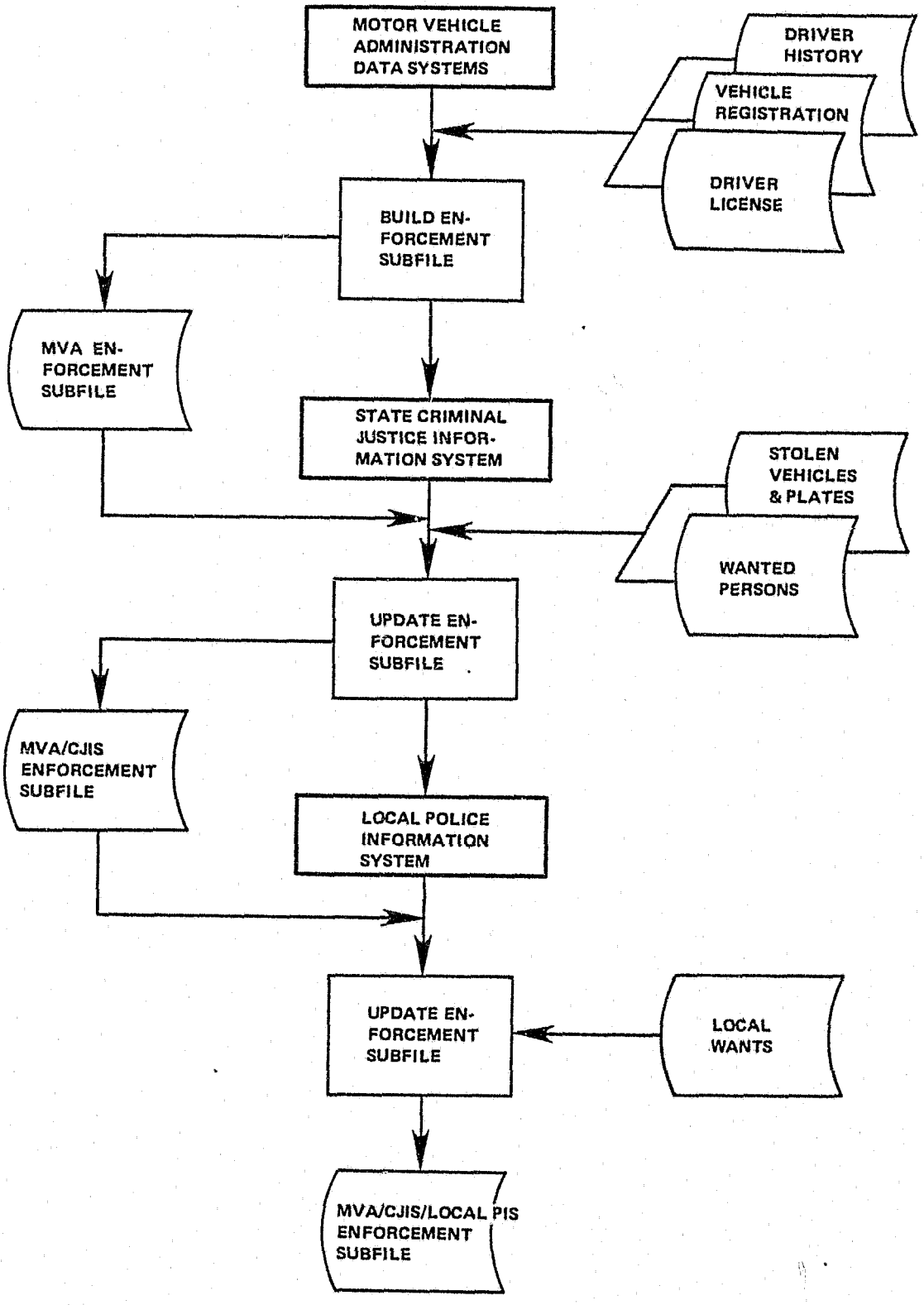
In general, for the purpose of hands-off enforcement a traffic records system should have the following attributes:

- On-line access to records system by law-enforcement
- Query response time of less than 10 econds
- Vehicle registration records on-line and accessible by vehicle tag number
- Bi-directional pointers or cross-referenced between driver record and vehicle registration record
- Driver records on-line that contain full name, address, license status, and physical identifiers, such as height, sex, race, age, and hair color
- Driver history records which list all previous accidents and citations and the registrtion number of the vehicle being driven at time of accident or citation.

The self-contained query system that would make use of an board data files and the manual look-up alternative would not require the extensive on-line support required by the remaining alternatives.

