

Total Obligated Time Index (T.O.T.I.)

Manpower Allocation Update June 1989

NCURS

UUL 20 1992

ACQUISITIONS

137597

U.S. Department of Justice National Institute of Justice

This document has been reproduced exactly as received from the person or organization originating it. Points of view or opinions stated in this document are those of the authors and do not necessarily represent the official position or policies of the National Institute of Justice.

Permission to reproduce this copyrighted material has been granted by Marvland State Police

to the National Criminal Justice Reference Service (NCJRS).

Further reproduction outside of the NCJRS system requires permission of the copyright owner.

Total Obligated Time Index Maryland State Police

How busy are troopers in the field? How busy should they be? How many troopers are needed to reduce workload to an acceptable level? How can a state police agency document and measure workload levels to substantiate a request for additional trooper positions from a state legislature? How many troopers should the agency ask for? These are concerns that have plagued state police administrators for years. All field installations generally perceive themselves as busy, but how busy? How does their workload compare to other installations? What is the definition of busy? The Maryland State Police has addressed these concerns with the implementation of a computerized manpower allocation system known as the Total Obligated Time Index (T.O.T.I.).

Until recently the Maryland State Police has allocated manpower using rudimentary workload criteria and political determinations of need. It has been very difficult in the past to determine relative workload levels which have meaning in real-life comparisons of installations because of the varied roles of the State Police in differing geographic areas of the state. The Planning and Research Division of the State Police embarked on a manpower allocation project in April of 1987 in the hopes of establishing a means of effectively distributing authorized field manpower.

In general, the state police field forces in Maryland provide a range of service to the public which to some extent is determined by the availability of local police resources. In some rural areas of the state, the Maryland State Police provides full primary law enforcement services and functions as the only police agency handling incidents within the area. Transitional (rapidly developing) subdivisions of the state have significant local policing capabilities and in these areas the State Police shares call for service responses and provides support and complimentary services with emphasis on major crime and traffic enforcement on major highways. In metropolitan areas of the state, the State Police generally provides line patrol services on interstate and major trafficways, leaving most of the local policing responsibilities clearly in the hands of local law enforcement.

Manpower allocation must be flexible enough to deal with state police activity within different enforcement environments. At the onset of the manpower project, the Planning and Research Division examined classically used methodologies for assigning manpower such as population growth trends, road miles, traffic density, accident data and crime indexes. These factors did not provide easily measurable predictors for use by the State Police. Local police growth and cooperative agreements with local law enforcement agencies significantly affected the type of service provided by the State Police and made differentiating State Police workload extremely difficult when a mixture of state and local police covered the same area. It became clear that the dynamic role of the State Police in varying areas, coupled with the inability to easily measure and sort out commonly used predictors in multijurisdictional areas, required a new approach

Total Obligated Time Index Maryland State Police

tailored to a state police environment. Among the many workload factors examined, one factor surfaced as a common denominator —TIME. It became clear that time obligated for whatever reason was the key factor, irrespective of the causal factor for the time. The reasons why troopers were busy performing tasks were not nearly as relevant as the fact that troopers were not available for patrol during that obligated time. It was determined that the rationale to be used in the Maryland State Police method should not differentiate between types of calls for service, self-initiated actions or administrative duties because all services delivered and duties performed required time allocations which reduced availability for proactive patrol.

The project direction then focused on existing statistics and measures that could be used to determine how much time could be accounted for employees. The State Police has in place a mainframe computer system which captures obligated time associated with calls for service. The Automated Incident Reporting System (A.I.R.S.) was instituted during the early 1970's in order to capture types of incidents, times and days of occurrences, and obligated time associated with the incidents. Each time a call for service is received, a duty officer or police communications operator manually fills out a Complaint Control Card which is coded with certain information pertaining to the call and the responding trooper. Using a time stamp, the time the call was received and dispatched, the troopers arrival and the time spent handling the incident are captured. All of the cards are compiled locally and sent in batches weekly to the Department of Public Safety Data Center for entry into the mainframe computer. Periodic reports are generated and distributed to field installations concerning the number of incidents by type, day of week, time of day, etc., as well as response and obligated times associated with the calls. Although the existence of this system provided a good start in capturing obligated time associated with calls for service, it was very limited in that only times, incident and day/date codes collected on the cards could be keyed into the mainframe program due to inherent limitations of the software. Associating A.I.R.S. data with a particular employee or group of employees at given installations is beyond the systems capability.

