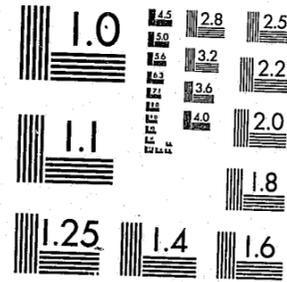


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LEA PROJECT REPORT • OFFICE OF LAW ENFORCEMENT ASSISTANCE • U.S. DEPARTMENT OF JUSTICE  
Washington, D.C.

# REPORTS, RECORDS AND COMMUNICATIONS IN THE BOSTON POLICE DEPARTMENT:

## A System Improvement Study

*M. J. # 669*

**00669**

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\* \* \*

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REPORTS, RECORDS AND COMMUNICATIONS  
IN THE BOSTON POLICE DEPARTMENT:  
A SYSTEM IMPROVEMENT STUDY

Project Report Submitted to  
Office of Law Enforcement Assistance  
U.S. Department of Justice

by

Boston Police Department  
Boston, Massachusetts

assisted by

Arthur D. Little, Incorporated  
Cambridge, Massachusetts

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## PREFACE

This report deals with a question which is of concern to law enforcement administrators. The question, as posed by the Boston Police Department: How can we best meet our information needs?

For Boston, the answer is of prime importance. Each year the police department makes 100,000 arrests, including 19,000 Type 1 (major) crimes. The annual volume of incidents resulting in some police record exceeds 200,000. New documents, including photographs and fingerprint records, are added to the department's central files at the rate of 100,000 a year. These files now contain over 2 million documents. The public makes half a million calls to the department each year, producing traffic over police circuits three times greater than the incoming calls, or about 1-1/2 million messages. All this demands, and depends upon, a sizable investment in manpower and man-hours.

Similar situations, differing only in degree, are common to all police departments. Police tasks of command and control, preventive patrol, response to calls for service, and investigation depend upon the communicating and processing of information. Duplication produces both inefficient input to the system and inefficient output. Copying and recopying reports devours unnecessary manhours. A poor system not only obstructs management's ability to decide whether the system is

effective, but it also defeats the job of evaluating changes to determine whether they represent bona fide improvements.

The task of analyzing information needs is thus not a casual or simple undertaking. The study reproduced here is only a first phase of the Boston Police Department's comprehensive, long-range "analysis and action" program. This project was supported by a \$30,200 Law Enforcement Assistance Act study grant and completed in 1967. Early this year, the department began its second phase, which includes implementation of primary recommendations and an in-depth analysis of more difficult areas. The department received a \$134,450 LEAA grant for the second phase effort. It has already realized savings from this project, in manpower and use of patrol cars, and anticipates greater benefits in the months and years ahead.

Although focusing on the problems of a single police department, the report can serve as a resource for both police departments and for organizations that work closely with law enforcement. It contains guidelines for evaluating a wide range of information problems. The quality of the project reflects a successful collaboration between the Boston Police Department and its subcontractor, Arthur D. Little, Inc., in the design of a new system tailored to specific needs of the Boston Police Department but reflecting concerns common to other large law enforcement agencies. Whether or not versed in relevant technology, readers

should find the project report understandable, to the point, and clearly expressed.

The Boston project is one of the more than ten advanced information/communication system development projects supported by grants under the Law Enforcement Assistance Act of 1968. These have involved national, regional, metropolitan, and statewide demonstration and study efforts.

Office of Law Enforcement Assistance  
U. S. Department of Justice  
May 1968

TABLE OF CONTENTS

	<u>PAGE</u>
I. INTRODUCTION	1
II. ORGANIZATION OF THE REPORT	3
III. BACKGROUND	5
A. Deterrence	5
B. Control	6
C. Apprehension	6
D. Costs	6
E. Explanations and Studies	7
IV. STUDY OBJECTIVES	9
V. SUMMARY	11
A. Reports	11
B. Records	13
C. Communications	14
D. Command and Control of Operations	16
E. The Computer Facility	17
F. Implementation	18
1. Reporting	18
2. Command and Control	18
3. Space Utilization in Headquarters	19
4. Records	19
5. Suggested Organizational Changes	19
G. Estimates of Costs and Returns	20
VI. CONCLUSIONS AND RECOMMENDATIONS	23
A. The Reporting System	23
1. Police Investigations and Reports Arising From Them	23
2. A Hierarchical Reporting System	25
3. Field Reporting Manual	27

TABLE OF CONTENTS (Cont.)

	<u>PAGE</u>
VI. (Cont.)	
B. Records	29
1. Master Name File	29
2. Control Numbers	30
3. File Purging	30
4. The Journals	31
5. The District Control Logs	32
6. Photograph Files	33
C. Communications	33
1. Evaluation of Facilities and Equipment	33
2. Recommended Changes in Facilities and Equipment	35
3. Suggested Changes in Support Functions	44
4. Radio Dispatching: The Command Operation	45
D. Command and Control of Operations	53
1. An Interim Control Center: Division by Function	53
2. A New Control Center: Division by Geography	54
3. Command vs. Command-and-Control	54
4. A Proposed Control System	55
E. The Computer Facility	59
1. Functions	59
2. Hardware	60
3. Back-up	61
F. Implementation	61
1. Reporting	61
2. Command and Control	62
3. Utilization in Headquarters	63
4. Records	64
5. Suggested Organizational Changes	64
G. Estimates of Costs and Returns	69
1. A Rough Measure of Cost	69
2. Records	69
3. Reports	71
4. Communications	72
5. Command and Control	75
6. The Computer Facility	75
7. Net Gain	75

TABLE OF CONTENTS (Cont.)

	<u>PAGE</u>
VII. POSSIBLE ALTERNATIVES	77
A. Auto Availability	77
B. Patrol Mileage	79
C. Number of Patrol Vehicles	80
VIII. SUGGESTIONS FOR FURTHER WORK	81
A. Manpower Planning	81
B. Improved Patrol Supervision	81
C. Improved Patrol Allocation	82
D. Experiments in Crime Deterrence	83
E. Selective Treatment of Drunk Arrestees	83
F. Vehicle Maintenance and Planning and Replacement Criteria	83
G. Functional Budgeting	84
REFERENCES	85
ACKNOWLEDGEMENTS	85
CONTRIBUTORS	85

Supplemental information on the Boston Police Department's police radio system and on oral and written communications that arise from complaints is available from Arthur D. Little, Inc., Acorn Park, Cambridge, Mass. When requesting, specify Appendices A and B of this project report.

LIST OF TABLES

<u>TABLE</u>		<u>PAGE</u>
1	Approximate Numbers of Public Open-Air Telephone Booths and Police Call Boxes in the City of Boston	42
2	Approximate Distribution of BPD Budget	70
3	Capital Expenditures Required for a 4-Frequency Radio Dispatching System	73
4	Capital Expenditures Required for a City-Wide Radio Call Box System	74

LIST OF FIGURES

<u>FIGURE</u>		<u>PAGE</u>
1	Present Communications Links	34
2	Map of the City of Boston	48
3	Possible Arrangement for a New Control Center	49
4	Proposed Organizational Structure of Records & Data Division and Communications Division	65

I. INTRODUCTION

This report describes an analysis of the communications and records capabilities and requirements of the Boston Police Department. The report recommends changes in equipment and procedures in these areas, and considers the problems of cost, timing, and motivation. Other areas of police operations are also discussed. The analysis was conducted by Arthur D. Little, Inc., of Cambridge, Massachusetts. Financial support for the study came from the Boston Police Department and the Office of Law Enforcement Assistance, U. S. Department of Justice.

## II. ORGANIZATION OF THE REPORT

Chapter III sets the stage for this report by describing first what the police function is and then how well the Boston Police Department performs. The question of efficiency is examined in addition to that of effectiveness.

Chapter IV states the objectives of this study succinctly, and makes it clear that emphasis is upon communications, reports, and records.

From this point on, the report goes progressively from the general to the specific. Chapter V presents an overview of the conclusions and recommendations. This is followed by the major portion of the report, in which each area of analysis is taken up in turn. The text of Chapter VI justifies and explains the recommended changes. Recommendations are scattered through the text. Major recommendations are underlined so that they can be found easily. It is hoped that this arrangement will encourage reading the recommendations in context.

Chapter VII examines the question of whether the recommended changes are as efficient as other possible changes, in achieving the results desired for the Department. Chapter VIII contains suggestions for further work which might improve the capabilities of the Department.

A number of technical appendices are included for reference. These contain material either too detailed or too digressive for inclusion in the main text.

## III. BACKGROUND

The objectives of a police force are: to protect lives and property by deterring crime and controlling such activities as traffic; and to apprehend criminals and make cases against them. It is difficult to determine or even define the success with which these objectives of deterrence, control and prosecution are attained. The effectiveness of deterrence is usually measured in terms of the crime rate, or per capita number of offenses, for the so-called Index Crimes\*. The success of the control function is reflected in vehicular and pedestrian injury and accident statistics, in the number of civil disturbances, their extent, and the skill with which they are handled. The effectiveness of apprehension is measured by the percentage of offenses that are cleared by arrest or exceptionally cleared by some means such as the death of the offender, and by the fraction of arrests which result in convictions.

### A. DETERRENCE

The rate at which aggravated assaults and crimes against property are committed in Boston is lower than the average for U. S. cities of comparable size. On the other hand, Boston has special problems with burglary, breaking-and-entering, and auto theft. (It will probably have the second highest auto-theft rate in the nation this year.) However, it is hard to feel complacent about Boston's slightly better-than-average record in deterring crime. For U. S. cities with populations between 300,000 and 1,000,000, the average number of police officers per 1000 citizens is 1.9; for Boston (population 680,000 estimated), the figure is 3.7. For the same cities, the average number of policemen per square mile is about seven; for Boston, 57. (For San Francisco, the city of most comparable size and other characteristics, the figures are: 2.4 and 14.) On the basis of its staffing, then, one might expect Boston to have a superior record in deterring crime.

\* Murder and non-negligent manslaughter; forcible rape; robbery; aggravated assault; burglary; larceny \$50 and over; auto theft.

#### B. CONTROL

Boston has a mixed record of protecting lives and property on its streets. The traffic fatality rate of 10.6 per 100,000 population is below average (12.8) for cities of its size, and below the state-wide average of 15.8. It is above average in terms of fatalities per 10,000 registered vehicles (3.8 vs. 3.0 average), perhaps reflecting the daily influx of suburban commuters. There were, however, more than twice as many non-fatal, injury-producing accidents than one would expect on the basis of national averages for cities.

The Boston police have not been accused of contributing to civil disturbances, as police have in some cities: they have dispersed recent outbreaks in a professional manner, in spite of the exacerbating influences of some local news media.

#### C. APPREHENSION

The proportion of offenses cleared by arrest is very close to the national average; however, the proportion of clearances is above average for larceny and robbery and below average for murder and auto theft.

#### D. COSTS

It is necessary to examine costs as well as performance. The per capita cost for police in Boston is one of the highest in the country. For U. S. cities with populations between 300,000 and 1,000,000, the average annual per capita cost is roughly \$17.50 (1965 estimate). The figure for Boston is about \$32 (and for San Francisco, \$25.50). On the other hand, the cost per policeman is close to the national average for these cities. The national average (annual) compensation for a patrolman is roughly \$7,000; for Boston it is \$7,300. The disparity increases slightly with rank: the national average for a captain is \$10,000; in Boston a captain receives \$11,000. For comparison, patrolmen and captains in San Francisco receive \$8,800 and \$16,200 per year, respectively.

#### E. EXPLANATIONS AND STUDIES

Naturally the department has reasonable explanations for the facts just stated. The high rate for auto theft is explained by the fact that Boston counts all cases of unauthorized use as theft; a vehicle must be missing for some minimum time before its loss is counted as a theft in most jurisdictions. The high number of policemen per citizen is explained as a response to the massive numbers of people who commute to the city from nearby suburbs and to the unusual services rendered by the Department. The high number of police per square mile is said to reflect the fact that Boston is small in area; this ratio is said to be less significant than police per citizen, in any case.

The high per capita cost of police protection is explained by the unusual services provided by the Department. The police provide close to 100 free ambulance runs per day, for example. Each year they take a complete census of all citizens of age 20 and above. In addition, the Department operates much of the city's licensing function, including inspection.

In spite of these explanations there is concern, both because the per capita cost for police protection is so high, and because the degree of protection does not appear to correspond to the cost. Consequently, the Boston Police Department has been studied repeatedly with the aim of improving its performance and more effectively using its resources of men and money.

The most recent study was done by the International Association of Chiefs of Police. That 1962 study dealt with the entire police operation, including administration, personnel, operations, communications, records, and facilities. Some of its recommendations have been put into effect; some have not.

It is evident that further changes might be made in the objectives, amounts and allocation of resources, and operating procedures of the Department. Pressure for change arises internally as well as from external sources. A commitment has been made to install a third-generation computer for data processing and retrieval. This installation

will require changes in some operations. In addition, there are two opinions expressed widely throughout the force: that the Department is overloaded with paper work, and that it needs to get police officers now performing clerical duties back on the street as patrolmen and detectives. The implication is seldom that paper work might be handled by machine or by persons other than policemen, thus releasing men for patrol and/or investigation. The implication is usually that much of the paper work is unnecessary.

#### IV. STUDY OBJECTIVES

The elements of police work are manpower, mobility and information. The manpower must be recruited, trained, deployed and supervised. The men must be able to move about, on foot, horse, cycle, auto or other vehicle. But these elements cannot be effective without information. Up-to-the-minute information is needed so the men can be at the right place when needed, and so that management can know that the work is being performed. This operational information is conveyed by radio, telephone, teletype, telegraph, police call box and other communications channels. Information about the past is also required; some to be used in current operations (checking for stolen cars, for example) and some to satisfy legal requirements, or to allow analysis. Records about the past not only need to exist, they must be accessible.

This report concentrates on the information needs of the Boston Police Department, including communications, day-to-day reporting, and the entire system of permanent records. Changes are recommended in each of these areas. In addition, the report presents a few conclusions with respect to mobility and manpower which flow naturally from the work on information.

The objective is not only to point out areas where change is needed, but to state what should be done, how to do it, how much it may cost, and when it may be possible.

## V. SUMMARY

### A. REPORTS

The reporting system now used by the Boston Police Department achieves its effectiveness at a great cost in manpower and time. Efficiency can be increased by decreasing the amount of paper work done in the field or at the District Stations, at the expense of some increase in work at Headquarters. Eventually, much of the extra work at Headquarters can be done by electronic data processing equipment.

