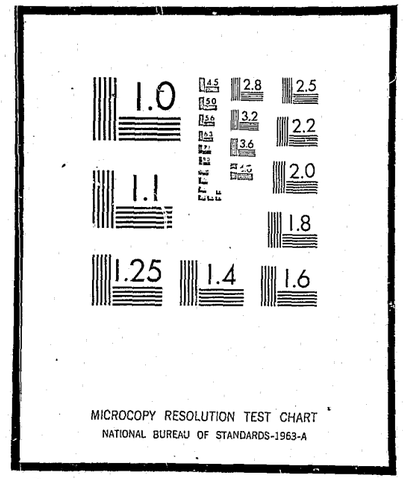

COMPUTER SIMULATION OF COMMAND/CONTROL OPERATIONS

PROJECT (70-04-05)

FINAL REPORT

SEPTEMBER 1972

SUBMITTED TO

GOVERNOR'S COUNCIL ON CRIMINAL JUSTICE

TALLAHASSEE, FLORIDA

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ACKNOWLEDGEMENTS

This report represents effort contributes by members of the Orlando Police Department and Florida Technological University. Although it is not possible to list all who participated, the contribution of several most directly involved are listed for recognition together with their area of responsibility.

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Members of the Florida Governor's Council on Criminal Justice who provided financial support and guidance throughout the project.

In addition the authors would like to acknowledge the assistance obtained from the Los Angeles Police Department, Advance Planning Division under command of Lt. C. L. Cronkhite.

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INTRODUCTION AND SUMMARY

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The Orlando area is experiencing a period of explosive growth which makes it one of the five fastest growing areas in the nation. Along with prosperity this growth brings with it new demands on the police and other service agencies of the City. This was recognized by Chief of Police, Robert J. Chewning, who initiated a study grant thru the IV Regional Office of the Governors Council on Criminal Justice to analyze his Command/Control System and develop methods whereby its effectiveness could be improved.

Initially the System was defined using functional flow diagrams. Subtask activity elements were identified and timed by statistical sampling to provide a data base for the operations. This data was used to develop a computer simulation model which was then exercised to evaluate a number of alternate operational plans designed to improve the effectiveness of the System against both current and projected demands.

A Command/Control management game was also structured to train personnel in the Complaint Officer function.

BACKGROUND OF STUDY

The projected explosive growth projected for the City of Orlando within the next several years will be reflected in an accelerating rate of demand for police service which can only be effectively met through use of advanced management tools and incorporation of equipment technology.

The Orlando area has experienced a rapid increase in population, business, and industrial growth in the last decade which viewed statistically shows it to be one of the five fastest growth areas in the nation. Unfortunately criminal activity has also shown increase and the requirement for police services must be expected to continue at a phenomenal rate. During the last 10 years, population and area of the City of Orlando increased 29% and 55% respectively; however, total annual offense incidents recorded by the Police Department increased 90%. This is a sharp increase but a more disturbing aspect is that the curve has assumed an exponential form. If the rate is sustained, a conservative estimate of offenses shows a 44% increase over the next 5 years.

Clearly, this increase in criminal activity will introduce a major demand on the City's justice agencies, creating personnel, facilities, and equipment needs as well as increased management responsibility to organize and plan effectively. A major portion of this responsibility must necessarily be assumed by the Police Department since it is the front line of defense against criminal activity.

This study was based on observation and recommendations assembled by the members of the Science and Technology Task Force of the President's Commission of Law Enforcement and Administration of Justice.[1] Their effort described how technology and analytical techniques such as Operations Research could be used to increase the efficiency and effectiveness of police operations in the apprehension process. The apprehension process commences with detection of a criminal activity by a responsible citizen or automatic alarm. The information is then communicated to the police, an appropriate response determined, and an officer is dispatched to the scene. Follow up activities include search, interrogation, investigation, data gathering, etc. hopefully culminating in an arrest.

Within the appr hension process the Command/Control function was singled out as one of the more effective areas to consider for improvement, and a number of critical Command/Control problems that limit Police operational effectiveness were identified. These are listed for reference in Table 1 together with brief comment on each pertaining to how the planned study might affect each.

An effective measure of Command and Control effectiveness is response time. Response time can be considered as comprised of two major components:

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1 Institute for Defense Analysis, Task Force Report: Science and Technology (Washington, D.C.: President's Commission of Law Enforcement and Administration of Justice, 1967), p. 21.

time required in the Communications Center from receipt of call to dispatch of the patrol vehicle and field response time or that required by the vehicle to reach the scene.