EXHIBIT III-1

DRIVER LICENSE ENFORCEMENT SUBFILE PROCESS FLOW



IV. DEMONSTRATION PROJECT PLANNING AND OPERATION

The purpose of this section of the report is to present the major planning and operational considerations involved in the development and implementation of a hands-off driver license law enforcement program. This section includes a general planning procedure and sample operational plans to define the scope and nature of activities that should procede program implementation and procedures that should be included in a program design. In general, the planning guideline is intended for use by agencies with interest in developing a hands-off enforcement program and provides guidance for the selection of an enforcement alternative best suited to local conditions and local agency capabilities.

One of the major problems that will confront an agency desiring to establish a program is the requirement for direct access to driver license information from vehicle registration information. On the surface this requirement would prevent the majority of states from participating in a program of this nature. However, this requirement does not necessarily imply that the entire driver license file of a state must be cross-referenced to the vehicle registration for the purposes of this program. The alternative methods of enforcement presented in this study require only that the denied driver be linked to vehicle registrations. It may be possible in some states to establish the cross referencing of this smaller subset of the data base through special processing at time of suspension or revocation, or to adjust suspension and revocation procedures to collect vehicle registration information when suspensions and revocations are issued. This involves the analysis of a number of technical characteristics of the local data processing environment and of the alternative method of enforcement selected. Each State's ability to participate in the program will have to be determined individually on a case by case basis.

1. HANDS-OFF PROGRAM PLANNING

The successful implementation of a hands-off driver license enforcement program will depend on close coordination between the law enforcement agencies implementing the program and the State Motor Vehicle Administration. Regardless of the alternative method of hands-off enforcement selected, availability of valid denied driver information required by the program will depend on close interagency coordination. Design and operation of the program should involve directly representatives from the States' Motor Vehicle Administration, preferably a traffic records system analyst, and from each law enforcement agency involved. In addition, an overall project coordinator should be appointed to direct program development and operation.

The role of the MVA systems analyst would be to determine if the state traffic records system has the capability to provide the data required. In addition, the analyst would supervise any special processing or programming needed to support the program. In the initial stages of the project, representatives from each law enforcement agency would develop patrol procedures to integrate hands-off enforcement with daily patrol activities. They would also participate in the selection of an alternative method of hands-off enforcement which would depend on the available resources of the law enforcement agencies. The role of the project coordinator would be to direct the planning and program development activities which would include the following:

- Select alternative hands-off enforcement technique for program development based on capabilities of MVA and law enforcement.
- Prepare written hands-off screening procedure and obtain legal opinion to ensure that the procedure does not violate State or Federal laws.
- Schedule design and development of special data processing services required.
- Prepare patrol procedure which would include defining time and duration of screening operations and identifying initial screening locations or areas.
- Design data collection instruments to capture data on program effectiveness for evaluation.
- Develop training program for familiarization of law enforcement offices with the program and special procedures or equipment.

The purpose of the written procedure to be followed when conducting random hands-off screening of vehicle tag numbers is to state specifically the objectives of the program and to define the procedures that will be strictly followed to ensure that the rights of the legal driver will not be violated. The procedure should incorporate a statement that clearly states that no data on drivers of vehicles not under suspension, revocation or wanted by the police will be recorded as part of the program. Prior to implementation of the program a legal opinion on the procedure should be obtained from the State Attorney General.

During the initial planning for hands-off enforcement it may be determined that special data processing support is required to implement the alternative selected. If the special processing requires alterations to the existing traffic records system considerable lead time maybe required to ensure that changes to the system made to accommodate hands-off enforcement do not adversely affect normal

traffic record system processing. Estimates should be developed for the amount of programming required and computer time need for development and processing once the program is in operation.

Hands-off driver license enforcement should be smoothly integrated with police patrol activities. Program patrol procedures should be structured so as to complement existing patrol activities and not require the dedicated service of law enforcement officers. This maybe accomplished by restricting hands-off enforcement to short intervals of time for each police unit equipped for the program and rotating enforcement among several units, or by designating hands-off enforcement as an activity to be performed during low activity periods as time becomes available. Initially, the locations for hands-off screening should be left to the intuition of the law enforcement personnel. As more experience is gained and data collected, a more systematic selection of sites for screening may be warranted.

In the initial program design consideration should be given and provisions made for the collection of data for program evaluation. Data collection instruments should be designed to include evaluation data elements for analysis of the effectiveness of the technique. Additionally, the program design may be structured so as to collect a statistically valid sample of the driver population as well as performing the primary function of suspension and revocation enforcement.