A first step should be to categorize incidents according to their importance. Three levels are suggested. The first level consists of those incidents for which no written report is required of the field man. Reporting of such Miscellaneous Incidents is done verbally to a second-level dispatcher in the turret. If the action is self-initiated, the patrol officer will first tell the secondary dispatcher, by code, the nature of his action. If an investigation has been assigned by the primary dispatcher the patrol officer will report his actions by code to the secondary dispatcher at the time of clearance. The code used for clearance will indicate both the nature of the call and the action taken: the former in case the actual incident was different from what was expected. More than half of all field incidents can be reported in this manner.

The second suggested level of reporting involves those incidents which result in an arrest. When the officer involved calls in to clear, he states that an arrest has been made, plus the crime code. The arrest report, to be made out by the field man, is the only report; the present 75-48's will not be used.

The third level of report is a field report tailored to the type of criminal or other incident investigated. It is recommended that each patrol vehicle, and possibly each patrol officer, be supplied with a field reporting manual. This manual should contain instructions, blank forms to be filled out, and general reference material on laws and procedures.

Details of a field reporting manual and forms are not given here. There are several possible systems which might be used. They do not differ in principle as much as in detail. It is suggested that a small committee of field officers be assigned to settle on final format and details. This procedure would improve both the chance that such forms will be accepted and the likelihood that they will be responsive to any purely local requirements.

Arrest and field reporting forms should be printed with one carbon duplicate of medium stock. The forms should be filled in by hand, either pencil or ball-point pen. It may be necessary to insist that those who write poorly shall print. The forms should not be copied by typing. The carbon copy should stay at the District in which it is produced. The original goes to Headquarters where further copies, in the correct number, are reproduced and distributed.

Copies of the Field Reports should serve as a source of records for the public, concerning incidents in which they have a legitimate interest. Suitable masks may be used to blank out information not suitable for release to the public. It is thought that this is an improvement over the present scheme of copying the relevant journal paragraph. It not only will give a more professional appearance to police records but also will give the public direct access to the original report rather than to the version typed at the Station. The standard of field reporting will be forced upward, but only if there is adequate supervision.

Use of the recommended hierarchical reporting system for incidents would reduce the field man's paper work. Use of field-reporting forms would cut down paper work in the District Stations as well as provide a record in more useful form than the present Journal. (The latter is more than simply a record, however, as will be brought out later.) There still remains the question of the almost 1,000 official forms in use by the Department. Clearly, a forms-management effort could reduce this number. However, the aim of this study was to improve the reporting procedure for primary police work, as contrasted to administrative and ancillary work.

## B. RECORDS

The Boston Police Department has an inadequate central records system. As a consequence, a tremendous amount of time and energy is spent throughout the Department by individuals and groups creating their own small records systems. As a very conservative estimate, there are in the department fifty name files, each laboriously created and maintained. If there were a master name file at Headquarters, all of these satellite files could be created by data processing machinery with a tremendous saving in manpower. More to the point, if there were a master name file, many of the duplicate files would be unnecessary.

The greatest inefficiency in the records system is the District Journal. An equivalent of 75 men in the Department are employed in keeping up these Journals, mostly with information which appears in other places, possibly at other times. The Journals are more than a record of history, however; they are the means by which the District Station can know what is happening in its District from hour to hour. Except for piecing together a picture from listening to the police radio net, a very difficult task, there seems to be no other way for the District to know what is happening. Therefore, although we recommend that the Journals should be dropped eventually, we also recommend that this act be coupled to a promise to provide something of equal or greater value to the District.

The steps which must be taken to augment the political feasibility of discontinuing the Journals are tied intimately to the command and control operation (the turret). An explanation of these steps is deferred until the communications and command functions have been discussed.

A first step in the creation of an adequate central records system is the compilation of a master name file. The present Central Records Section has two parts of such a file. One is the index of known offenders; the other is the index of names found in the Journal. The Traffic Analysis Unit has a third component. It is recommended that all three of these components be co-located, preferably on the first floor of the Headquarters building. There is a problem, however, of floor load. The present filing cabinets in the C.I.D. have already

exceeded the safety limits of the building by a considerable margin.

There should be one central file of all names to be found on incident reports (from the turret) and on field reports, including traffic. Names should include those of victims, witnesses and complainants, as well as known or suspected offenders. The complete file should be restricted for police use only.

It is suggested that the District Control Log should eventually be supplied to the District from Headquarters rather than in the other direction.

Records needed by the investigative branch have been looked at only superficially. Nevertheless, it is apparent that a simple addition of equipment could greatly facilitate one detective function. It is recommended that each detective group be supplied with a microfilm reader and microfilm rolls of mug shots. It is possible to get adequate color shots for a very reasonable cost. This would give District detectives a better opportunity to show shots to victims in the many cases where the latter are reluctant to spend time going to Headquarters.

Records which form a basis for reports to the FBI will be discussed under the section on the computer facility.

Creation of a central records system will require reallocation of space within the Headquarters building. It is suggested that the first floor is the only one adequate for the floor loading which may be created. In addition, the first floor would be convenient both for the public and to the suggested ultimate control room in the sub-basement. Parenthetically, the whole utilization of space within Headquarters needs to be examined carefully.

### C. COMMUNICATIONS

Communications include many links in the police context. It is the means by which a citizen requests police service (telephones, citizen alarms); police cars are dispatched to incidents, and report back to the dispatcher (police radio); administrative information is

passed between Headquarters and the Districts ("hot lines"); and patrolmen maintain contact with the District personnel (recall lights, call box telephones). None of these links functions as well as it could. The Complaint Clerks receive telephone calls from all of Boston, making it difficult for them to determine the appropriate car to have dispatched. About 70% of the citizen alarms received are false. Traffic on the police radio is experiencing a very high rate of growth, impeding its efficient use. The Station-to-Headquarters telephone lines are used primarily to communicate information of a routine nature. The recall lights and call box telephones, originally used to supervise and control the patrolmen in a District, have long since ceased performing this function; nothing has taken its place.

Police internal communications can be separated into two categories, emergency and administrative/supervisory. The emergency communications system should be expanded in order to provide for adequate capability at present, let alone in the future when patrolmen will be equipped with portable radios. A three-channel, three-zone dispatching system for Headquarters-to-patrolmen communication will greatly improve the operation of the system, reduce response times and dispatcher work loads, and be more responsive to the needs of the police and the citizens of Boston.

As previously mentioned, supervisory control of the patrolman is inadequate mainly because of the lack of a definite supervisory channel. Use of the police call boxes for supervision became ineffective when automobiles and radios began to be used for patrol, over twenty years ago. Headquarters, in particular the communications center known as the Central Complaint Room, is the repository of the information of use to supervisors: what each patrol car is doing, how long he is taking on each assignment, etc. A computer can keep track of these facts, District by District; a coaxial cable installed between Headquarters and each District Station House can transmit the data; suitable equipment in the Station House can display the data.

The "hot lines" may be used occasionally for emergency communication between District and Headquarters (such as a walk-in complaint

or a request for a certain car), but they are more commonly used by the District to obtain Central Complaint numbers and to notify the dispatcher of a call box citizen alarm. Using the same computer and coaxial cable, all Central Complaint numbers relevant to a District can be teletyped to the District; connecting the citizen alarms directly to Headquarters would eliminate another source of traffic, leaving the telephone circuits open for the more important communications.

About seven out of every ten citizen alarms answered by the police are false alarms. There were almost 8,000 false citizen alarms in 1966 (and over 8,000 false fire alarms to which the police responded). Both citizen and fire alarms are operated by pulling a crank. A voice link between the alarms and the authorities would improve the state of knowledge in the event of an emergency, and would discourage false alarms. We therefore recommend that a pilot program using open radio emergency call boxes be instituted in order to determine their utility to both police and fire departments. Since Districts 1 and 2 are due to be consolidated within the year, we recommend that they be the focus of the pilot study. As a second choice, we recommend the use of telephone call boxes: cost data are not now available to make a final decision possible.

#### D. COMMAND AND CONTROL OF OPERATIONS

The Districts would not have to generate the synthetic reality represented by the Journals if they had the information available in the turret plus a little more. The little is very likely to be exactly what the turret needs to perform its function more effectively: a status board describing the recent past.

At present, the dispatcher knows which cars are on assignment but can tell only at considerable inconvenience the relative importance of various car assignments. It is so difficult, in fact, that few attempts are made to search out cars on unimportant assignments when an emergency arises and cars are scarce. Further, no attempt is made to monitor cars to see whether they are off the air so long as to suggest danger or dereliction. The latter information can be pieced together after the fact but is not, in spite of its utility for the supervisory sergeants at District level.

The present situation is that the dispatcher gives assignments but has little control. He seldom knows the present state of affairs well enough to direct changes as necessary.

It is now technically feasible to make a command and control system for police field operations which will: allow the dispatcher to see at a glance the status of car operations in any District; allow District supervisory personnel to know what its cars are doing; provide data on daily operations in a machine-usable form for the preparation of daily operational statistics; provide the basis for a District control log to be prepared at Headquarters for transmission to the Districts; and provide the machine-usable data base for a name and location index.

The heart of the feasible system is a computer in the size range already planned for, plus some ancillary equipment discussed in detail later in this report. The heart of the justification is that Headquarters, by increasing its capability from simply assigning to command plus control (i.e., monitoring so that changes can be made), will have information which will both improve field operations and allow many men to be released from paper work and returned to police work.

#### E. THE COMPUTER FACILITY

The Department is committed to installing an IBM 360/30 computer system to be used for routine processing of data and for responding rapidly to field inquiries about stolen cars, missing persons, warrants, and perhaps other information stored on disc files. Some police agencies have found that rapid data retrieval is of utility in field operations. However, we believe that the computer system would best be employed in controlling field operations, and that rapid response to inquiries is only ancillary to the more important control functions.

The task of specifying and selecting the appropriate computer, tape and disc files, and input/output devices including display units to handle routine data processing, on-line inquiries, and control of field operations is complex, and it deserves a thorough and comprehensive analysis. The tasks of specifying and writing the computer programs

which would enable the display and other systems to function effectively also needs to be studied in detail. A thorough analysis might indicate that the IBM 360/30 is the appropriate computer system, but there is no a priori reason for assuming this. We strongly urge the Department to postpone the selection and installation of a computer system until it conducts a careful study of what its requirements would be using the systems recommended in this report.

#### F. IMPLEMENTATION

##### 1. Reporting

It is recommended that as soon as a two-dispatcher, three-channel radio system can be implemented, the reporting of miscellaneous field incidents by code by instituted. The remainder of the recommended field reporting procedure should proceed through: preparation of final forms; preparation of a training syllabus; instruction and testing in one District; revisions as needed; and city-wide adoption. The process may take up to six months.

##### 2. Command and Control

It is recommended that the two-dispatcher system, based on a functional division, be implemented as soon as possible. Plans should simultaneously be prepared for a three-dispatcher system, based on a geographical division of responsibility. This facility should be built in the sub-basement of the Headquarters building.

It will take in the order of a year for the telephone changes required to implement an area system. It will take longer to change over the mobile and base radio facilities, perhaps up to two years.

The proposed system includes use of portable radio equipment which, while in a vehicle, will utilize vehicle-installed microphone and antenna and be the only radio available.

It is recommended that the scheduled computer installation be deferred until specifications can be prepared for an installation which can cope with both the planned-for functions (missing person, stolen car and other files for rapid retrieval) and the proposed function of operational control.

##### 3. Space Utilization in Headquarters

In addition to utilization of the sub-basement, mentioned above, it is proposed that a Central Records Unit be created on the first floor and that the computer facility be installed in the basement of Headquarters.

##### 4. Records

It is recommended that a master name file be created. The principal base for such a file is the present name file in the Criminal Investigation Division. To this file should be added the files kept in the Traffic Analysis Unit and those now abstracted from Journal entries. The names of all offenders, suspects, complainants, witnesses, and victims should be included. The problem of purging this master file is discussed in a later section.

We recommended that the Journals now maintained at District Stations be abandoned. We recognized that there will be very strong resistance to such a move. However, we suggested that adoption of the field reporting scheme proposed here will go a long way toward making the Journals unnecessary. The final step is, in our opinion, the provision of a picture of current events for each District, as described above. With the availability of such current information there would appear to be no further excuse for continuing the Journals. An estimated 75 men would thus be released for other police functions.

The proposed computer facility will be able to prepare most of the statistical reports required by the FBI without going through intermediate records as is now the case. In addition, the rapidity with which such reports can be prepared by a computer facility will greatly enhance their value in planning day-to-day operations.

##### 5. Suggested Organizational Changes

The Traffic Analysis Unit should be shifted to Headquarters and made part of the Planning and Research Division. When the data-processing activities of that Division are eventually shifted to the recommended Records and Data Division the Traffic Analysis Unit should move too. This unit is primarily a data-processing activity. For this reason,

plus its input of names to the master name file, it should be in Headquarters. Another reason is that its output of advice with respect to preventive enforcement might be more useful if issued from Headquarters than from the Traffic Division.

Because of the increasing workload in communications, and the planned addition of a computer facility and true central files, it is recommended that the Records and Communications Division be divided into a Records and Data Division and a Communications Division. The proposed structures of these two new Divisions are given in the following Chapter. The only new features included are small units for planning and analysis of the needs and functions of the new Divisions.

It is recommended that the dispatchers be placed under the Bureau of Field Operations as far as their operational authority is concerned, even though they may report to the Communications Division for administrative purposes.

If all of the recommendations described above were to be put into effect immediately, they would be ineffective unless there were a means of insuring that the changes were effectively carried out. Therefore, we strongly recommend that the Bureau of Inspectional Services be given the responsibility, and the authority, to insure that the necessary operations and procedures are being applied correctly by the personnel of the Boston Police Department.

#### G. ESTIMATES OF COSTS AND RETURNS

Our estimates of costs of, and returns from, the proposed changes have been made in terms of patrol car equivalents. One effective patrol car represents approximately nine man-years and \$68,000 per year. Assuming that the recommended radio call boxes are installed city-wide and that the portable radios are adopted there would be an initial capital outlay of roughly \$1.5 million over a two-year period. After that the annual budget would be increased by approximately \$200,000. The gain provided by this increase, in addition to the real-time control capability, would be equivalent to five patrol

cars, or roughly 45 men, released for police work. Under the present scheme of things, this gain would cost \$340,000 per year. If, instead of maintaining a constant size force, it were decided to maintain a constant budget, the force size would be decreased by roughly 50 men. Another twenty would be required to operate the computer facility, and the net gain "on the street" would be two-plus patrol cars.