It became clear that A.I.R.S. obligated time data did not capture enough of the overall time dedicated by troopers away from proactive patrol. A system which could account for all forms of obligated time and compare that time to hours worked at each installation was needed. Total Obligated Time Index (T.O.T.I.) was developed. Total obligated time per individual at a given installation is defined as the average available yearly work time per employee, excluding leave of all types, divided into all forms of yearly obligated time per employee. This process yields a percentage of total time which is obligated.

In order to incorporate all activities contributing to obligated time, numbers of traffic citations, warnings, equipment repair orders,

field observation reports and traffic safety reports issued were examined. Raw numbers of these documents were of little value, however the average time associated with their issuance was determined through time and motion analysis of the traffic stop procedure. Once accepted standards of time associated with each document were established, obligated time dedicated to traffic enforcement could be determined. It was also necessary to document other forms of obligated time which kept troopers away from proactive patrol. Other forms of obligated time considered were time spent by investigators, not otherwise captured by existing methods (investigator follow-up time is not captured under A.I.R.S.) and various types of support time such as training, equipment maintenance, meetings, mealtime and miscellaneous paperwork not otherwise documented or captured. The obligated time for investigators was captured by an analysis of Criminal Caseload Ledgers which are maintained by field investigators to document time not otherwise captured by A.I.R.S. This analysis revealed, on average, that field investigators spent 861.4 hours (64% of work time) each year dedicated to duties not captured elsewhere. Other time associated with support duties such as maintenance, meetings, meals and miscellaneous paperwork for all employees was determined by analyzing time spent during each year and agreeing on acceptable averages per employee. Actual time associated with training is maintained at local installations and is reported annually for use by T.O.T.I.

Once the time associated with obligated time is captured and computed, it can be compared to the available work time in a year. Available work time per individual per year is 2,920 hours (365 days X 8 hours) minus employee leave hours. Regular, holiday, and personal leave days are standard for all employees. Sick and annual leave data are captured by field installations from work and leave reports and are reported annually by installation. Annual and sick leave earnings and usages vary by installation due to differing seniority of personnel. Installation averages used in computations are limited to plus or minus one standard deviation of the overall average.

The T.O.T.I. formula used is:

(obligated times)

<u>AIRS+TRAFFIC+INVESTIGATOR</u>

<u>NUMBER PERSONS</u> + SUPPORT OBLIGATED TIME

= TOTI

AVAILABLE WORK TIME (PER PERSON)

DEFINITION OF VARIABLES:

A.I.R.S. OBLIGATED TIME

SOURCE: Automated Incident Reporting System, a mainframe computer system which captures data from calls for service and certain traffic activities.

OBLIGATED TRAFFIC ENFORCEMENT TIME

SOURCE: Traffic citation, warning, safety equipment repair order (S.E.R.O.), traffic safety report (T.S.R.) and field observation report (F.O.R.) data (numbers issued) are reported monthly and compiled centrally at Headquarters. Traffic enforcement documents are given time values based on an average time required to complete the form and handle verbal explanations and other ancillary tasks associated with the enforcement activity. Recognizing that some violator contacts are protracted by lengthy discussions and some shortened as with radar or Vascar stopping teams, and that some stops take longer than average because of trips to a district court commissioner, time allocations are prorated as follows:

CITATIONS - 75% @ 5 minutes each and 25% @ 20

WARNINGS

S.E.R.O.

F.O.R. - 90% @ 5 minutes each and

T.S.R. 10% @ 20

NOTE: Citations for driving while intoxicated are factored out of the total as the time associated with those arrests is captured by A.I.R.S.

INVESTIGATOR OBLIGATED TIME

SOURCE: This is the product of a formula which uses the average obligated time per year documented on investigator caseload ledgers for investigators holding the rank of Trooper, Trooper First Class or Corporal which is not captured under A.I.R.S. Investigators do not capture follow-up time on patrol trooper initiated cases via A.I.R.S. They maintain a ledger of cases open and time associated with them. These ledgers were examined in order to determine an average time spent by investigators which was unsupported by A.I.R.S. This average is then applied to compensate for obligated time spent throughout the year. Studies concluded that approximately 64% of an investigator's

Total Obligated Time Index Maryland State Police

net work time is obligated to some part of investigation or follow-up. This percentage held true regardless of the enforcement environment of the installation. The formula used is:

(number of investigators)(* % worktime obligated)= INV. OBL. TIME

* as determined by caseload ledgers

NUMBER PERSONS

SOURCE: This is the number of worker-level positions which contributed to the workload measures during the year. The number of police employees holding the rank of Trooper, Trooper First Class and Corporal are tabulated from agency personnel rosters published during October of each year. This count is then used each year in T.O.T.I. computations as the worker-level strength.