Successful implementation of a hands-off enforcement program will require that all participants have a thorough understanding of program objectives as well as operational procedures. This will necessitate training and familiarization task to be performed before operation of the programs. If the alternative selected makes use of existing equipment familiar to the enforcement personnel, then the training procedures can be brief and directed only toward the procedures and technique to be used. However, if the alternative selected makes use of unfamiliar equipment, such as an onboard computer system, training sessions should be sufficient to allow each participant to become comfortable with the operation of the system or equipment.

2. METHODS OF PROGRAM OPERATION

Operation of a hand-off enforcement program can be designed to take advantage of existing police patrol low activity periods. By structuring the hands-off enforcement strategy so as to involve several police units in the operation for short screening intervals, disruption of normal patrol activities can be kept to a minimum. There are several possible alternative methods of program operation that will depend on the alternative hands-off technique selected for implementation and the capabilities and resource allocation procedure used by the police agency involved.

Alternative hands-off enforcement techniques that rely on mobile two-way communication must be conscious of the communications traffic

load that will be generated during screening operations. If the tags inquiry traffic load increases channel loading to the point where channel waiting time is significant the number of vehicles that can be screened will drop substantially. The effect of channel congestion can be offset somewhat by control and scheduling of screening periods. By estimating the inquiry traffic rate that can be handled effectively by the communications system being used and by scheduling the number of police units participating so as not to exceed the effective traffic rate, communication delays can be minimized.

The allowable inquiry traffic rate will vary for different parts of the day as normal police communication traffic increases and decreases. Hands-off screening traffic, which can be controlled, should be scheduled for low channel utilization periods. This would increase the allowable inquiry traffic rate and not substantial delay other police traffic on the channel. It is assumed that vehicle screening traffic will reside on a channel that carries low-priority police information traffic and not emergency police dispatch messages.

With the exception of the potential voice data entry alternative, operation of hands-off vehicle screening while moving in traffic will require two persons patrol vehicles. One law enforcement officer and a screening system operator. In the Maryland TAGS project the State Police use MVA personnel to operate the terminal as a State Police officer drives the patrol vehicle and takes all enforcement actions. The need for a second law enforcement officer or civilian operator can be circumvented by screening tags at traffic lights, stop signs or other traffic control points that would allow police officers to safely divert their attention from operation of the vehicle.

Selective scheduling of police units for participation in tag screening operations could take several forms. For example, at designated time intervals, several patrol units could concentrate on hands-off enforcement for a 15 to 30 minute interval, depending on workload. After the screening assignment, the patrol units could resume normal patrol and would be replaced by units in another section of the city performing hands-off screening. This type of procedure would provide for wide area coverage, minimize increased capacity requirements for the communications system, and not severely impact normal patrol duties. Another procedure for program operation would establish longer periods for each unit's participation, but each police unit would screen vehicles only as time became available. In the first procedure police units would be dedicated to hands-off screening for short intervals of time and would only interrupt tag screening to respond to high priority calls. In the second procedure screening of vehicles would only be performed when the police unit was not otherwise assigned on a call. The first procedure has the advantage of more precise program control but would place more of a burden on police resources. In the second procedure police resource allocations would remain essentially unchanged but more program control procedures would have to be built into the program.

Using several police units at one time in the screening operation would reduce the number of tags inquiries needed by any one unit and would still maintain a high overall sample rate. If for example, five police units were screening tags for a 30-minute period and they averaged three inquiries per minutes, 450 vehicles would be screened during the period. The communication system would be required to handle on the average one message every four seconds which is not a heavy load by today's standards provided the system's current utilization is low.

3. SAMPLE OPERATION PLAN

The following sample operational plans are based on the mobile digital terminal query and the voice tag query alternatives. These two alternatives are used as examples to illustrate the operation of a hands-off enforcement program.

(1) Voice Tag Query Operational Plan

The voice tag query sample plan is based on the assumption that the resource requirement for voice inquiry and on-line data access are provided for program support. Determination of support requirements would have resulted from a detailed analysis of the following:

- Survey of existing communications message traffic on voice channel to be used in program
- Projection of additional traffic to be generated from each scheduled screening period
- Workload estimates for communications operator(s) who will enter tag inquiries into on-line system and number of terminals required
- Traffic volume that can be effectively processed by the on-line facilities of the traffic records system.

Operational ADP support for the program would be provided by a combined denied driver and police wanted person enforcement file. The file would be updated daily with new suspension and revocation data and with additional wants and warrants from the police information system. The denied driver enforcement file would contain the following data elements:

- Vehicle registration (tag) number(s)
- Reason code (denied driver, police want, etc.)
- Last name

- First name
- Middle initial
- Date of birth
- Sex
- Race
- Height
- Hair Color.