## VI. CONCLUSIONS AND RECOMMENDATIONS

Rather extensive changes in present practice are required if Boston is to have adequate records and communications. The criteria that should guide any reorganization are simple and obvious: the detail, comprehensiveness and timeliness of the information that police need to adequately follow-up, record, and control their activities varies according to conditions such as the type of offense investigated. For any investigation, the information needed and only this information should be communicated and recorded, and this information should be available to those who need it when they need it in a form suitable for their purposes.

Of course, there are a variety of ways to attain a system of this description, some capital intensive, some labor intensive, and some in-between. An "optimum" reorganization would employ each resource available to the Department up to the point where the marginal contribution of the next unit used is the same for all. Obviously, practical problems make it very difficult, if not altogether impossible, to measure the marginal contribution of each resource. However, even a casual examination of the relative productivities of capital and manpower in the Boston Police Department is sufficient to show that the marginal productivity of capital is by far the greater. The proposals which follow provide a workable means for implementing a records and communication system which is near to "optimum" in terms of the criteria stated. Implementation would require a substantial capital expenditure, but the rewards as measured by such things as the improved quality and timeliness of information and by the productivity of policemen released from clerical duties will more than offset this cost.

### A. THE REPORTING SYSTEM

#### 1. Police Investigations and Reports Arising From Them

Boston patrolmen who investigate citizen complaints must complete a variety of reports each day. Some of these are not needed at all; some are needed, but convey more than the necessary information; and some supply information similar or identical to that in other reports. Patrol-

men's reports are only initial documents in the reporting system, and from them still other documents containing the identical information are prepared. The clerical time needed to maintain the system is obviously large. However, the inefficiency is measured not only by unnecessary clerical time, but also by the inevitable confusion, delays and red tape that result from a poorly conceived and difficult to administer information control, storage, and retrieval system, and by the limitations on usefulness and availability of the information that is recorded.

To take an extreme example, suppose that a citizen has just telephoned the Central Complaint Room to report that a robbery was committed an hour ago by felons who departed from the scene in a stolen city-owned vehicle. A clerk in the Central Complaint Room answers the call, completes a stolen-car card for the "Hot File", writes a very short description of the incident and other information on a Complaint Message Card (CMC), and places it on a conveyor which carries it to a dispatcher. On the basis of the information on the CMC, the dispatcher assigns a patrol-car officer to investigate the citizen's report. During or immediately following his investigation, the assigned officer takes notes on the back of a folded 8-1/2" x 11" teletype manifold or other informal note paper. He then returns to his District Station where he completes and submits

- a. a 75-48 Report (The form for this report is printed on punched card stock although nothing is punched in it. Because of its size, it often has inadequate space for a full written description of the incident.)
- b. A Felony Report (Every robbery requires a felony report. The information on this report includes what is reported on the 75-48.)
- c. A "Special" Report (Theft or destruction of city-owned property requires a non-standard report called a "Special".)
- d. Stolen Automobile Report (This report contains much of the information recorded on the 75-48 and Felony Reports.)

The Duty Supervisor or one of his clerks reviews and edits these reports.\*

\*If someone were injured in the robbery, or if suspects were arrested, additional reports would be required.

If the reports are found to be inadequate, the investigating officer may be asked to rewrite them or he may be told to return to the scene to get additional information.

When the reports are satisfactorily completed, a member of the District staff types a description of the incident in the Journal, a detailed chronological compendium of events that happen in the District. A one line summary of the incident is also typed on the District Control Log, and two stolen-car cards are prepared, one for the District file, and one for the Automobile Squad at Headquarters.\*

Each day the Journal, Control Log, and Reports are sent to the Code Room at Headquarters where they and the CMC's are audited to make sure that all are mutually consistent. Headquarters also makes a Xerox copy of the Journal entry for the Robbery Squad. The District is required to send a 75-49 follow-up report to the Code Room within 48 hours, and a 75-52 follow-up report each time the status of the case changes after this time. The Code Room holds the 75-48 Report until a 75-49 Report is received, both as a control to assure follow-up and to check to see that the reports are mutually consistent. The format for the 75-49 and 75-52 follow-up reports is almost identical to that of the 75-48 Report.

The example cited is extreme, but even the most routine investigations require extensive reporting. For example, the arrest of a teenage boy for breaking a streetlamp would require a Complaint Message Card, an Arrest Report, a 75-48 Report, a Special Report, a Journal Entry, and a Control Log Entry. A detailed description is given in Appendix A.

## 2. A Hierarchical Reporting System

The present reporting system does not formally categorize incidents for reporting purposes. As a result, reporting of minor incidents

\*The Control Log is used as a source document for keypunching cards from which various statistical reports are prepared. A rough Control Log entry may also be completed in pencil on the basis of information received from the Central Complaint Room.

is much too detailed and time consuming. We recommend a hierarchical system with different reporting requirements for each of three distinct levels of complaint importance.

The most numerous but individually the least important police investigations are of miscellaneous incidents like false alarms, noisy parties, and other disturbances. We propose that formal written reports be eliminated for most such incidents. Instead of submitting a written report, the investigating officer would report the results of his investigation directly to the dispatcher. The class of incidents for which this is permissible would be defined by listing each type of Miscellaneous Incident in a standard table.

Of course, it is impractical for a patrolman to radio detailed accounts of investigations to a dispatcher. However, for most investigations, the results can be placed in one or more of several categories and the investigating officer need only report category codes. We recommend that the types of Miscellaneous Incidents be given numeric codes and the usual police actions alphabetic codes. To report his investigation of a miscellaneous incident, an officer would say "missle" to indicate the type of report, and then give the numerical code of the incident and one or more alphabetic codes which indicate the result of his investigation. To avoid confusion, he should use a specified phonetic alphabet to report alphabetic codes. For example, to report a domestic disturbance where the officer was able to restore peace, the officer might state "missle -- one Frank". If one of the parties to the disturbance were advised to obtain a warrant, the officer might report "missle -- one Frank George" where "George" would indicate that a warrant was advised.

Some Miscellaneous Incidents require brief written reports. For example, when a broken window is discovered in a city building, the appropriate city agency must be notified so that the window will be repaired. A card-size Miscellaneous Incident Report should be created which would be mandatory for some incidents, discretionary for others, and unnecessary for most. If a Miscellaneous Incident Report is to be submitted, a police action code should indicate this. For the example above,

the officer might state "missle -- one Frank X-ray", where X-ray would indicate that a Miscellaneous Incident Report is to follow.

Occasionally, information of value for future investigation such as descriptions of suspicious persons or youth gangs will be turned up while investigating a Miscellaneous Incident. Information of this nature should be reported on another newly created form, the Information Report. This report would be routed to the detectives and would be used whenever a patrolman turns up useful information which would not otherwise be reported.

Some incidents where persons are arrested require a substantial amount of reporting but others do not. Arrests for drunkenness and warrants served for other jurisdictions are good examples of the latter. A list of those arrests for which no additional reports are required should be created. Arrest Reports would serve as the official Departmental records of both incidents giving rise to these arrests and the arrests themselves.

The final class of incidents includes those of which one or more field case reports are required. An Arrest Report may also be required for these incidents.

Specially designed case reports should be created for Robberies, Burglaries, Crimes Against Persons, Auto Thefts, Worthless Documents, Missing Persons, Hospitalizations, Vehicle Towing, Traffic Accidents, and Motor Vehicle Recoveries. In addition, a General Report should be provided to record preliminary investigations of offenses not specifically provided for by these forms.

### 3. Field Reporting Manual

Careful training of police officers would be required to acquaint them thoroughly with the alternative reporting procedures and associated forms. A Field Reporting Manual should be created to provide each patrolman with concise instructions for reporting incidents of all descriptions. For each incident on a comprehensive list, an index should indicate which report(s) if any are to be submitted or what Miscellaneous Incident reporting procedure is to be followed. The index would also give offense

classifications for entry on written reports and references to relevant statutes. Separate thumb-indexed sections of the Manual would describe the use of, and give instructions for completing, each written report. If an officer were uncertain about reporting procedure, he would go to the index, determine what reports, if any, should be submitted, and then go to the appropriate section(s). Each patrolman would be issued a copy of the Manual, and every vehicle would carry one.

Police officers would be expected to be completely familiar with the contents of the Manual, and would be required to attend a one-week training school to thoroughly acquaint them with the revised reporting system and some aspects of the revised communications system described in other sections of this report. At the conclusion of school, each officer would be tested, and if his understanding were found to be inadequate, additional study would be required.

Occasional one-day schools would reinforce and test the initial training and provide a forum where officers could register complaints, make suggestions, and ask questions. One-day schools would also be held to correct widespread deviations from standard practices if any were observed and to explain any substantial changes. The Field Reporting Manual would be in a loose leaf binder so that it could be changed easily whenever desired. Minor changes would be announced in memoranda accompanying the replacement pages. The District Captains would explain minor changes and see that each patrolman had an up-to-date Manual.

## B. RECORDS

### 1. Master Name File

The Department has an adequate records system in the Criminal Investigation Division, a barely workable system in the Traffic Division, and essentially no records which can be called "central records." At the same time, there are multiple records kept in myriad places, to ensure availability of information to those who need it.

Hopefully, all of the information in District-level records (files) exists also at Headquarters. If it were readily accessible from Headquarters, it would not need to be copied and stored at the Districts. For example, if there were a master name file at Headquarters, prepared on punched cards or tape, then each District could be given a daily (and weekly, etc.) printout of all relevant names for the period. With each name would appear date, time, crime (or incident) code, and an identification (C.C.) number with which to retrieve pertinent reports, if any. Machine processing at Headquarters would make it unnecessary for clerks at the Districts to prepare such an index. If the District needs a card file, that too should be prepared at Headquarters by machine.

We recommend that a master name file be established, as the core of a central records system. This file should contain names of all known or suspected offenders, victims, witnesses and complainants. In addition, persons who come to police attention through the licensing activity should be included. The file would be for police use only.

The present file of names of persons arrested should be the core of the proposed Master Name File, and the names that are currently being added to the Traffic File and the Journal Index should instead be added to it.\* To accomplish this index consolidation, the

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\*If the recommendations of the report were adopted, the names now appearing in the present Journal index would be taken from documents that would replace and serve the same functions as the present Journals.

Traffic Analysis Unit, which now prepares a name file for traffic incidents, should be moved back to Headquarters,\* and the public information desk, at which copies of Journal entries can now be obtained, should be co-located with the Master Name File.

New name cards for the master file would eventually be prepared using the computer. This is described more fully in Section VI E.

## 2. Control Numbers

To locate records (if any) relevant to it, each incident for which one or more name cards appear in the master file would have a control number (C.C. or Central Complaint Number). Traffic incidents should be identified by a separate series of numbers, perhaps with an alphabetic prefix. Alternatively, traffic incident reports might be filed by vehicle registration or operator license number.

## 3. File Purging

There is little to be gained from saving case reports (and the associated index cards) beyond the time that the applicable statute of limitations runs. In Massachusetts a statute of limitations runs six years for most crimes. However, there are some exceptions, e.g., murder, for which there is no statute of limitations, and robbery for which the statutory limit is ten years.

We recommend that cards for the Master Index be printed on colored card stock, and that the color of the cards be used to indicate the year that the cards and associated records are to be discarded. The cards for arrest reports and for crimes without a statute of limitations should always be printed on the same color of card to indicate that these cards and the associated records are not to be purged.

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\*The choice of an administrative location for the Traffic Analysis Unit is discussed in Section VI F.

## 4. The Journals

After careful consideration we recommend that the Journals now kept at the District level be abolished. This should not be done, however, until a better system has been created to meet those needs which the Journal now meets rather inadequately.

In many respects the Journal is like a Sunday newspaper: each reader uses only a fraction of the information provided but would object strongly if the paper were not available. The problem is to determine what functions the Journals perform, or fail to perform, and to devise more efficient and effective ways to carry out these functions.

As a record of history the Journals are used in three ways:

- (1) by the police, to provide a picture of the immediate past, in terms of minutes or hours;
- (2) by the public, as proof of the existence and/or nature of past events; and
- (3) by the police, to describe the recent past, in terms of days.

The Journals are inadequate for either of the first two functions. We shall discuss each of these functions in turn: current events, the public record, and recent history.

### a. Current Events

Commanders at the District level need to know what is happening from moment to moment in their area of responsibility. The picture of what is happening is created on the pages of the Journals, primarily because there is no alternative. This explains the very strong resistance to abandoning the Journals and our recommendation that they not be dropped until something better is provided.

It is easy to show that the picture of reality created in the Journals is inadequate for command needs. The District Commander does not know, for example, how his patrol cars are occupied at any instant, or whether they are spending reasonable amounts of time on their assignments.

Provision of an adequate picture of current events in a District is intimately tied to the operations of the command and control center (the "turret") and is described in detail in Section VI D.

b. The Public Record

At present the only police records available to the public are copies of Journal entries. Because there is no format or check list, the adequacy of these records is variable and a Xerox copy of a completed field report would be preferable. If the report form were designed carefully, it would be simple to mask out information which should not be given to the public.

c. Recent History

One of the functions now served by the Journals is to bring patrolmen up to date when they return to duty after time off. This function would be met by use of a District Operations Summary (DOS). Each DOS entry would contain roughly the same information that now appears on a Complaint Message Card, and would be sent from Headquarters by teletype or other transmission device as soon as the investigating car called clear. Entries for important incidents would be flagged.

The District would keep the entries in a loose-leaf binder, and this binder would be the District's primary chronology of its recent activity. All field reports would have a single carbon copy to be kept in the District while the original would go to Headquarters. The carbon copies would be kept in a notebook for two or three days before being filed by Central Complaint number so that an interested policeman could easily refer to reports for incidents that are flagged as important in the DOS.

5. The District Control Logs

The District Control Logs should be abolished. The logs are presently used primarily by Headquarters as a source document for key-punching cards that are used to prepare statistical reports. They are sometimes used by the Districts as a brief summary of recent history, but

this information would be provided by the recommended District Operations Summary. Section VI E describes how Headquarters would obtain the necessary statistical information without burdening the District with the preparation of Control Logs.

6. Photograph Files

The "mug shot" files at Headquarters are excellent in technical quality and they are filed in a useful way. These files are used to less than maximum advantage, however, because of the time required to get to them. We recommend that the working color files (as contrasted to the large and largely unused black and white files) be microfilmed. Each detective unit in an outlying district should be equipped with a microfilm reader and the photo files on film. The films should be updated, say every six months in order to include recently taken photographs. A re-arrested person should be photographed if more than three years have elapsed since his most recent previous arrest.