SUPPORT OBLIGATED TIME

SOURCE: These times are a combination of averages spent on activities required of all troopers and actual average times per individual at given installations as reported on work and leave reports.

AVG. HRS PER YEAR

TRAINING

(reported individually by installation and adjusted for each installation)

SUPERINTENDENT'S INSPECTION

- 16 hrs. (preparation and inspection)

PROMOTIONAL EXAMINATIONS

- 8 hrs. (excluding preparation)

FIREARMS TRAINING

- 12 hrs. (three hours, quarterly)

VEHICLE/PERSONNEL INSPECTION - 12 hrs. (one hour per month)

VEHICLE MAINTENANCE

- 57 hrs. (15 min. per shift, gas, oil, check tires etc.)

BARRACK DUTY

- 75 hrs. (20 minutes per shift)

MISCELLANEOUS PAPERWORK

- 117 hrs. (31 min./shift)

MEALS

113 hrs. (30 min./shift)

AVAILABLE WORK TIME

SOURCE: Work time available per year is determined by averages of actual data from work and leave records.

REGULAR LEAVE	DAYS - 104	HOURS 832	
HOLIDAY LEAVE	- 14	112	
PERSONAL LEAVE	- 3	24	
SICK LEAVE	 averages reported per installation and entered into computer 		
ANNUAL LEAVE	 averages reported per installation and entered into computer 		

Once all raw data is collected, computer entry is accomplished by using the entry screen for each installation.

MARYLAND STAT YEAR: 88	TE POLICE T.O.T.I. ENTRY SCREEN	
INSTALLATION: WATERLOO	INSTALLATION CODE: 50 TYPE: T (M,T,R)	
11	OF TOTAL, HOW MANY ARE INVESTIGATORS? (CPL, TFC, TPR): 3	
(Yearly Averages Per Cpl/TFC/Tpr) TRAINING HOURS: 101.3 ANNUAL LEAVE HOURS: 77.2 SICK LEAVE HOURS: 94.3		
YEARLY DATA: A.I.	R.S. HOURS: 22456	
# CITATIONS: 18156	# WARNINGS: 12578 # E.R.O.: 949	
# T.S.R.:	281 # F.O.R.: 697	

After entries are made, three dBASE III programs run calculations. The programs are depicted as follows:

The first program calculates T.O.T.I. by analyzing raw data supplied through data entry:

```
*TOTICOMP.PRG
*F/SGT L. D. WARD, PLANNING AND RESEARCH DIVISION 11/3/88
*THIS PROGRAM COMPUTES T.O.T.I. FOR MSP INSTALLATIONS
CLEAR
USE TOTI2
SET INDEX TO BUSY
SET ECHO OFF
SET TALK OFF
SET DEVICE TO PRINT
@5,9 SAY DATE()
@5,60 SAY TIME()
@8,30 SAY "MARYLAND STATE POLICE"
@9,27 SAY "TOTAL OBLIGATED TIME INDEX"
@15,9 SAY "INSTALLATION"
@15,34 SAY "TYPE"
@15,53 SAY "T.O.T.I."
SET DEVICE TO SCREEN
SET PRINT ON
DO WHILE .NOT. EOF()
TRAFF=((CIT*.75*5)+(CIT*.25*20)+(WARN+ERO+TSR+FOR)*.9*5+(WARN+ERO+TSR+FOR)*.1*20)/60
 INVT=INVNO*861.4
 SUPPT=TRNG+438
AVAILT=2920-(ANNLV+SICK+968)
TOTI=((AIRS+TRAFF+INVT)/WORKER+SUEET)/AVAILT
           ",INAME," ",ITYPE,"
                                                   ",STR(TOTI*100,4,1),"%"
REPLACE PINDEX WITH TOTI
SKIP
ENDDO
SET PRINT OFF
SET DEVICE TO PRINT
Q43,10 SAY "TYPE CODES: T=TRANSITIONAL, R=RURAL, M=METRO"
@44,10 SAY "ACCEPTABLE T.O.T.I. LIMITS: T,R = 66% M = 70%"
@47,10 SAY "PLANNING & RESEARCH DIVISION"
EJECT
CLEAR
SET DEVICE TO SCREEN
```