Totals would be maintained by the tag inquiry software on the total number of inquiries processed each day. The totals will be reported by time of day, police unit making inquiry and matches as a percentage of total inquiries.

Each screening period of the hands-off enforcement program would be scheduled to occur between voice communication traffic peaks and for a duration of approximately 30 minutes. After each screening operation police units participating in the program would complete an activity log indicating the locations covered and the police enforcement action taken on hits that occurred during the session. Location information would include type of area (commercial, residential, etc.) and type of road or highway.

Police units would be assigned to hands-off screening sessions based on a combination of factors, such as, availability of police manpower, demand for police service, and the data needs of the program. During the initial phase of the program a broad sample of the area road system would be obtained. Preliminary analysis of the violation data would attempt to determine if there are discernable trends associated with location, time of day or types of road. The analysis would be guided by an overall sample design developed in conjunction with deployment plans.

Each officer participating in hands-off enforcement would follow a specific written procedure specifying each step of the process. The first step in the process would be to select at random a vehicle tag number from the traffic stream and radio the tag to the special vehicle screening operator. The operator would enter the tag number into the system via the on-line terminal. The terminal would reply with a short negative response code or the name and description of a denied or wanted driver on matches. In the final step the police officer would verify visually that the description matches the operator of the vehicle before stopping the vehicles for possible enforcement action. For each match encountered, regardless of outcome, the police officer would record the location and resulting action.

Initially screening session would cover an entire day, with the possible exception of the early morning hours, depending on the traffic characteristics of the area. Assignment of police units to participate in hands-off enforcement would be rotated among the patrol force on a daily basis.

The program would be staffed with individuals from each of the agencies involved in the program and the staff would consist of the following:

- Project Director for program management and coordination
- Motor Vehicle Administration System Analysis for liaison with MVA and to provide traffic records system support
- Police Coordinator to provide liaison with law enforcement and to develop screening schedules and provide police information system support
- Program Analyst to develop program sample plan and to analyze data collected during the program.

The initial phase of the program would cover approximately a three month period. At the end of the first phase a preliminary evaluation would be conducted primarily to adjust program operating procedures and refine data collection and sampling techniques. At the end of the second three months of program operation an evaluation would be conducted to determine the effectiveness of the program in terms of cost and impact on the denied driver problem. The results of the detailed evaluation would be used to determine if hands-off driver license enforcement should be incorporated as a standard method for enforcing driver license suspensions and revocation laws.

(2) Mobile Digital Tag Query Operational Plan

In the mobile digital terminal hands-off enforcement operation the program would be similar to the voice query operation in program structure and staffing. In operation and support the programs would differ significantly.

Mobile digital terminal would have direct access to the data base containing the hands-off enforcement file. The communications operator would be eliminated and the number of tag inquiries permitted would increase significantly. During the screening operation each patrol unit would receive an immediate reply on the results of each vehicle tag number entered and when matches occurred, the description and name of the denied driver would be displayed on the mobile terminal. The description display would contain space for entry of the enforcement action taken or a code describing the reason for no enforcement action. Additionally, the display could be designed to allow entry of

location data for later analysis, eliminating the need for an activity log.

If the mobile digital terminal system used for hands-off enforcement operated on a dedicated channel, screening session traffic would not have as large an impact on police communication and sessions could be scheduled with less time restrictions.

Program staff requirements would be similar to the voice program staff requirements except for the addition of a communications system analyst familiar with the mobile digital communications system. The communications analyst would have the responsibility of determining the effect increased digital message traffic would have on police digital communication and of establishing maximums vehicle tag message rates, this data would be used to set the maximum number tags that could be input during any one screening session.

Data collection and analysis for evaluation of the project would be aided by the automated nature of the screening procedure. Location data and the results of each match on tag number will have been entered into the system and could be summarized for presentation to the program analyst.

V. PROGRAM COST FACTORS

Developing cost estimates for a demonstration project for hands-off driver license law enforcement will be almost totally dependent on the particular characteristics of the selected demonstration site. As a result, the development of cost estimates for a demonstration project has been approached from the standpoint of identifying the major cost factors associated with the basic elements of hands-off driver license enforcement. The major cost factor estimates include project staff presented by man-month, equipment cost and data processing support. Cost particular to each alternative enforcement technique are defined as the special equipment cost associated with each alternative.