C. COMMUNICATIONS

The following diagram (Figure 1) shows the possible links among the four parties concerned with police communications: the Headquarters radio room (turret) from which orders are issued to field activities; mobile units in the field; station houses at the District level; and the public. Considering each party as a source, there are theoretically 16 possible one-way communication links, but four of these are either not practical or not necessary. Most of the links are symmetric, but some are not: that is, in some cases A calls B over a different link from the one over which B calls A.

Police communications will be treated in four parts: a general evaluation of facilities and equipment; recommendations for change in various communication links; suggestions for change in support functions; recommendations for changes in command operating procedures.

1. Evaluation of Facilities and Equipment

The technical facilities used in communications are radios, public and private telephone lines, police call boxes, recall lights,

		<u>TO</u>			
		H.Q.	Mobile	District Station	Public
<u>FROM</u>	H.Q.	X	RADIO	HOT LINE; TELETYPE	TELEPHONE
	Mobile	RADIO	RADIO RELAYED VIA H.Q.	CALL BOX	X
	District Station	HOT LINE	RECALL LIGHTS & CALL BOX	TELEPHONE	TELEPHONE
	Public	TELEPHONE; CIT. ALARM VIA DISTR.	X	TELEPHONE VIA H.Q.	X

FIGURE 1: PRESENT COMMUNICATIONS LINKS

citizen alarms, and teletype equipment. These can be divided into radio and wire links.

The radio system of the Boston Police Department is described in Appendix B. The system is technically adequate for the present communications needs of the Department, very reliable and well maintained by the Radio Maintenance Section. In addition the Department's emergency radio equipment insures continuous communications in any emergency.

The wired communications of the Department include "hot line" private telephones (between Headquarters and the station houses), Bell System telephones, and police call boxes (wired into switchboards in the station houses). The hot lines are used continuously to transmit information between Headquarters and the Districts. The call boxes are used by the police, mostly for administrative matters, and by the public, mostly for false alarms. These systems are reliable and well maintained by the Signal Service Section.

The changes in facilities which are recommended below are designed to correct operational inadequacies rather than technical ones.

2. Recommended Changes in Facilities and Equipment

Several of the communication links shown in Figure 1 could benefit from change. Citizen alarms, call-box telephones, and recall lights are considered together as the call box system. The link between Headquarters and mobile forces away from their vehicles is essentially non-existent: it is taken up under the topic "portable radios." Finally, the link between Headquarters and district stations is examined.

a. Call Box System

We recommend that the call box system be replaced by an emergency reporting system, preferably using radio call boxes. The system should include voice communications, and should be connected directly to the Central Complaint Room in Headquarters.

The call box system of the Boston Police Department is physically and functionally outmoded. It was installed nearly eighty years ago. Its function was mainly to allow officers in the station house to supervise, control, and communicate with the patrolmen on their beats, with a secondary (but important) function of enabling citizens to call for police help. These links were essentially the only means of communication at the time: the telephone and automobile were considerably less ubiquitous than now and the two-way mobile radio was in its infancy.

Each call box is equipped with a duty pull, a pull to summon a wagon, a telephone to the station, a recall light, and a buzzer, all locked inside inaccessible to the public; and an accessible citizen alarm pull. The buzzer sounds on the station house switchboard whenever the box is unlocked. The wagon pull is no longer in use, the two-way radio or telephone to the station having supplanted it. The duty pull became obsolete when most of the patrolmen were put on cars, and is also disconnected. The recall light is still used to call a car, although one can be summoned more quickly by radio, especially when a particular man is wanted. The call-box telephone is still the only way for a patrolman to communicate with officers in the station house\* (at the signal desk) without returning there, but there is less need now for him to do so. Pulling the citizen alarm causes the number of the box and the time and date to be recorded on a paper tape at the signal desk in the station house.

However, very few people are aware of the existence of the citizen alarm on the call boxes (Reference 1). And many, if not most, of those who are aware of its existence appear to use it more to annoy the police than to seek their help: over 70 percent of the recorded citizen alarms are false. Furthermore, less than 1 percent of all Part I crimes and less than 2.5 percent of all Part II and Part III crimes\*\* are reported through this communication channel. Yet it is the

\*Of course, he can use a public telephone, but there is presently no way for him to get his dime back.

\*\*1966 statistics.

only way a citizen without access to a telephone (or a dime for one) can get police help in many instances.

This is the present status of the call box system. The Boston Police Department is faced with deciding whether or not to keep the system, and if not, what to replace it with. This decision is made more immediate by the imminent consolidation of Districts 1 and 2, in June 1968.

The present call box system is very well maintained by the Signal Service Section. A spot check of twenty-five boxes in Districts 2, 4, 11, and 14 turned up no defective units. However, the cost of maintaining and operating the system is quite high. We estimate that the average signal desk requires one-half policeman per shift, or approximately two and one-half men assigned to the signal desk in each of the thirteen station houses. This is the major operating cost, approximately \$240,000 per year. Maintenance costs are high due to the age of the system and the costs associated with replacing faulty underground cable; over \$150,000 of the Signal Service Section budget of \$175,000 goes for maintenance of the call box system. These figures demonstrate that it costs the Boston Police Department roughly \$700 to operate and maintain every call box, every year.

One of the reasons for the high cost of maintenance is that the city-owned cable system, which connects the call boxes to the station houses, is expensive to repair; but this cable system, over one hundred miles long, has less than 560 "customers," or call boxes, over which the cost is spread. Because the cables are terminated at the station houses, it is very costly to redefine District boundaries, which may be necessitated by population shifts.

Renovation costs, due to either consolidation of two police Districts into one or to large-scale construction projects, are very high because of the fixed nature of the underground cables. In order to keep these costs down, a microwave link was used to tie together two formerly separate call box networks into the present District 4. At present,

\$240,000 is budgeted for the consolidation of Districts 1 and 2 into a new station house in Government Center.

During 1966, there were 11,332 citizen alarms sounded, of which 7,573 were false. It takes approximately thirty minutes to check on a citizen alarm. Therefore, 473 eight-hour shifts were spent on checking false citizen alarms. Of the 3,759 remaining alarms, 198 were sounded for Part I offenses, 801 for Part II offenses, the rest for services, noncriminal disturbances, etc.

These figures should be contrasted with the number of citizen complaints received by the Central Complaint Section. 216,902 complaint cards were processed by the complaint desk. Of these, 25,454 were for Part I offenses, 36,359 were for Part II offenses, and the rest were for services, noncriminal disturbances, etc.\*

One cannot judge the merit of the call box system on the basis of gross statistics alone. Could the requests for police services have been communicated by means other than the citizen alarm? Can station-to-patrolmen communications be handled by other means? As a link between a citizen and the police the call box is the only means of communication that can be guaranteed; at night, in a strange neighborhood, lacking a dime for the telephone, a citizen would be hard pressed for a way to get help if there were no call boxes. As a link between the patrolman and the station the call box has little purpose; its existence may be helpful, but since all emergency calls are handled by the police radio, its traffic is mainly low-priority and administrative messages. These could be handled during slack times on the radio or when the patrol car returns to the station.

Thus, the one irreplaceable function of the call box system is the citizen alarm, despite its many faults. However, several alternative systems exist which perform this function better and at a lower cost.

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\*Including 16,506 false citizen or fire alarms.

These alternatives have two features in common: they are terminated in the Central Complaint Room rather than in the Station Houses, and they include voice communication between the citizen and a Complaint Clerk. The former feature decreases the reaction time of the police,\* while the latter allows the police to gauge the nature of their response.

The possible alternatives include the following:

A - Have New England Telephone and Telegraph install emergency telephones on the present police pedestals. This had been proposed by NET&T in 1961, again in 1965, and again this year. In 1961 the proposal focused on District 14 (as well as the whole Department); the 1965 proposal was concerned with the consolidation of District 16 and 4 and Districts 17 and 18; this year's proposal was concerned with the consolidation of Districts 1 and 2.

In the 1961 proposal NET&T estimated the annual cost of the system to be over \$143,000, of which \$27,000 was for annual maintenance costs incurred by the Boston Police Department for upkeep of pedestals and conduit. The responsibility for the system is thus shared by NET&T and the Boston Police Department: the call boxes would be maintained by NET&T; the pedestals and the connections from the call box to the NET&T telephone cable would be maintained by the Boston Police Department; and the cable to Headquarters and the switchboards would be maintained by NET&T. In any such hybrid system, questions of responsibility and jurisdiction can prevent the proper maintenance of the system, which is a disadvantage that the present system does not have. Furthermore, the proposed system is no more flexible than the present system, tied as it is to present pedestals with a high relocation cost.

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\* At present the alarm sounds in the Signal Room in the station house. The Signal Desk Clerk reads the tape on which the box number is punched out, determines its location from a map, and calls a Complaint Clerk to relay the information to him.

B - Have NET&T install emergency telephones on the outside of their outdoor telephones. Table I gives the approximate distribution of outside telephones and call boxes throughout Boston. Although there are one hundred fewer telephones than call boxes they are distributed in much the same way throughout the city. They are also more visible and more familiar to the public as a means of communication.

Although NET&T has not submitted a proposal for such a system, its expected annual cost is about the same as the preceding system. Since it is maintained entirely by NET&T, jurisdictional problems are avoided. Furthermore, the number of outdoor public telephones has been increasing while the number of police call boxes has been essentially constant or slightly decreasing.

C - Have NET&T change the outdoor telephones to allow for a free dial tone. With such a system calls to the operator or other free numbers (which could include the police emergency number) could be made without a dime, while all other calls would require prepayment. The Bell system is presently experimenting with this change in some of its operating companies. Representatives of NET&T have stated that they would like to study the results of these experiments before committing their resources to such an endeavor.

D - Install radio call boxes. This system would be maintained by the Radio Maintenance Section of the Boston Police Department. The boxes could be powered with batteries, solar cells, Boston Edison electricity, or combinations of the above, depending on location and use. The cost per box would be (for quantity orders) less than \$2500 (the exact price has not been determined), including two base stations in the Central Complaint Room in the Headquarters building, a box-checking function to ensure reliable operation, and repair by the manufacturer (i.e., turn-key contract) for the first two years. Maintenance costs are expected to be less than \$10,000 per year, with a possible increase of \$10,000 after the first two years, including labor. Amortized over a period of ten years, the average annual cost would be about \$150,000.

TABLE I

APPROXIMATE NUMBERS OF PUBLIC OPEN-AIR TELEPHONE BOOTHS AND  
POLICE CALL BOXES IN THE CITY OF BOSTON\*

<u>Section</u>	<u>Telephones</u>	<u>Call Boxes</u>
E. Boston	43	39
Charlestown	16	28
Brighton	65	41
Roslindale, W. Roxbury, & Jamaica Plain	56	62
S. Boston	10	48
Roxbury	61	69
Dorchester	57	86
Hyde Park	18	18
Central Boston	126	162
Total	452	553

\* Figures for the distribution of telephones were obtained from Robert Powers of NET&T; William Malone of the Signal Service Section of the Boston Police Department provided the source data for the call boxes. The figures are approximate because the telephone-exchange boundaries used in compiling this table were only roughly defined.

Such a system would operate in the 450 MHz band on frequencies approved by the Federal Communications Commission.

These boxes would have buttons for police, fire, ambulance, and other services as well as voice communications. They are inherently more flexible than any of the other systems discussed, since they can be moved practically anywhere without major relocation costs.

The two most attractive systems from the point of view of flexibility, growth possibilities, and prompt installation are systems B and D above. We recommend that the Boston Police Department obtain firm price estimates from NET&T and from manufacturers of radio call boxes for the two systems, respectively, for installation in Districts 1, 2, and 4. This would be a pilot program, to determine the total number of calls for each service, the false alarm rate, the average response time, reliability, and maintenance cost of such a system, as well as other statistics of use to the Boston Police Department. The experiments would point the way to determining the type of system which should be installed throughout the city of Boston, as well as in other cities with similar problems. The cost of the pilot program would be paid for by the \$240,000 set aside for consolidation of the call box systems in Districts 1 and 2 into the new house in Government Center that is scheduled for completion in June 1968.

If the expected cost of the radio call box system is not much greater than the cost quoted by NET&T for the telephone system, we recommend that the radio call box system be installed. As previously mentioned, it is more flexible than any other proposed system. Secondly, the maintenance would be entirely in the hands of the Radio Maintenance Section, which would be very responsive to the service demands of the Boston Police Department. Thirdly, the system also functions as an emergency backup to, rather than an adjunct of, the NET&T telephone system, and as such adds a measure of reliability to the city's communications network. The Civil Defense authorities may be interested in supporting this system from the viewpoint of emergency and disaster

communications, since the communications terminal for this system would be in the police communications center, the Central Complaint Room.

b. Portable Radios

We recommend that the gradual acquisition of portable radios be continued, with an eye toward eventually replacing the mobile radios with them. Portable radios have been used mostly in emergencies, for scooter and mounted patrolmen, and for other special operations. They have been found so useful that the current demand for them exceeds the number available. Although now used as a secondary communications channel, they are well adapted for primary mobile communications as well.

All cars could be equipped with two-frequency portables and with charging racks so that when a patrolman left his car, he would take the portable with him. With this capability a patrolman could always be in contact with the dispatcher, giving him an added measure of safety.

c. District-to-Headquarters Communication

We recommend that coaxial cable with a wide bandwidth be run between Headquarters and every station house. At present the communications between Headquarters and the Districts are limited to telephone circuits, on both the administrative number (KE 6-6700) and the "hot lines" which terminate in the Central Complaint Room. The coaxial cable would find immediate use in the following: teletype transmission of such data as Central Complaint Numbers, hot line telephones (replacing the lines presently used), and internal private line communications.

In the future the cable would also carry patrol status information to be displayed in each station house. This function is described in Section C-4 of this Chapter. Further eventual use for the cable might include high-speed facsimile transmission, data transmission, and closed-circuit television. These would serve to coordinate the efforts of each District more closely with Headquarters, to disseminate

and collect information more quickly and accurately, to increase the utility of the records and other information kept on file in Headquarters, and to eliminate some of the paperwork and duplication in the present system.

### 3. Suggested Changes in Support Functions

The recommended changes in facilities and equipment imply an increase in work load for radio repair and a decrease for land lines. These changing loads will impinge on the Radio Maintenance and Signal Service Sections of the Central Services Division.

#### a. Radio Maintenance Section

We recommend that the staff of the Radio Maintenance Section be increased by at least three men this year. We further recommend that the Section budget be augmented to include allowances for training costs associated with new equipment and technology.