This is a sample of output from the first program:

MARYLAND STATE POLICE TOTAL OBLIGATED TIME INDEX

INSTALLATION	TYPE	T.O.T.I
CHESTERTOWN	R	67.6 %
HAGERSTOWN	R	68.6 %
PRINCESS ANNE	R	68.8 %
J.F.K.	М	70.2 %
SALISBURY	R	71.0 %
Westminster	R	72.0 %
EASTON	R	72.0 %
SECURITY	M	72.2 %
COLLEGE PARK	М	73.2 %
BEL AIR	T	74.2 %
ANNAPOLIS	T	74.4 %
GARRETT COUNTY	R	74.9 %
NORTH EAST	R ,	75.1 %
ROCKVILLE	M	75.7 %
VALLEY	M	76.0 %
FREDERICK	T	76.7 %
GLEN BURNIE	T	77.0 %
CUMBERLAND	R	77.2 %
WALDORF	T	79.8 ₹
FORESTVILLE	M	90.0%
BERLIN	R	80.0 %
LEONARDTOWN	R	82.5 %
CENTREVILLE	R	82.7 %
PRINCE FREDERICK	T	82.8 %
WATERLOO	T	83.3 %

TYPE CODES: T=TRANSITIONAL, R=RURAL, M=METRO ACCEPTABLE T.O.T.I. LIMITS: T,R = 66% M = 70%

PLANNING & RESEARCH DIVISION

The second program determines how many troopers would be needed to optimally staff each installation at predetermined workload levels:

```
CLEAR
  USE TOTI2
  SET INDEX TO BUSY
  SET ECHO OFF
  SET TALK OFF
  SET DEVICE TO PRINT
  @5,9 SAY DATE()
  @5,60 SAY TIME()
  @8,30 SAY "MARYLAND STATE POLICE"
  @9,27 SAY "TOTAL OBLIGATED TIME INDEX"
  @10,23 SAY "WORKER LEVEL POSITION COMPUTATIONS"
 @15,9 SAY "INSTALLATION"
 @15,34 SAY "CURRENT"
 @15,53 SAY "NEEDED"
 @15,68 SAY "ADDITIONAL"
 SET DEVICE TO SCREEN
 SET PRINT ON
 DO WHILE .NOT. EOF()
  TRAFF=((CIT*.75*5)+(CIT*.25*20)+(WARN+ERO+TSR+FOR)*.9*5+(WARN+ERO+TSR+FOR)*.1*20)/60
  INVT=INVNO*861.4
  SUPPT=TRNG+438
  AVAILT=2920-(ANNLV+SICK+968)
 IF ITYPE="M"
  TOTI=.70
 ELSE
  TOTI=.66
 ENDIF
 NOWORKER=(AIRS+TRAFF+INVT)/((AVAILT*TOTI)-SUPPT)
 IF NOWORKER>WORKER
 NEEDED=NOWORKER-WORKER
ELSE
 NEEDED=0
ENDIF
            ", INAME,"
                             ", WORKER."
                                                     ",STR(NOWORKER ,4,1),"
                                                                                      ",STR(NEEDED ,4,1)
REPLACE WORKNEED WITH NEEDED
SKIP
ENDDO
SET PRINT OFF
SUM WORKER TO CTOTAL
SUM WORKNEED TO TOTAL
SET DEVICE TO PRINT
@42,9 SAY "TOTAL"
@42,28 SAY CTOTAL
@42,45 SAY TOTAL+CTOTAL
Q42,62 SAY TOTAL
@45,10 SAY "PLANNING AND RESEARCH DIVISION"
EJECT
CLEAR
SET DEVICE TO SCREEN
```

This is a sample of output form the second program:

MARYLAND STATE POLICE TOTAL OBLIGATED TIME INDEX WORKER LEVEL POSITION COMPUTATIONS

INSTALLATION	CURRENT	NEEDED	ADDITIONAL
CHESTERTOWN	8	8.4	0.4
HAGERSTOWN	35	37.5	2.5
PRINCESS ANNE	17	18.3	1.3
J.F.K.	30	30.1	0.1
SALISBURY	31	35.6	4.6
Westminster	76	88.6	12.6
EASTON	39	45.3	6.3
SECURITY	27	28.4	1.4
COLLEGE PARK	32	34.5	2.5
BEL AIR	52	63.6	11.6
ANNAPOLIS	26	32.0	6.0
GARRETT COUNTY	16	20.1	4.1
NORTH EAST	48	59.9	11.9
ROCKVILLE	25	28.3	3.3
VALLEY	26	30.0	4.0
FREDERICK	49	63.0	14.0
GLEN BURNIE	38	49.3	11.3
CUMBERLAND	28	37.6	9.6
WALDORF	31	43.6	12.6
FORESTVILLE	32	40.1	8.1
BERLIN	18	25.1	7.1
LEONARDTOWN	23	33.7	10.7
CENTREVILLE	20	30.3	10.3
PRINCE FREDERICK	27	40.1	13.1
WATERLOO	31	46.0	15.0
TOTAL	785	969.4	184.4

PLANNING AND RESEARCH DIVISION

The third program aids management in distributing academy positions to field installations. The number of anticipated available field positions is entered in the computer and is automatically distributed:

```
*ALLOCATE.PRG
*THIS PROGRAM ALLOCATES NEW F.O.B. RECRUITS (POSITIONS) TO FIELD INSTALLATIONS
*F/SGT. L. D. WARD, PLANNING AND RESEARCH DIVISION 3/15/89
SET STATUS OFF
SET TALK OFF
USE TOTT2
SET INDEX TO BUSY
POSFOB=0
INPUT "ENTER NUMBER OF POSITIONS FROM CLASS TO F.O.B.:" TO POSFOB
SET DEVICE TO PRINT
@5,9 SAY DATE()
@5,60 SAY TIME()
@8,30 SAY "MARYLAND STATE POLICE"
69,19 SAY "ALLOCATED STRENGTH POSITION DISTRIBUTION"
@10,28 SAY "FIELD OPERATIONS BUREAU"
@11,9 SAY "BASED UPON ACADEMY ALLOTMENT OF:"
@11,34 SAY POSFOB
@15,9 SAY "INSTALLATION"
@15,34 SAY "RECOMMENDED POSITIONS"
SET DEVICE TO SCREEN
SET PRINT ON
GO TOP
HGET=0
REALNO=0
TILINDEX=0
SUM WORKNEED TO TILINDEX
GO TOP
DO WHILE .NOT. EOF()
  REALNO=POSFOB/TTLINDEX
  HGET=REALNO*WORKNEED
311
            ", INAME,"
                                    ",STR(HGET,3,1)
SKIP
ENDDO
SET PRINT OFF
SET DEVICE TO PRINT
Q45,10 SAY "PLANNING AND RESEARCH DIVISION"
EJECT
CLEAR
SET DEVICE TO SCREEN
```

This is a sample of output form the third program:

MARYLAND STATE POLICE ALLOCATED STRENGTH POSITION DISTRIBUTION FIELD OPERATIONS BUREAU BASED UPON ACADEMY ALLOTMENT OF: 40

INSTALLATION	RECOMMENDED POSITIONS
CHESTERTOWN	0.1
HAGERSTOWN	0.5
PRINCESS ANNE	0.3
J.F.K.	0.0
SALISBURY	1.0
WESTMINSTER	2.7
EASTON	1.4
SECURLTY	0.3
COLLEGE PARK	0.5
BEL AIR	2.5
ANNAPOLIS	1.3
GARRETT COUNTY	0.9
NORTH EAST	2.6
ROCKVILLE	0.7
VALLEY	0.9
FREDERICK	3.0
GLEN BURNIE	2.5
CUMBERLAND	2.1
WALDORF	2.7
FORESTVILLE	1.3
BERLIN	1.5
LEONARDTOWN	2.3
CENTREVILLE	2.2
PRINCE FREDERICK	2.8
WATERLOO	3.3