1. PROGRAM STAFF COST ESTIMATES

Program staff cost estimates have been developed based on a demonstration project organization that would include at a minimum a full time program director and program analysis and the half-time commitment of a MVA systems analysis, law enforcement coordinator and law enforcement systems analysis. On a man-month basis, estimates for program staff are the following:

- Program Director, $2,000 per month
- Program Analyst, $1,500 per month
- System Analyst, $1,800 per month
- Police Coordinator, $2,000 per month

The program staff estimates are based on the assumption that the program director will be a person familiar with traffic safety programs and will have several years of experience in project management. Additionally, the background of the program director would enable this individual to function adequately in the statistical analysis role of the program analyst. The program analyst would be an individual whose basic skill area would be quantitative methods and who had several years of practical experience is statistical analyses and survey and sample design. The role of the system analyst would be filled by an individual with a background in computer sciences and who would normally function as a senior systems analyst familiar with on-line computer applications in a traffic records system environment. The police coordinator is assumed to be a command level law enforcement officer whose experience includes patrol deployment and police communications.

2. ADP SUPPORT COST

Data processing is at present the major area to be considered in estimating program cost for hands-off enforcement. It is also the most difficult area in which to make a general estimate on cost due to the wide variation among state traffic records system capabilities, status of development and operating environment. Any cost assigned to such factors as, creating cross references between driver license and vehicle records, would be at best misleading if presented as the typical anticipated cost. The variation in cost for creating the needed cross references could range from a few man-months of programming effort to several man-years of system design, development and programming.

Reasonable estimates of ADP support cost are possible if they are limited to special processing requirements such as generation of the suggest enforcement sub-file. This process as illustrated in Exhibit III-1 in section III, is a straightforward data processing application provided the cross reference exist. It is estimated that this process would require approximately three man-months of effort from a experienced computer programmer.

Estimates of the cost for computer system usage will depend on the method used by the supporting data center to allocate cost. It will also depend on the duration of the screening session and the amount of computer equipment resources required for each session.

3. SPECIAL EQUIPMENT COST

Special equipment cost estimates are based on information received from equipment vendors. Mobile digital terminal cost estimates reflect the cost of adding an additional terminal to an existing communication system for the purpose of hands-off enforcement. Information on the cost of an on board computer system is an estimate based on the cost of a comparable standard minicomputer system. The estimate of the on-board system does not include development or modification cost to enable the system to be installed in a police vehicle. The special equipment cost estimates for special equipment for hands-off enforcement are the following:

- Mobile digital terminal cost $4,000
- On board mini-computer system $20,000
- Voice data entry terminal $10,000

The voice data entry terminal cost estimates reflects of current cost of the standard system configuration provided by Theshold Technology Inc.

4. SUGGESTED STATE SELECTION PROCEDURE

Suggested criteria for selection of States to particpate in hands-off is incorporated in a procedure that would allow States to evaluate their own potential for consideration as a demonstration site. This

approach is suggested to accommodate the majority of States that do not currently possess the key capability of direct cross-references between driver license and vehicle registration files.

In the area of ADP support for hands-off enforcement, the selection procedure would require from each State expressing an interest in the program to submit a description of how the support system requirements would be met in their State. The ADP requirements would be the following:

- A file of denied drivers information cross-referenced to vehicle tag numbers.
- Denied drivers who are non-owners cross-referenced to vehicle tag numbers.
- Response time to tag inquirey of less than 10 seconds for denied driver records.
- Addition of police warrants and warrant information in the tag screening process.
- Estimates of cost required to develop the needed capability and an estimated timeframe.

Once this information is obtained, an assessment could be performed of a State's ability to meet the program requirements in a reasonable period of time. Additionally, each State would determine the most appropriate hands-off technique or techniques to be implemented after considering the special requirements associated with each alternative.

The criteria for consideration of the voice tag query alternative would be the following:

- Availability of a voice communication channel that with the addition of hands-off inquiry traffic would be operating at less than 50% utilization.
- On-line access from the communications center to a file of denied drivers using vehicle tag number as the key.
- Availability of a communications operator to process the tag inquiries.

States selecting the mobile digital terminal alternative would have to establish that they could meet the following criteria

- Availability of an operational two-way digital communication system.

- Communications channel with sufficient capacity to handle the tag inquiry traffic.

- Computer systems capable of processing mobile digital inquiries within the response time limits.

Additionally, each State would identify the law enforcement agencies who would be committed to participating in the program.

The advantage in this approach is that each State would be evaluating the potential for successful implementation of the program based on a clear understanding of the data processing and communications systems particular to their environment. Each State's potential for initial consideration as a demonstration site could then be evaluated on an individual State-by-State basis.

END