There are thirteen officers in the Radio Maintenance Section, including the Section head, six radio technicians, four radio operators, one clerk, and one custodian. With one man busy full-time maintaining the stock and spare parts inventory and ordering replacement parts, only nine men are available for actual equipment installation, maintenance, and repair. This is equivalent to less than two men on duty twenty-four hours a day, since it takes more than five men to man one position around the clock throughout the year. Their responsibilities include service and installation of 370 mobile radios, 90 portable radios, 29 base station receivers, 200 selective calling units, 90 electronic sirens, 58 monitor receivers, 8 microwave transmitters and receivers, all of the equipment in the dispatchers' booth and in the transmitter room in Police Headquarters, transmitting and receiving equipment in the Prudential Building, in the Pemberton Square court house, and on the water tower on Bellevue Hill, and miscellaneous tape recording, multiplex and marine electronic equipment owned by the Boston Police Department

The changes we have recommended in the communications system will serve to increase the amount of equipment under the cognizance of the Radio Maintenance Section. Furthermore, the new equipment is

considerably more complex and difficult to repair. Unless the Boston Police Department recognizes the need for more technicians and more training for these technicians, the potential benefits from the new equipment may not materialize.

#### b. Signal Service Section

We recommend that the Signal Service Section be gradually reduced in size, due to a reduction in work load. This section is responsible for the wired communications\* of the Boston Police Department: its prime concern is the call-box system, which includes the 553 call boxes located throughout the city; the cables connecting them to the station houses; and the switchboards, batteries, and motor-generators in the station houses, which provide the communications link and the power for the call boxes.

Our recommendation to discontinue the call box system in its present form has a great effect on the Signal Service Section, since this system occupies over two-thirds of its time; it would appear to warrant an immediate reduction in manpower. However, this reduction need not be abrupt, for three reasons. First, as mentioned before, the system need not be totally abandoned immediately; it still serves a useful, albeit limited, function. It will still be necessary to repair the call boxes until an alternative system is installed. Second, due to the needs of Vietnam the scrap value of copper and lead is very high, making it worthwhile to pull out the old cable. Third, we recommend elsewhere in this report that the Department install coaxial cable between every District station house and Headquarters, for secure telephone, teletype, data, facsimile, and television transmission.

#### 4. Radio Dispatching: The Command Operation

We recommend that a three-zone radio dispatching system be implemented.

The heavy workload of the dispatchers during peak hours is a burden on both the dispatchers and the radio channels. In addition

\*Non-communications functions of the Signal Service Section include electrical installations and wiring, painting of curb markings, and maintenance of taxi stands.

there are long delays for field men trying to call in. Normally, however, only one channel is used during off-peak hours, with the other set aside for standby, emergency, or special operations. The total radio traffic has been steadily increasing and soon two dispatchers may be needed most of the time. In 1964 over 1.4 million radio messages were sent and received; in 1965 there were more than 1.6 million messages; and in 1966 more than 2.1 million messages, a 50 percent increase in two years.

Because of the increasing radio traffic, we have investigated the possibility of splitting Boston into three zones, each with its own frequency and its own dispatcher. For proper operation such a scheme requires that incoming calls be separated (prior to being answered by Complaint Clerks) according to their frequency areas so that each call is handled by a Complaint Clerk and the dispatcher corresponding to its area of origin. This type of operation is used in New York City, Chicago, and Philadelphia, and has been found to give good results: the dispatcher has to keep track of fewer cars, and the Complaint Clerks need to be familiar with smaller geographical areas.

A series of discussions was held with representatives of the New England Telephone and Telegraph Company in order to determine whether telephone calls could be pre-separated into three groups by point of origin. The following facts were brought out:

1. It is possible to divide the city into three telephone zones, but it is practical only if these zones follow telephone exchange boundaries. The resulting zones are: Zone A - Districts 1, 2, 4, 6, 7, 8, and 15; Zone B - Districts 9, 10, 13, and 14; Zone C - Districts 3, 5, and 11, and small sections of Districts 6, 9, and 13.
2. This possibility is further contingent upon the Boston Police Department accepting a new emergency police number. The reason is that the cost would be prohibitive if it were necessary to convert their present system to separate calls by exchange of origin. In order to do this at a reasonable price, NET&T

would create a new office code\* for the use of the Boston Police emergency telephone system.

3. The necessary changes can be completed by NET&T within one year of authorization.
4. We estimate the cost of such a change to be less than \$50,000, which may be partly absorbed by NET&T and partly reflected in an increase in the telephone base charge to the Boston Police.
5. There would initially be four telephone lines per zone.

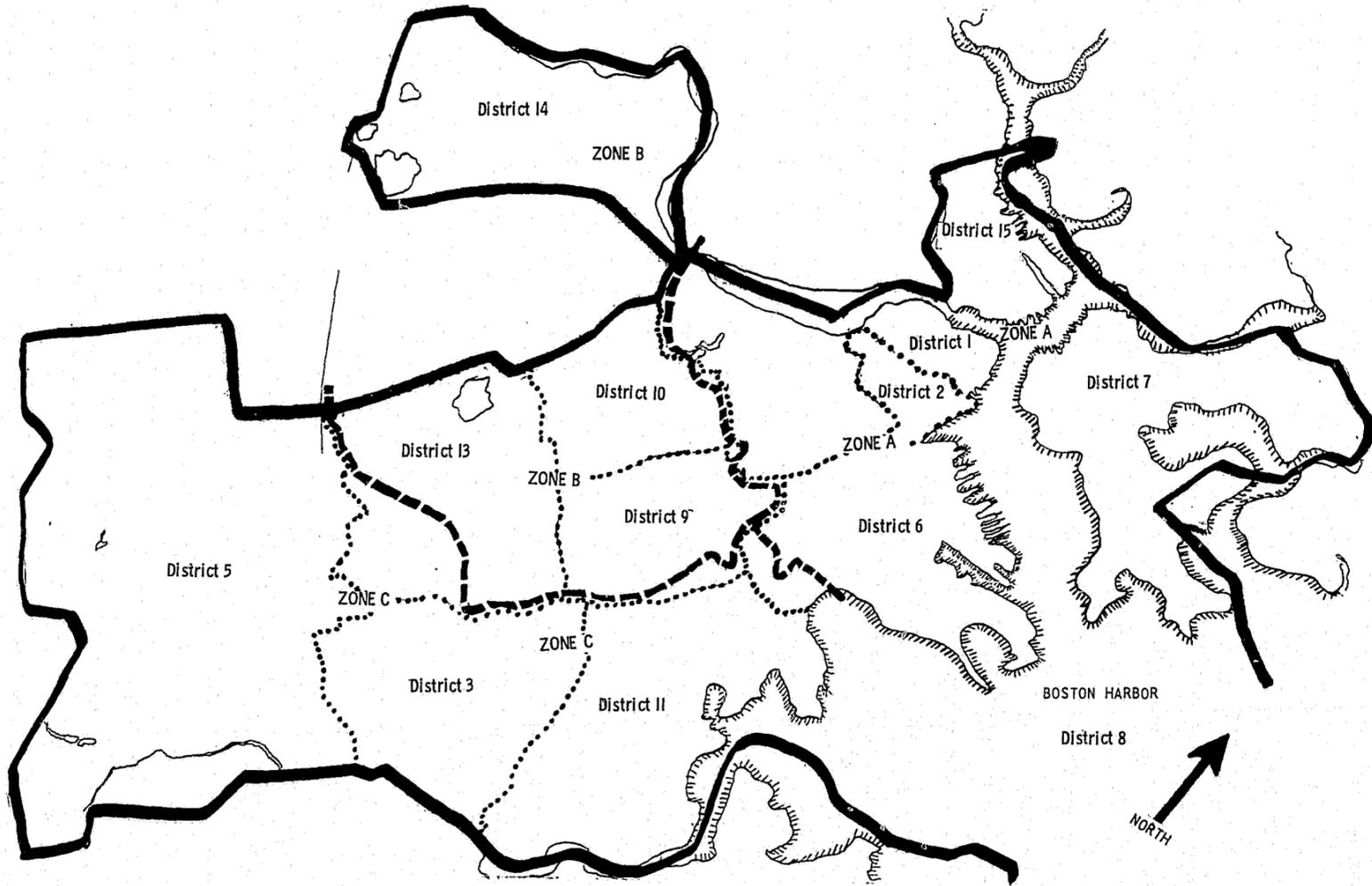
Figure 2 is a map of the city of Boston, with the present police District boundaries in dotted lines. The solid lines mark the boundaries of the three telephone zones. Figure 3 is a possible arrangement for the Central Complaint Room with a three-zone dispatching system. Up to four Complaint Clerks and a dispatcher sit around each zone desk. (There is room for more than four clerks, allowing for expansion.) The call boxes of the zone also terminate at the zone desk.

Depending upon the time of day, from one to three dispatchers may be on duty; that is, each dispatcher position should have all three frequencies at his disposal for dispatching, as well as a fourth city-wide standby and emergency frequency. The complaint clerks have the ability to switch an incoming call to the clerks of another zone, if the call requires it. The fourth desk contains the supervisory control console with the intercity frequency, the District emergency frequency, the four dispatching frequencies, as well as telephone monitors. The supervisor thus has the ability to monitor all of the Complaint Clerks and dispatchers, or to take charge of communications, either telephone

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\*An office code is the first three digits of a telephone number; the office code for the present emergency police telephone number is 338, while the administrative number office code is 536.

FIGURE 2: MAP OF THE CITY OF BOSTON



87

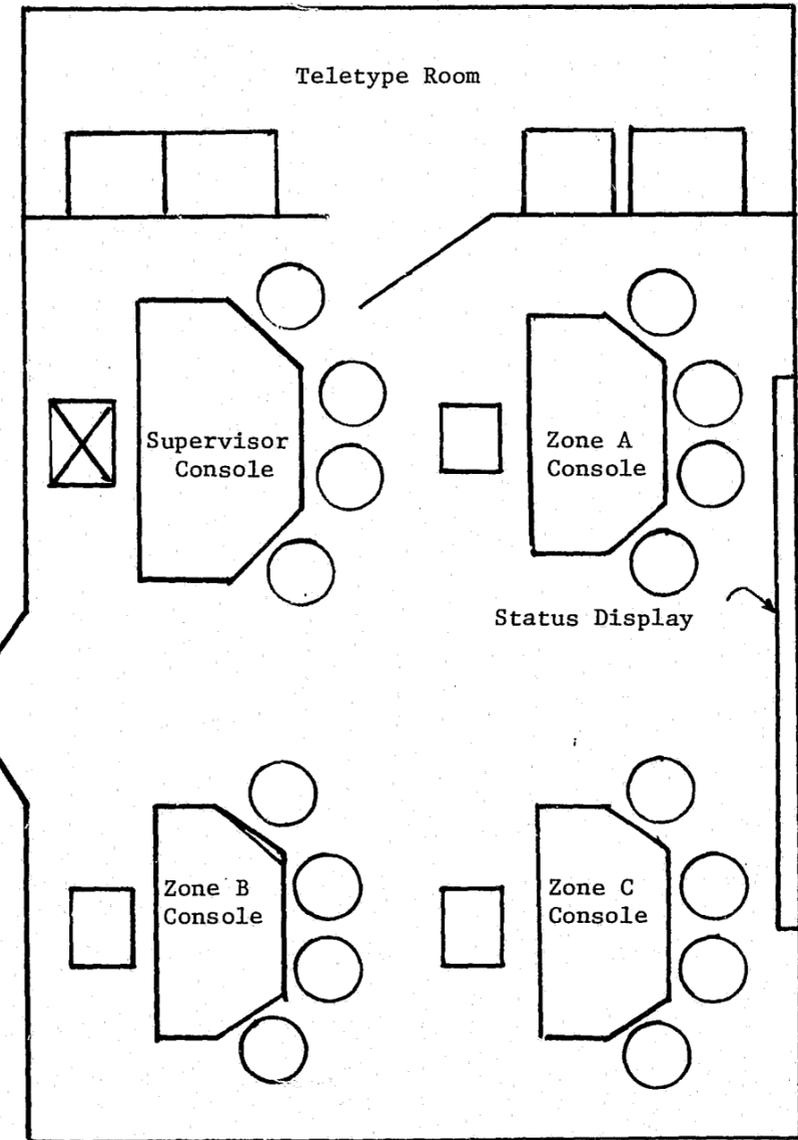


FIGURE 3: POSSIBLE ARRANGEMENT FOR A NEW CONTROL CENTER

49

or radio, whenever the need exists. The National Crime Information Center typewriters and the teletypewriters are all in an adjacent room, in order to keep the dispatching room as quiet as possible.

Since four channels are needed for such a system and the Boston Police Department has only two channels assigned to it in the 150 MHz band, we recommend that the system be installed in the 450 MHz band, in which the Department has at least four pairs of frequencies. All cars should be capable of receiving and transmitting simultaneously (i.e., a "full duplex" system) on both their zone channel and the city-wide channel. Cars assigned to the Tactical Patrol Force, and those cars assigned to Headquarters which require it, should have four-channel radios, capable of operating in any zone. The administrative frequency should be in the 150 MHz band, on one of the present frequencies.

Conversion to such a system cannot take place in a short period of time. Time is needed to prepare specifications for the equipment, to purchase the equipment, to install the radios in new patrol cars following the regular car replacement cycle, to install the base equipment and change the Central Complaint Room. We therefore recommend a three-phase approach to change the system.

Phase I. This phase can and should be put into effect immediately in order to alleviate the work load of the present dispatching procedures. Both channels should be in operation at all times, but instead of communications being separated geographically, they should be separated functionally. The Primary Dispatcher would give assignments over Channel 1, and all patrolling vehicles would be required to keep their radios switched to this channel. Vehicles on assignment would be required to listen to Channel 1 also except when reporting back to Headquarters. For reporting, a car would switch to Channel 2 and speak with the Secondary Dispatcher to notify him of a change in status such as "clear" or "lunch." In other words, emergency communications, whether initiated by the Primary Dispatcher or by vehicles, would be handled on Channel 1 while non-emergency communications initiated by vehicles would be

handled by the Secondary Dispatcher on Channel 2.\*

By separating the communications and using both frequencies, a greater than 50 percent reduction in air time can be expected. A great deal of air time is spent at present when three or four cars are trying to talk to the dispatcher at once, when he pauses between messages. By the time all get through a lot more air time than necessary has been used, and cars may experience delays of a few minutes in reporting. With the proposed system, the chance of having three or four cars trying to report in at once is diminished considerably. There will doubtless be some operational problems and "growing pains" in instituting the new dispatching procedure, but we feel that the gains in dispatching efficiency far outweigh the initial adverse reaction that almost always accompanies new procedures.