PLANNING AND RESEARCH DIVISION

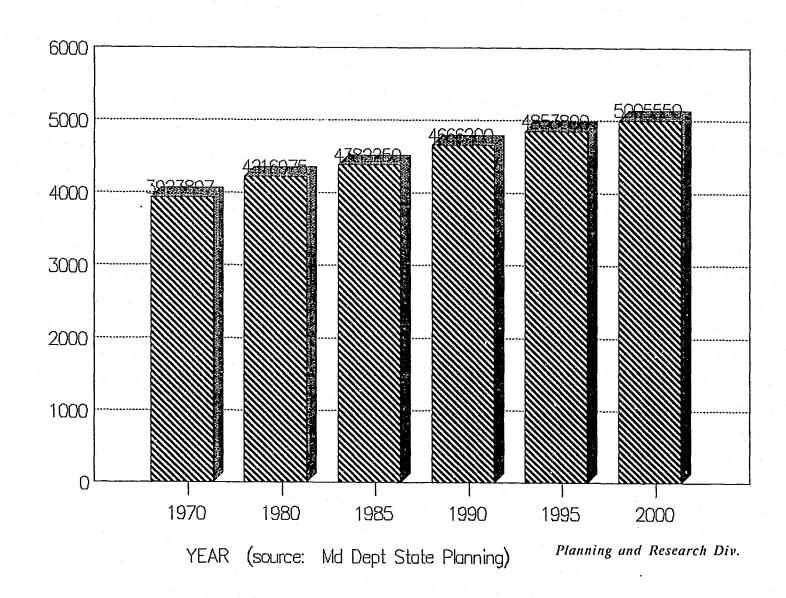
Thresholds for maximum allowable T.O.T.I. levels were determined by examining qualitative services rendered to the public at various installations. Any full-service or transitional installation exceeding a 66% T.O.T.I. experienced a degradation in services to the community and the ability to provide proactive policing. Thresholds for metropolitan installations are allowed to reach 70% due to the inherent proactive relationship of greater traffic enforcement involvement on line patrol highways. A general management concept of ideally achieving a two-third/one-third relationship of obligated time to routine patrol time was agreed upon within the agency. These maximum T.O.T.I. levels are averages over a long period of time, and as such, do not apply to peaks and valleys in workload which must be addressed through scheduling. Weekends, holidays and peak work hours result in the greater obligation of an individual's time. On the average, these extremes are offset by slower times when little time is obligated. These desired average T.O.T.I. levels will supply a local commander with sufficient human resources to meet the majority of scheduling demands.

By using T.O.T.I. for the past two years, the Maryland State Police has been able to place additional patrol positions where they are most needed and to supply documentation of increases in workload required to substantiate requests for additional troopers.

One of the most significant factors of this allocation system over many others commonly used in the police community is the wide acceptance by personnel at all levels. Feedback from commanders indicates that T.O.T.I. accurately reflects the real-world and is in fact representative of field workload. In order for an allocation system to survive the test of time, general acceptance, support, and accuracy are a must.

The Maryland State Police Total Obligated Time Index is a dynamic process that will continue to be refined and grow with changes in the role of the State Police. The inherent flexibility and simplicity of the system will easily accommodate these changes.