Phase II. When about one-third of the cars are equipped with 450 MHz 2-frequency radios it will be possible to shift to the zonal system on a limited basis. If Zone A is equipped with only cars with 450 MHz radios, then it could be dispatched on the 450 MHz-band frequency, and the cars could report back on the second channel, which in this case would be the city-wide emergency 450 MHz channel. Zones B and C operate as before.

Phase III. When two-thirds of the cars are equipped with 450 MHz radios, full zonal coverage is possible, with Zones A and B on their respective 450 MHz channels and Zone C on the former Channel 1 in the 150 MHz band. From this point in time, the transition to full 450 MHz coverage is direct.

We recommend that the final system be installed in the sub-basement of the Headquarters building in such a way that it conforms

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\*The Primary Dispatcher would give all assignments including escort duty and others where there is no emergency.

with Federal Civil Defense standards. This is to the advantage of the Boston Police Department since: the design objectives of the Civil Defense standards are in keeping with those of the Boston Police Department; the added cost of conforming to these standards may be partially met by reimbursement from the Civil Defense authorities; and the Boston Police Department must cooperate with Civil Defense during exercises and major disasters.

Further details of the proposed turret are given in the following section.

#### D. COMMAND AND CONTROL OF OPERATIONS

Up to this point, we have separated the discussion of paper work, in terms of reports and records, from the discussion of communications. When we come to the command and control center (which the Boston Police call the "turret"), we are forced to discuss both of these problems simultaneously. In the turret, communications and paper work go hand in hand.

##### 1. An Interim Control Center: Division by Function

We propose a two-stage modification of both the communications and paper work of the turret. The first change involves modification of the present turret. The second stage requires a new control center, constructed in the basement of the Headquarters Building. The modified seventh-floor center would eventually be used only as a stand-by. It would utilize two control channels, each with a separate dispatcher, as described in the preceding section. The second channel and the secondary dispatcher would handle administrative traffic only.

Vehicles would be kept track of almost as they are now, but the physical arrangement would be somewhat different. The primary and secondary dispatchers would sit face to face across a table with a vehicle-status rack running down the middle. An empty slot in this rack would denote an available vehicle; a slot with a Complaint Message Card (CMC) in it would indicate that the vehicle corresponding to this slot is in service.

Complaint Message Clerks would receive telephoned complaints from citizens, write the details of these complaints on CMC's, and place those cards requiring police action on a conveyor which would carry them to the primary dispatcher. The three classes of complaints would be recorded on CMC's of different colors so that the color of the card would indicate the priority of the complaint.\*

\* In times of peak loading, the ability to keep track of priorities should aid the primary dispatcher in reassigning cars which are investigating complaints of low priority. For this purpose, Miscellaneous Incidents are of lowest priority, incidents involving only an arrest of slightly higher priority, and case-report incidents of highest priority.

The primary dispatcher would assign vehicles to investigate complaints on the basis of the information on the CMC's, and insert these cards in the appropriate slots of the status rack. He would not usually be concerned with the routine procedures associated with removing a card after the corresponding car has called clear. Instead, a patrolman would call "clear" over the secondary channel. The secondary dispatcher would then remove the card, time stamp it, check a box to indicate whether there is to be a written report, and record the code if it is a Miscellaneous Incident. (Refer to Section VI A.) The secondary dispatcher would use a fourth color of card for routine matters such as auto defects, officers' lunches, and the like. Cars calling to indicate that they will be out of service for such reasons would use the secondary channel.

#### 2. A New Control Center: Division by Geography

While the modified (stand-by) turret is in use, a new control center should be built in the sub-basement. The long-term recommendation to divide the city into three geographic areas has already been given in terms of communication requirements. For control purposes there should be three dispatchers, each served by different complaint message clerks. Each dispatcher would perform a function for his area similar to that performed by the present dispatcher. Ultimately each dispatcher should be aided by a display system which will keep track of vehicle assignments and complaint priorities. Such a system would allow the status of current operations to be known in the turret and also provide up-to-date information over coaxial cable to the District Stations.

The primary reason for changing the control operation in two stages is that the final desirable system cannot be constructed in less than, say, a year and the present system needs to be changed. The first stage can be implemented in the present space, but the final system will have to be built in another space, since there is no possibility of closing down operations.

#### 3. Command vs. Command-and-Control

The "turret" has been referred to rather loosely as a communications center, the Central Complaint Room, a command center, and a control center. Technically, it is a communications center. Operationally,

it is the focus for complaints and the source of orders (or at least directions) to the mobile forces. The turret is not a control center, however, except in extraordinary circumstances.

The dispatcher gives commands which result in field activity. He does not control the activity, in the sense of being able to redirect or evaluate it, primarily because he does not have easy access (if any) to the information needed to exercise such control. There is no feasible way for the dispatcher to acquire the needed information, given the pressures of time and the physical arrangement of his records.

It is our judgement that the inability to control field operations is the single greatest defect in the police function. Approximately 25 percent of the Department's budget is spent on mobile field operations, exclusive of overhead costs. It would be worth increasing the communications budget above its present 4 percent to make the mobile function both more effective and efficient.

The Department is already committed to acquire a large computer for data processing and retrieval. We conclude that the planned computer would be more usefully employed to implement a command and control system for police operations, than in the ancillary functions for which it is being installed. The specifications for the planned computer should be re-opened or left open to determine what size would handle both sets of functions.

In the following section we describe a computer-aided command and control system which is technically feasible and which, if implemented, would advance the effectiveness of police field operations many-fold. The second advantage is that the proposed system will do away with the need to maintain Journals at the District level. It will also greatly simplify collection and processing of statistics and certain records. The saving in clerical manpower will more than equal the costs.

#### 4. A Proposed Control System

The heart of the proposed control system would be a set of video display units, one for each Complaint Clerk and two for each dispatcher.

Each unit would have a typewriter console for entering input data and requests on the display. The display units would be controlled by a small computer with extensive disc files for memory. When a Complaint Clerk answered the telephone, he would press a button on his display unit, and the unit would respond by displaying the standard complaint message format. The time would be entered on the display automatically by the computer. The Complaint Clerk would type the nature of the complaint in as brief a form as possible, and push a button which would jump the typing position on the display to the address heading. The display would request the address and other identifying information in descending order of importance.

In cases of emergencies demanding immediate action, the clerk could push a button which would cause the message on his display to appear before his dispatcher, line by line, as the complaint message was typed. This would enable the dispatcher to assign a vehicle as soon as the address is displayed, and even before the names and other information appear.

Normally, when the Complaint Clerk finished typing in the required information (as specified by the format displayed), he would push a button to transfer the complete complaint message to his dispatcher's right-hand display and also store it in the computer's disc file. At the same time, the dispatcher's left-hand display would present the status of each car in the District concerned. For each current complaint in the District, the car assigned, time of assignment, location, type of complaint (priority), and possibly other information would be displayed. The status display would also indicate which vehicles are out of service for routine matters such as maintenance. From the displayed data, the dispatcher would determine which cars are free, or if all are busy, which cars could be reassigned to investigate complaints of high priority.

When a vehicle completes an assignment, it would call "clear" and give the appropriate code if it has just investigated a Miscellaneous Incident. The dispatcher would type the vehicle number and then this information on a console provided for this purpose. For other incidents (robbery, etc.), he would enter the crime type. The code would indicate the

type of crime and also indicate the written reports to be submitted. The time would be recorded automatically. The computer would then combine this information with the complaint message that was stored at the time the incident was reported. A Central Control Number would be assigned automatically, and all information relating to the incident would be stored on a magnetic tape.\* In this way a magnetic tape summarizing daily patrol activity would be produced continuously. This tape would be used to produce a variety of reports, and would eliminate the District Control Log that is presently used as a source document for keypunching information about complaints and their investigation.

Back-up Procedures -- From time to time, the computer would be out of service for repairs and maintenance. During these times, some alternative system would be required. Each dispatcher in the turret would also be equipped with a vehicle status rack and his dispatchers with complaint message cards. A conveyor would be provided to carry cards from each area's complaint message clerks to its dispatcher.

When the regular system was out of order, complaint message cards, color coded like the ones described for the stand-by turret, would be used in the usual manner; their format would be identical to the one usually appearing on the displays. However, a time stamp would be used since times would not be recorded automatically. Central Control Numbers would be assigned manually. (The last number assigned automatically would always be known.) When the system was restored to normal, a clerk would enter completed complaint message cards on a display, including the Central Complaint Number and the times that were stamped, and press a button which would cause the message to be stored on the complaint-message magnetic tape. All complaints originating while the system was down would be handled in this manner, and such complaints would be displayed only after the investigating officer had called clear. Before returning to the regular procedures, it would be necessary to reset the Central Control number counter by making a console entry.

\* This would eliminate the practice of assigning group Central Control Numbers to some kinds of incidents.

Information Available at the District Stations -- Each

District Station would be linked to the turret by one or perhaps two coaxial cables. This would make it possible to connect a District display unit with console to the Headquarters display system. The District would use its display for two purposes: to determine the locations of cars and to get a picture of current vehicle availability or conversely of complaint activity. This status information is essentially identical to that available to the dispatcher. The latter, however, can call up information on any District while each District will receive information only on its own vehicles.

When all the information concerning an incident has been gathered, an edited version of the data is stored on magnetic tape as described in the previous section. At the same time the information is stored on magnetic tape, it would also be sent to the District via coaxial cable. At the District the transmitted information would be printed in an appropriate format so that the District would have a permanent record of each incident. The printed complaint messages and the arrest and case reports would replace the present District Journals. The complaint messages would be sent to the District in Central Control Number order, which roughly corresponds to the order in which incidents are reported. The messages would be held in notebook form for at least 24 but no more than 48 hours; the day shift would be responsible for filing the messages for the previous midnight to midnight period in Central Control Number order. They would also prepare a list of the reports that were required but not submitted for incidents occurring during this period and submit it to the District Captain and to Headquarters (Recall that the dispatcher would record codes for the reports to be submitted when the investigating officer called "clear.")

Each day Headquarters would furnish each District with cards which would index its complaint messages for the previous day by name and location. These cards would be produced by the computer using the complaint-message magnetic tape as a source. Each card would indicate what reports were filed by the investigating officer, if any, and the incident and disposition code for Miscellaneous Incidents.

E. THE COMPUTER FACILITY

1. Functions

The Department is committed to installation of an IBM 360/30 computer facility. This machine with peripheral equipment will be used to store and provide data on stolen cars, missing persons, and eventually warrants. According to the experience of several police agencies the rapid data retrieval is of some utility in field operations. It is our judgement, however, that the computer facility could be more usefully employed to provide the control of police field operations described in the preceding section.

We foresee a computer facility which would perform three kinds of tasks. First, computer-generated visual displays would be used by the dispatchers and Complaint Clerks for command and control of patrol vehicles. Each District Station would also have a display of information (also displayed in the turret) relevant to that District. The displays would be on-line, meaning that they would communicate directly with the processing unit, and they would be the input/output device for the storage of real-time data describing the current status of the patrol network.

Second, the displays would be used by the dispatcher to check for arrest warrants, stolen cars, and other information requested by patrol officers. Only information for which a very short retrieval time is required would be stored for access through the dispatchers' display units.

Both of the functions described demand a rapid response by the computer, and the response is needed within a few seconds. The connection between the display and the computer would be buffered to ease the problems caused by several simultaneous or almost simultaneous demands for the same processing capacity, i.e., the computer would be able to store several different input messages while responding to others. The display units themselves would have internal storage capacity, so that no message would be sent until it had been completed. This is important so that the processing unit is not tied up while waiting for a user to complete a message.

The third kind of task is producing routine reports, some daily, some monthly, and some at other intervals. Examples are the daily summaries of complaint activity that would be produced for the District Captains; and Return A, a monthly report that is produced for the FBI. Routine processing would also include the production of various card indices presently produced by hand. Unlike the on-line, real-time functions, routine processing can be scheduled at times when other demands for the central processor are low.

Two different kinds of files would be required -- magnetic tapes and discs. These fulfill two different kinds of filing needs. Information on tape is only accessible in the order in which it was recorded; information on a disc can be obtained without regard to the order in which it was stored. This results in a much shorter average retrieval time than with tape. Discs would, therefore, be used for storing command and control data and other information to which rapid access would be required.

## 2. Hardware

The task of specifying the appropriate computer, files, and input/output devices, including display units, to handle the three kinds of demands is complex, and deserves a thorough and comprehensive analysis. Not only hardware considerations are involved. The task of specifying and writing the computer programs which would enable the display and other systems to function effectively needs to be studied in detail. The average and peak demands for various kinds of computer capacity at various times of the day need to be estimated carefully, taking account of which tasks can be postponed and for how long and which must be performed immediately. A thorough analysis might indicate that the computer that the Boston Police have already ordered is the appropriate choice, but there is little a priori justification for assuming this. We strongly urge the Department to postpone the selection and installation of a computer system until it conducts a careful study of what its computation requirements would be, using the systems recommended in this report.

There are at least three possible sources for the visual displays described in the preceding section: IBM, Sanders Associates, and Bunker-Ramo. It is apparent that the display function for control of field forces can be managed by an IBM 360/30 computer together with the buffer and displays. This model of the computer could also cope with the data processing and retrieval functions but whether or not it can cope with all the tasks simultaneously has not been determined at this time.

## 3. Back-up

It is clear that routine maintenance of the computer facility will have to be scheduled in the early morning hours, when the volume of inquiries and incidents will normally be lowest. There is some concern that two computers will be needed to cover possible breakdowns. It is our judgement that a single machine will suffice, provided that the present manual system is retained as a back-up for recording complaints. The data retrieval (warrants, etc.) can shift to a manual search of the most recent (daily) print-out of the computer-stored files during emergency shut-downs.

## F. IMPLEMENTATION

### 1. Reporting

#### a. Miscellaneous Incidents

Part of the hierarchical reporting system recommended earlier could be implemented practically immediately. This is the reporting of miscellaneous incidents by radio using a code scheme to record the nature and disposition of the incident. Implementation will require that instructions and a code system be promulgated to field forces. In addition, it may be necessary to put one clerk in the dispatcher's booth, monitoring the input from field to dispatcher. This clerk will write the code given when the car clears, on the complaint message card. The dispatcher may be able to cope with this task in periods which are not too busy.

b. Field Reporting Manual

It is recommended that a small committee be brought together to decide on final details for the report forms and instructions to be given in the field reporting manuals. This committee should include active officers from the field as well as from Headquarters. It is estimated that several months will be required to settle on final details and to print the forms.

c. A Training Program

Before the field reporting manual can be used by patrol, the officers involved must be given short training courses. It will be necessary to prepare a syllabus and run a trial course, perhaps associated with only one District at first. The District should then use the field reporting system as a pilot area. Subject to changes required after this experiment, the syllabus should then be taught to the entire force. It might take two or three months to convert the whole city to use of the proposed field reporting manual.