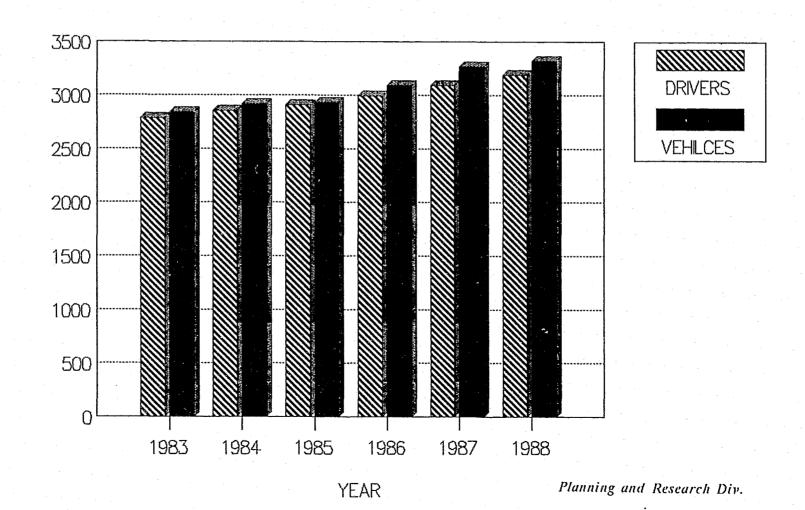
MARYLAND POPULATION



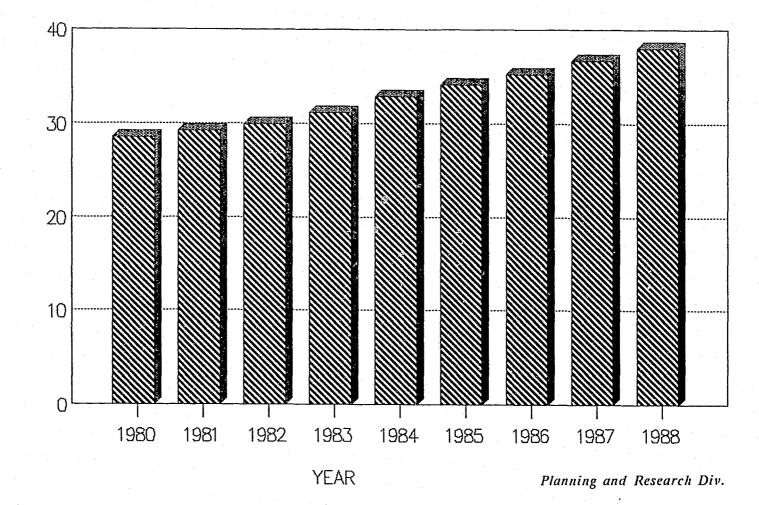
(thousands)

LICENSED DRIVERS/REGISTERED VEHICLES

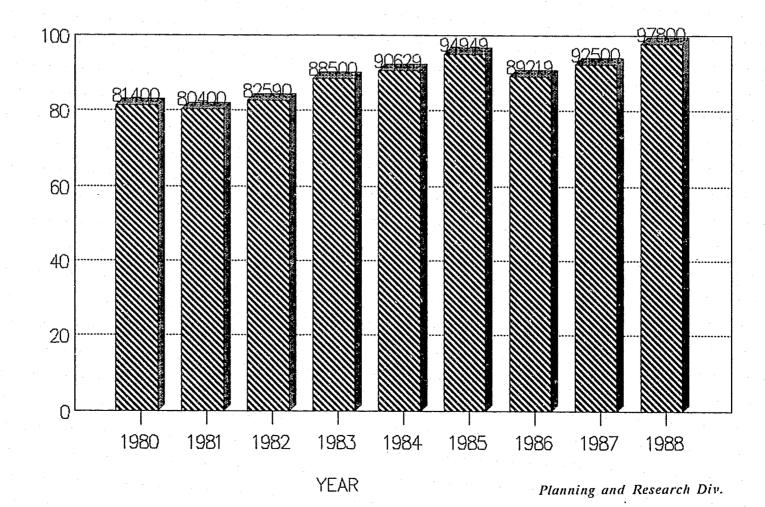
1982 - 1988 MARYLAND



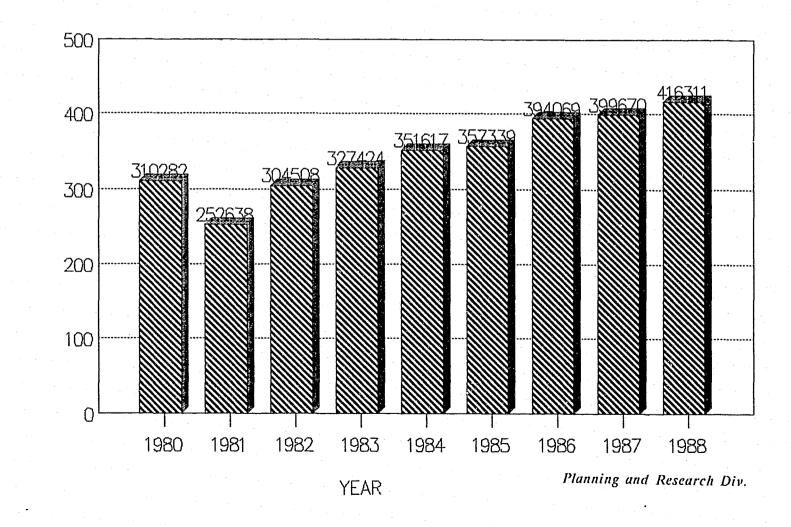
MILES DRIVEN MARYLAND



TRAFFIC ACCIDENTS INVESTIGATED MARYLAND COUNTIES

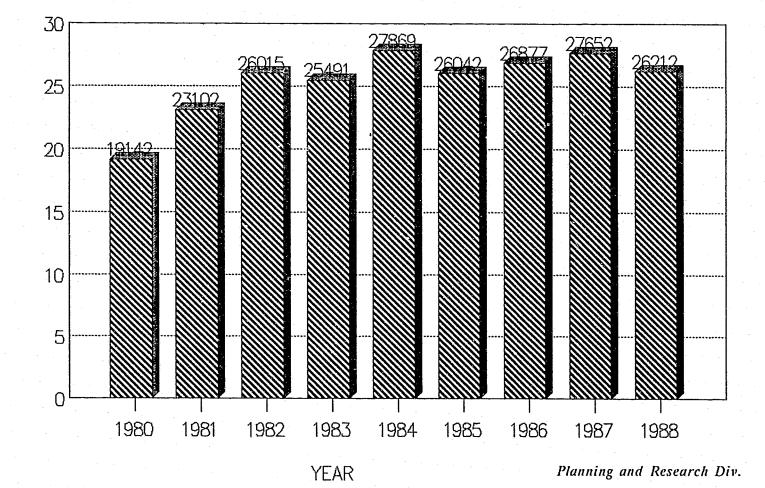


TRAFFIC CITATION ARREST SUMMARY MARYLAND STATE POLICE



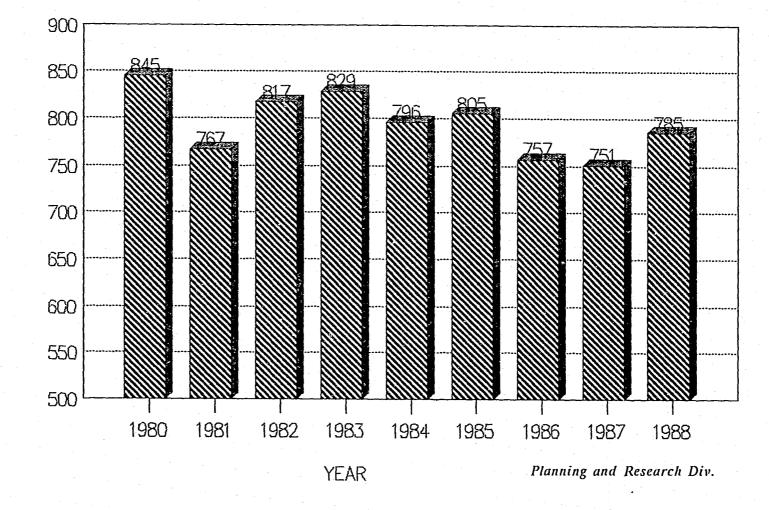
PART I AND II OFFENSE ARRESTS MARYLAND STATE POLICE



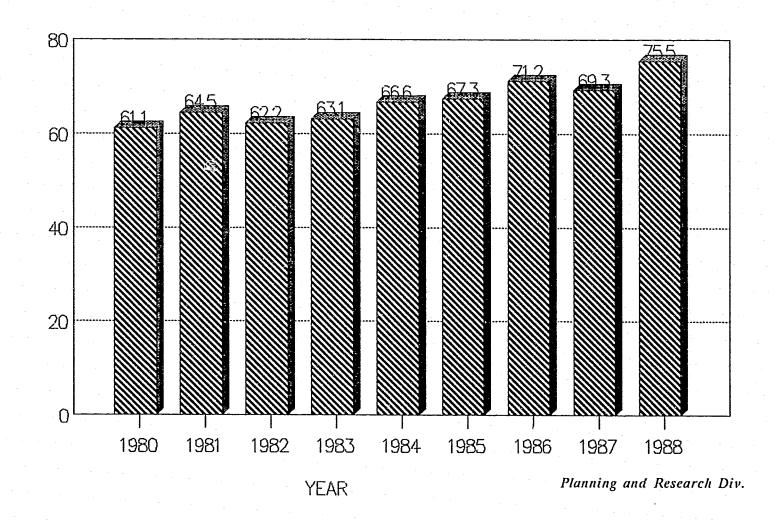








T.O.T.I. AVERAGE ALL INSTALLATIONS



T.O.T.I. BY TROOP

1988