2. Command and Control

a. Two Channels Divided by Function

It should be possible to initiate a two-channel command and control system fairly rapidly. This is the interim system advocated to relieve the present dispatchers' overload during peak hours. In this system, administrative and clearance messages will be handled by a secondary dispatcher, while the assignments and orders are given by the primary dispatcher.

b. Radio Call Boxes

Specifications can be written and radio call boxes ordered in time to implement this capability in Districts 1 and 2 by the time the new district headquarters is available. Implementation in District 4, which is also recommended, may take roughly the same amount of time.

c. Geographical Division of Command and Control

If a decision is made to divide the command and control function of the city into three geographical areas, the requisite work by the telephone company may take up to one year. The change-over in police communications will take probably the same amount of time. Therefore, these two prospective changes will fit together. It is suggested that one area at a time be changed in terms of police radio communications even though the telephone change would probably be accomplished for the whole city at once.

d. Computer Aided Car Control

It has already been recommended that the computer facility be used to provide control information with which the dispatchers and the District can actually control the whole operation. Several possible schemes exist with which to implement this capability. It is suggested that at least a year will be required to decide on the actual computer and display facilities, to write the software (computer instructions) to make the system work, and to debug and install the hardware.

3. Utilization in Headquarters

a. Control Center

It is recommended that the ultimate three-area control center be built in the sub-basement of the Headquarters building. The possibility of financial support for this center should be investigated with the Civil Defense authorities. Two or three months should be allowed for detailed planning and probably six months for construction of such a facility.

b. The Computer Facility

It is recommended that the planned computer facility be installed in the basement of the Headquarters building in what used to be the line-up room. Such a location appears to be determined by structural considerations in the building, but it is also a convenient location between the planned ultimate turret and the advocated records system on the first floor.

#### c. Central Records

Space utilization will have to be changed in the Headquarters building in order to allow upgrading of the Central Records Section. It is recommended that the central records section be constructed on the first floor of the building, for proximity to the computer and other installations, because of floor load limitation in the building, and for ease of access to the public.

#### d. Other Specialization Problems

It is noted that the general utilization of space within the Headquarters building seems to be rather haphazard and inefficient. It is recommended that a thorough examination of the entire building be made and some budget set aside for moves within the structure.

#### 4. Records

Creation of a central records division involves both physical changes and organizational changes. The physical changes have been mentioned above, and the organizational changes will be discussed in the following section. Here it is sufficient to point out that it may take 6 months to a year to begin to have a meaningful Central Records Section: partly because of the physical moves that must be made within Headquarters building and partly because of the volume of paperwork which must be handled during the transition. Another point to note is that when both the computer control facility and the central records exist, the time will be right to insist that District Journals be terminated. This date may be a year away.

#### 5. Suggested Organizational Changes

The recommendations made so far suggest a few organizational changes.

##### a. Traffic Analysis Unit

In an earlier section we recommended that the Traffic Analysis Unit be shifted to Headquarters and be made a part of the Planning and Research Division. The justification for moving this unit to Headquarters was given earlier as the fact that it provides a large input

to the master name file. There are two other reasons for the move.

The Traffic Analysis Unit is basically a data processing activity and should be combined with the other data processing capabilities of the Department. A principal output of this unit should be recommendations for selective enforcement of traffic regulations. Such recommendations are more likely to be followed than is now the case if they are issued as orders from Headquarters. There is some evidence that the traffic analysis objective of reducing accidents conflicts with the Districts' objectives of issuing citations.

In passing, this unit is understaffed (by two or three people) and is in desperate need of adequate filing space and equipment.

##### b. The Records and Communications Division

We recommend that the Records and Communications Division become two divisions, the Records and Data Division and the Communications Division. The Records and Data Division would be primarily concerned with the collection and dissemination of information in the form of reports, fingerprints, photographs, and statistics; the Communications Division would be concerned primarily with the communications systems through which information is transmitted: telephone, teletype, microwave, radio, land lines, and coaxial cable.

The proposed organizational structure of the two divisions is shown in Figure 4. The Records and Data Division would be composed of the Central Records Section, the Identification Unit, the Data Processing Section, and the Reports and Procedures Analysis Section. The functions of the Central Records Section and of the Identification Unit would be substantially unchanged; the former is the repository of all records and files required by law or by the investigators and intelligence units. The latter maintains the fingerprint and photograph files of the Department.

The Data Processing Section, scheduled to be brought under the jurisdiction of the present Records and Communications Division in January 1968, would perform the statistical analyses required as a basis for overall supervision of the Department: manpower utilization,

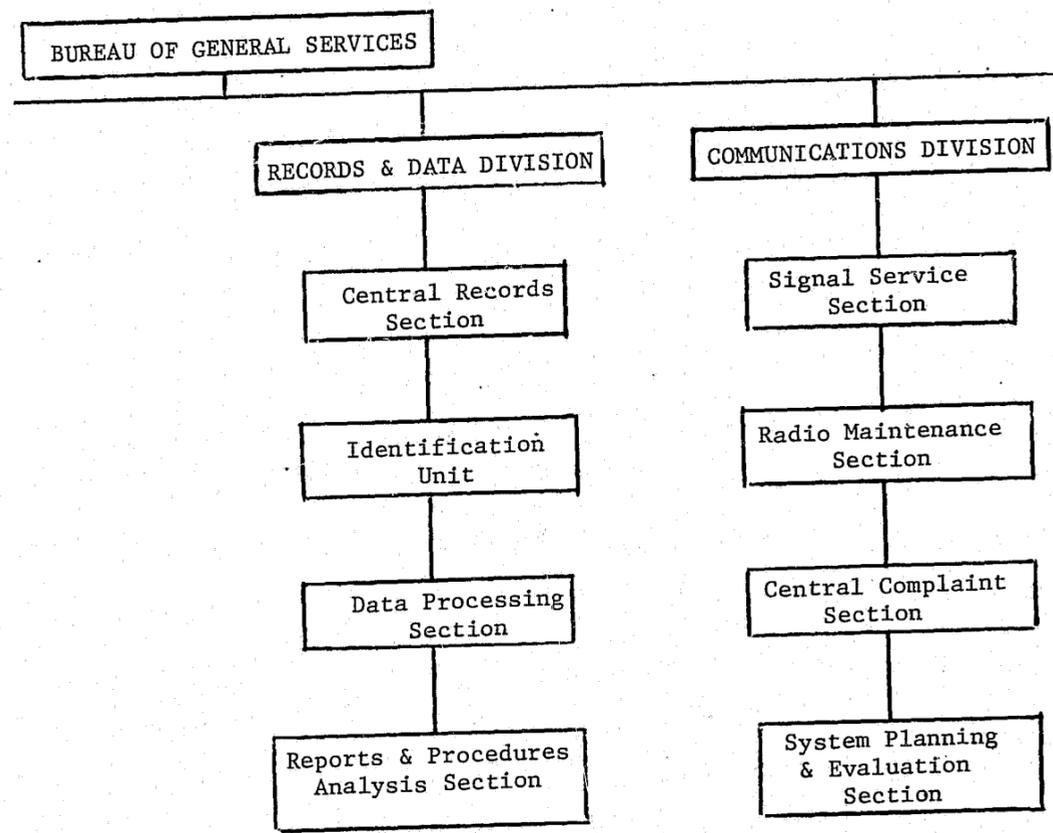


FIGURE 4

redefining car sector boundaries, redefining district boundaries, and other functions associated with changing work loads. It would also collect those statistics required by law and by the FBI uniform crime reporting system, and aid in the analysis of experimental and pilot programs instituted for the reduction of crime. This section would be responsible, also, for the computer facility.

The Reports and Procedures Analysis Section is a new section. Its prime responsibility would be to obtain feedback from the users of the reports and records, to insure that the proper procedures are being employed, to train police personnel in the proper procedures to be carried out, to plan for changes in these procedures, reporting systems, or record filing based on inadequacies or insufficiencies in the present systems, to experiment with new systems when deemed justified, and to oversee the installation of new systems.

The Communications Division will consist of the Signal Service Section, the Radio Maintenance Section, the Central Complaint Section, and the Systems Planning and Evaluation Section. The Signal Service Section and Radio Maintenance Section will function essentially as they do now, modifying their structure and size as required by changing work load and equipment. Placing the Central Complaint Section under the Communications Division insures that the radio dispatching equipment and operation are in consonance with the requirements of the Federal Communications Commission, that the telephone and call box systems are properly interfaced with the radio dispatching system, and that all of the communications equipment in this communications center is maintained and used properly.

The function of the Systems Planning and Evaluation Section would be to extrapolate the communications needs of the Boston Police Department into the future, plan for new communications equipment, procedures, and systems as dictated by requirements, write specifications for new equipment and systems, evaluate new equipment to determine whether it meets the needs of the Boston Police Department, and to represent

the Boston Police Department before the Federal Communications Commission in matters involving frequency allocation and communications.

It should be emphasized that the proposed specialized analysis units proposed above are not meant to replace the Planning and Research Division in the Bureau of Inspectional Services. If any change is made in this division it should be an expansion.

There are two reasons for forming two new divisions: First, the functions of each division as described herein are important enough and divergent enough to call for separate administration and supervision. Secondly, both of these areas have recently experienced very high rates of growth of activity, more than enough to warrant their separation. The Deputy Superintendents in charge of these divisions should be thoroughly familiar with the equipment, systems, and procedures under their responsibility.

#### c. Dispatching Made a Line Function

In the preceding section, it was recommended that the technical functions of the turret (Central Complaint Room, control center, or other name) be the responsibility of a new Communications Division. We recommend, that the control function -- that is, the Complaint Clerks and dispatchers -- be placed under the Bureau of Field Operations. If this cannot be done there should at least be a strong directive giving the dispatcher line authority by direction. The need for such authority will become more evident when a real-time control capability is created.

#### d. Supervision

It is recommended that the Bureau of Inspectional Services be given a clear mandate, and sufficient staff, to monitor the recommended changes in reporting and record-keeping.

### G. ESTIMATES OF COSTS AND RETURNS

Some of the changes recommended here will require capital outlays; some will result in permanent changes in operating expenses. The degree of accuracy with which either type of expense can be estimated, or needs to be estimated, varies almost as widely as the accuracy with which the value of the change can be estimated.

#### 1. A Rough Measure of Cost

Table 2 gives our estimate of the distribution of the Department budget over various functions. It may be seen from the table that mobile patrol accounts for approximately one-fourth of the budget. The average number of patrol vehicles (including wagons and ambulettes) is 80, out of the scheduled 102. The annual cost per effective patrol vehicle is thus \$68,000, not including any overheads for communication or supervision. Roughly \$64,000 of this amount is for manpower, 8.8 men per car-year. We shall talk about the cost of various proposed changes in terms of the annual cost of one patrol car, either in dollars or manpower, or both.

In talking about changes in manpower for patrol, we assume that the current average number of men per car, 1.7, will remain unchanged.

#### 2. Records

The dollar cost of creating a central records system is probably the smallest of the outlays recommended. Including new filing cases; preparation of a facility, and moving, the capital outlay cannot exceed a fraction of a patrol car. The manpower cost is harder to estimate. We estimate that approximately 250 of the 400-plus "inside men" are doing paper work other than that associated with arrests, licenses, and auto investigations. Of this 250, some 75 are tied up with the journals. Of the remaining 175, we estimate that at least 50 are busy creating and maintaining files which would be unnecessary if there were an adequate central records system. We estimate that such

TABLE 2

APPROXIMATE DISTRIBUTION OF BPD BUDGET

<u>Function</u>	<u>Millions</u>
Supervision	1.09
Patrol	
Mobile: auto	5.44
other	.84
Foot	2.47
Harbor	.33
Traffic Control	
Street	1.27
School Crossing	.27
Investigation	2.77
Juvenile	.15
Overtime; court	1.25
Support:	
Records	.54
Communications	.85
Training	.47
Prison	.21
Other: licenses	.17
services, supplies, etc.	3.40
TOTAL (Approx.)	21.25

a system could be operated by something like half that number (50) of people.

Without a detailed analysis of the work-load of each District Station, it is not possible to make a better estimate. Part of the difficulty is that in most Stations each task is spread over several men and each man has several duties. This system is an excellent one, particularly in allowing a flexible response to emergencies. However, it does make it difficult to determine how much manpower is required for a particular task.

Our conclusion is, however, that the creation of a central records system will produce a net saving of manpower equivalent at least to three patrol cars. When and if the recommended status-display system allows the journal to be abandoned, there will be another saving of manpower for nine patrol cars.

3. Reports

The cost of printing forms, supplying notebooks, and printing instructions will result in a very small change in the Department's present budget for paper. The cost of the necessary training effort can be squeezed out of the patrol expenses by going to lower manning levels (per car), or fewer cars, during quiet periods.

Introduction of the hierarchical reporting system will require five men in the turret and will reduce the paper work burden of field men by an estimated one-third. This will allow the effective patrolling time to be increased by several percent, at a minimum: each percent means one more effective car.

We estimate that the average patrol vehicle spends 20% of its time on investigations (half of the time during which it is off of patrol for one reason or another), and that one-third of that time is spent filling out reports. The call-in system for minor incidents ought to cut out half of this report-writing time; hence, the estimate given above.

Further, the use of the recommended field reporting forms, with no typing over of handwritten reports, will reduce the need for clerical help in District Stations by two patrol-car equivalents (17 men). This is on the assumption that the typical form takes 20 minutes to fill out.

4. Communications

a. Radio

Table 3 indicates the capital outlays required to implement the recommended 4-frequency radio dispatching system. Since the system might take as long as two years to install, the annual outlay for equipment would be approximately \$330,000 each year. Reference to Table 3 indicates that this is a 40% increase in the total annual outlay for communications (which includes personnel, of course). The recommended increase in personnel, three or four men, is a small item.

It is hard to quantify the return from this investment. It will give the field man readier access to the dispatcher during busy periods. The field man will not have to hold for long minutes waiting for a break in air traffic. The value of this change is similar to the value of insurance: it is really apparent only when you need it. When you do not need it, it may seem an extravagance.

Another advantage of the recommended three-area system is that Complaint Clerks and dispatchers each have a small area to learn. Ambiguities of location are decreased and response time improved. Combined with the proposed status-display system, the area split should allow excellent control over field operations for the first time.

b. Call Boxes

The recommended radio call box system will have estimated costs as shown in Table 4. A pilot program for Districts 1, 2, and 4 can be largely paid for by the resources already allocated to rewire the present

TABLE 3

CAPITAL EXPENDITURES REQUIRED FOR A 4-FREQUENCY RADIO DISPATCHING SYSTEM

The Boston Police Department has three 450 MHz base stations:

5	450 MHz base stations at \$4000	\$20,000
8	satellite receivers with voting equipment, etc.	30,000
3	dispatcher consoles at \$30,000	90,000
1	master console	60,000
300	portables, 2-frequency (for cars, emergency, etc.) at \$1100	330,000
20	4-frequency mobile radio (for TPF, supervisors) at \$1500	30,000
1	communications van, complete	<u>80,000</u>
		640,000
		safety factor <u>60,000</u>
		700,000
Less:		
	300 mobile units at \$150 trade-in value	-\$ 45,000
	base station trade-ins	?
	Civil Defense support	<u>?</u>
	total less than	\$655,000

TABLE 4

CAPITAL EXPENDITURES REQUIRED FOR A CITY-WIDE RADIO CALL BOX SYSTEM

553 boxes at \$2,000	\$1,106,000
4 consoles (3 zone and 1 master) at \$20,000 each	100,000
Less:	
recoverable equipment	195,000
recabling allowance	<u>240,000</u>
	\$ 771,000
	plus maintenance
The pilot program cost for 150 boxes and two consoles =	350,000
	<u>- 240,000</u>
	\$ 110,000

call boxes in Districts 1 and 2. If this experiment does not produce a very economical alternate proposal from the telephone company -- a reasonably priced police telephone system, or dime-free boxes -- we recommend implementing the \$770,000 system over the next few years. The system should last at least 10 years without further capital outlay. If the experiment (150 boxes) proves successful, the Department should make a serious effort to combine its call boxes with those of the Fire Department. If the police-only radio call-box system were installed over three years, the annual outlay would be equivalent to less than four patrol-car equivalents.

5. Command and Control

We cannot estimate at this time the cost of constructing a new control center in the sub-basement of the Headquarters building, although we have a preliminary picture of how it should be laid out. We recommend that an attempt should be made to have Civil Defense share the cost.

6. The Computer Facility

We estimate that a computer facility adequate to perform the functions proposed may involve annual rental approaching \$200,000, including displays. This is equivalent to three patrol cars; or roughly 25 men. The primary return is the potential release of 75 men from inside jobs, specifically the journal. Perhaps of greater importance is the newly-created ability to control the field operation and monitor performance.

The implied net gain of 50 men will be at least half absorbed by the costs of personnel to operate the computer facility.

We have not investigated the cost of writing computer instructions for the desired operations. An unknown fraction of such costs will be borne by the equipment suppliers.

7. Net Gain

A very approximate estimate of the net gain in manpower released for police work by the recommended changes is: the equivalent of five patrol cars, or approximately 45 men. Under the present scheme of things such an increase would require additional budget of \$340,000, exclusive of

any overhead costs. After the initial transient of capital outlays of roughly \$1.5 million (assuming the radio call boxes are installed city-wide), the actual additional annual budget will be approximately \$200,000. If the capital investment can be considered amortized over 10 years the net change in expenditures is essentially zero. The gains, however, will include: increased cars on patrol, increased patrol time, efficient control of the forces and the possibility of more effective management.

An alternative way of estimating the gain is to assume a constant budget after the initial (two-year) capital outlay. This would require decreasing the total police manpower by roughly 50 men, while another 20 persons would be hired to operate the computer facility. (If the latter could be converted from some of the unneeded patrolmen, the impact would be less). There would still be a net gain in manpower released for police work of the equivalent of two-plus patrol cars.

## VII. POSSIBLE ALTERNATIVES

In the introduction one reason given for decreasing the paperwork of the Department was to get more policemen back to doing police work. We have thought it useful to investigate to what extent such an improvement can be made, independent of the recommended changes in records and communications. Admittedly, the latter changes are important by themselves. But to the extent that they are motivated by the need for more police work, we wished to establish the reality of the relationship. In other words, are the recommended changes an efficient way to get more policemen doing police work, or are there other (possibly better) ways to accomplish this end?

Noting that the ratio of detectives to patrolmen is "normal" for the force, relative to other police departments, and recognizing that we know little about the detective function, we have concentrated on patrol operations in answering the question posed above.

### A. AUTO AVAILABILITY

The first point to note about patrol operation is that, of the 102 marked vehicles currently available for patrol, an average of 22 percent are down for mechanical troubles on any given day. This down-percentage compares very unfavorably with the record of any commercial vehicle operator.

The largest taxi fleet in Boston, which is of roughly 250 cars, operates its cars continuously 15 hours a day and gets from two to three times as many miles per year per vehicle as does the police department. These vehicles are radio-equipped. The fleet is maintained with 18 men in a repair shop and no more than 7 percent of the vehicles are down at any time. The 18 repair men do all major overhauls and body work in addition to normal preventive maintenance and minor repairs.

From the experience of the Chicago Police Department, it should be possible to have 10 percent or fewer cars down for repairs at any time. The difference between this fraction and current experience would put 15 extra cars on the street every day.

The most expensive part of the patrol operation is the manpower involved, by a factor of 23 to 1. Consequently, any time spent by patrol manpower which can be associated with auto maintenance is time wasted. At the present time, 1 percent of all the available patrol time is spent driving vehicles to the repair center and/or picking them up. This driving to and fro should be done by personnel associated with the police garage, personnel perhaps with limited duty status. The driving required could probably be accomplished by one person on the day shift and two on the first night tour, with cars left for morning if they go down in the second tour. Five or six of the total complement of 60 or so limited duty personnel might be assigned to the police garage for this function.

It is recommended that the police vehicle repair and maintenance operation be revised. A fleet of roughly 10 marked cars and 5 to 10 unmarked cars should be maintained by the garage in ready status. When a car in a district or at Headquarters is down for mechanical trouble, one of the limited duty drivers at the garage should deliver a car from the ready stockpile and take away the defective car if it can be driven; otherwise, it should be hauled away by a wrecker. Most of the ready pool of cars would be out on loan at any time.

Such a substitution scheme would allow all cars to be brought in by the garage for preventive maintenance on the desired schedule of once every 2,000 miles. The present system brings these cars in at something like 6,000 miles average, which does not do them a bit of good. Looking only at the marked patrol cars, 102 in number, it is apparent that one could keep 102 in operation by having about 112, including the pool at the garage. This would give a greater number on the street than is now the case, the cars would be better cared for, and patrol

time would be increased by about one quarter.

Roughly two cars out of three are now operated with two men. In some districts and at some times of the day, this is imperative. It is clear, however, that there are enough men available to man many more patrol cars than are now used in the Department even without getting men out of the station onto the street.

#### B. PATROL MILEAGE

Two things are required of patrol-car operations: response to calls for help, and continuous patrols. Response should be as rapid as possible so that antisocial characters will have reason to believe that their chance of apprehension is high. Quick response also gives the public confidence in the Department, and limits the amount of damage that occurs in assaults and other such incidents.

Our general observations in response time of mobile patrol will be delivered in another context. Here we wish to examine patrol by itself.

Continuous patrol is desirable for its deterrent effect, which should be similar to that of known fast response. It also inspires confidence and, in a few cases, allows on-sight apprehension of criminals.

The amount of patrolling performed by the Department is surprisingly low. The typical patrol car is driven somewhere in the range of 70 to 130 miles per 24-hour day. The mileage records indicate that the lower mileage is characteristic of the "busier" Districts.

A simple calculation indicates that, city-wide, the average patrol vehicle is driven 25 miles a day for investigations and administrative trips. This indicates that daily patrol mileage per vehicle falls in the range 50 to 100 miles. Suppose half of this is done in the evening (first) tour. At the low end, the 25 miles of patrolling could be accomplished on foot during the time available. (Sixty percent of the time is available for patrol by 1.7 men, at an assumed three miles per hour.) This is an extreme example, of course, but the fact is that patrol could be increased markedly in all Districts with a small increase in fuel costs.

If patrol is believed to be useful, either to decrease crime or to increase public confidence, the present state of affairs should be changed. The number of patrol miles covered can easily be doubled in the evening tour when it is likely to be most useful. The need for increased patrol at other times is not so apparent.

It is recognized that attempts to increase patrol mileage can be subverted easily. There seem to be two possibilities: equip the cars with Wagner meters (used widely in commercial truck fleets to record vehicle operations); or divide mobile units into two separate functions. The latter approach, now being tried in St. Louis, utilizes a group of cars in a patrol-only mode: these cars cannot take themselves off the air without permission.\* The difficulty with this scheme is that the patrol-only officers, in looking for a measurable output of their work, probe around enough to arouse resentment of the citizenry.

#### C. NUMBER OF PATROL VEHICLES

We estimate that the average annual cost of operating a patrol vehicle is \$2,850, including purchase, equipment, operation and maintenance. At the present manning level, 1.7 men per car, the manpower cost for a continuously deployed vehicle is \$64,500. Obviously there could be more vehicles and fewer men per car if it were desired to increase patrol. In spite of the general reluctance to make capital outlays, the argument for more cars seems to be an easy one to make.

Implementation of the proposed control/display system will give the dispatcher sufficient information so that he can send two one-man cars to incidents which might need two men. This capability can be used to counter the argument that two men (in one car) are needed for safety. It might also make it unnecessary for two or more cars to voluntarily "cover" a potentially dangerous assignment, as is now the case.

\*The other cars handle complaints.

### VIII. SUGGESTIONS FOR FURTHER WORK

As a result of our examination of the Department's needs in the information area, we have become aware of other components of police activity which might be improved by analysis. Several avenues for further work are discussed briefly in this portion of the report.

#### A. MANPOWER PLANNING

When it becomes possible, through implementation of recommendations made earlier in this report, to release men for police work, it will be necessary to plan for their most effective employment. It has been stated that even if a decision is made to maintain a level budget, thereby decreasing the total force size, there will be extra men available for use in the field. The question of where to use them is not as simple as it seems at first glance.

Another aspect of manpower planning which needs attention is career development. This problem is touched upon peripherally in the following section, with respect to the shortage of sergeants. The whole problem includes recruitment, training, advancement, pay, working conditions, and other factors, of course.

#### B. IMPROVED PATROL SUPERVISION

If one plots the per capita index crime rate versus the ratio of patrolmen to sergeants for each District, the relative ranking of Districts with respect to crime will come as no surprise. What will be surprising is that the ratio of patrolmen to supervisory sergeants is largest in Districts with the greatest crime rate. The more serious the police problem the less manpower is devoted to supervision. There is no implication of a cause and effect relationship. What is implied is that there should be many more sergeants on the force and/or a redistribution of those now at hand.

We recommend a careful look at the rank structure of the Department, both from the standpoint of supervision mentioned here and from the patrolman's view of career incentives.

#### C. IMPROVED PATROL ALLOCATION

The measure of patrol is here taken to be the (theoretical) repetition rate at which a police vehicle would, on the average, pass a randomly selected point in the area being patrolled. (The reciprocal of this number, which may be called the patrol cycle time, gives the average length of time between successive passages of patrol past a randomly chosen place.) If, in an eight-hour tour, four hours are available for patrol, and if it is assumed that the average speed is 15 miles per hour, then a single car patrolling 30 miles of streets would have a repetition rate of one-fourth per hour. The cycle time would be four hours, i.e., on the average a stationary citizen would see a patrol car every four hours.

The patrol measure described above is usable only for the roughest comparisons, obviously, for a number of reasons. First, it assumes that all the street mileage is patrolled at some time: depending upon street lay-out and visibility, the fraction patrolled will vary from one District to another. Second, it assumes that the average patrol speed is constant: it will vary with place and time of day. Third, and most important, it assumes that all time available for patrol is spent patrolling. Finally, it ignores the exposure which is produced by a car proceeding to an investigation.

One can separate Districts into active and quiet, in terms of calls for service or investigations. In an active District a larger fraction of the available car time is spent on calls than is the case in a quiet District. As a consequence, there is less patrol effort possible, per car, in the active Districts. In spite of the fact that the active Districts have more cars per capita (or per area), the present situation is that some quiet Districts have four times as much patrol as other more active Districts.

It is recommended that a careful study be made of the present allocation of patrol vehicles, with the aim of producing more patrol where it might do the most good. This need is greatest in District 4 where a decrease in patrol cycle time might be beneficial in reducing the large number of auto thefts now occurring in this District.

#### D. EXPERIMENTS IN CRIME DETERRENCE

It is suggested that the proposed control system for field operations be used to conduct a number of experiments in crime deterrence. This does not mean to decrease police effort and see what happens; only increases should be tried. The most obvious target, even if not the most important one, is to deal with auto theft. In the Districts in which it is now a severe problem, there are enough resources available to create a reasonable probability of catching a car thief in the act. The forces can benefit from improved communications and control, particularly the latter.

#### E. SELECTIVE TREATMENT OF DRUNK ARRESTEES

It is noted that the garage facilities now housed in the District 4 Station will eventually be moved to a new building. Since District 4 has a large fraction of all drunkenness arrests, it is suggested that a lock-up might be built in the space to be vacated by the garage. The utility of such a lock-up would require cooperation from the court. It would certainly save the city money for one or two court officials to come to District 4 each morning rather than move all of the drunks to the city jail from which they are then released.

#### F. VEHICLE MAINTENANCE AND PLANNING AND REPLACEMENT CRITERIA

Some suggestions have already been made which might make it simpler for vehicle maintenance to be carried out: the creation of a reserve vehicle pool and the collection and return of vehicles by manpower assigned to the maintenance group. In addition, savings might

be achieved by rationalization of the vehicle replacement policy of the Department.

#### G. FUNCTIONAL BUDGETING

It is proposed that future work should include a careful analysis of the Department budget so that a functional budget can be prepared. This sort of budget would reveal many interesting things. For example: the entire census effort done each January by the Department represents less than 1 equivalent patrol car in terms of resources; the licensing function represents 3 equivalent patrol cars. Budgeting by function makes the connection between resources and output easier to understand than does the usual accounting procedure.

#### REFERENCES

1. Rosenberg, S. D., Analysis of Urban Police Call Box System Alternatives. M.S. Thesis, Massachusetts Institute of Technology, Cambridge, Massachusetts, June, 1967.

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APPENDICES A and B may be obtained  
from Arthur D. Little, Inc., Acorn  
Park, Cambridge, Massachusetts.

Appendix A. The Oral and Written Com-  
munications of the Boston  
Police Department which  
Arise from Complaints

Appendix B. The Boston Police Radio  
System

**END**