The urgency to improve response time derives from its correlation with the probability of apprehension of a suspect. It was determined from statistics based on Los Angeles Police Department data that with a response time of <1 minute 62% of the emergency calls ended in an arrest. As the response time was increased the apprehension probability rapidly decreased and at 14 minutes the cummulative cases exhibited only 44% arrest probability.

In addition it was found that the Communications Center accounts for 30-50% of total response time delay. Further examination showed it to be one of the best areas to invest dollars to decrease response time. Expenditures to decrease travel time are also cost effective but typically require higher investments. This approach can be typified by installation of an Automatic Patrol Vehicle Locator or introduction of additional patrol vehicles. Accordingly this study was designed to evaluate the Command/Control requirements and capability of the Orlando Police Department through use of a simulation model which could be selectively modified to develop and evaluate alternate improvement plans.

TABLE 1

OPERATING PROBLEMS IDENTIFIED

WITH POLICE COMMAND/CONTROL SYSTEMS

Problem Area	OPD System Comment
o COMMAND/CONTROL PROCEDURES	AVERAGE USE MODEL TO IMPROVE
o INSUFFICIENT INFORMATION ON PATROL VEHICLE LOCATION	DISTRICT ASSIGNMENT VEHICLE LOCATOR NEEDED
o COMMUNICATIONS CENTER RESPONSE DELAY	AVERAGE USE MODEL TO IMPROVE
o RADIO SPECTRUM CONGESTION	GOOD P.R.E.P. SYSTEM
o STAFFING CAPABILITIES	LIMITED USE MODEL TO TRAIN
o COMMUNICATION CENTER DESIGN	GOOD USE MODEL TO IMPROVE
o STRATEGIC AND TACTICAL PLAN DEVELOPMENT	LIMITED USE MODEL TO DEVELOP

SUMMARY OF REPORT

The research resulted in an effective computer simulation model of the Command/Control System which was used to evaluate several viable operating alternatives. In addition a training game for the Complaint Officer position was generated and tested.

In police operations the success of the apprehension process is directly dependent on the effectiveness of the Command/Control System. This conclusion derives from the relationship between the probability of arrest and response time to an incident call; the quicker the response the higher the arrest probability. Response time is in turn dependent on the efficiency of the Command/Control process. An effective Command/Control System must have the inherent capability of rapid and complete information assembly, decision making and execution to minimize delay in response to the call.

The primary objective of the research was to study the Command/Control System of the Orlando Police Department with emphasis toward improving its effectiveness against present and future requirements. This required definition and analysis of the Command/Control function through statistical and system operational techniques. This information was then used to develop a valid model of the system which was used to evaluate alternate methods of operation. Emphasis on developing current operational improvements was focused primarily on the Command/Control Center. The impact of projected requirements were examined emphasizing the total system. A secondary objective was to establish a methodology for modeling police Command/Control Systems which could be used to develop a model for Central Florida regional police operations. It should be recognized that criminal activity does not recognize political boundaries and progressive improvements can thus only be totally effective if incoporated in a regional system analysis.

A system analysis approach was used. Initially an operational flow diagram was constructed to describe the Command/Control System. The logic was then expanded to define four basis operational response modes - Routine, Incident, Emergency and Internal. The activities of each major function within this System was thus identified by mode. This was used to generate detailed time oriented subtask description for each major function (Complaint Desk, Radio Communication, Teletype Communication and Patrol Unit) by mode. Independent task elements were selected which could be measured by stop-watch techniques. Two sampling periods of about 5 weeks each were conducted on a 24 hour basis. During this time over 8700 incoming calls were recorded and up to 10 discrete activity elements associated with processing each call timed. This data was statistically analyzed. The mean and variance of each element was obtained by watch and day of week. These results were tested to determine confidence level at which it could be stated statistically that there was no significant difference between the mean time for each element and the overall mean time obtained.

Several other smaller sampling studies were conducted to define other aspects of the incoming call traffic. These included distribution of the origin of calls mean time between calls, and call loading of the radio operators.

A basic model of the Command/Control system was developed using GPSS/360 simulation language. This was validated by statistically testing the hypothesis that there was no signifiance differences at the 10% level between response time simulated by the computer model and that obtained for sampling the real operation. The validated model was used as a basis for experimental investigation because it could be easily modified to quickly determine the effectiveness of alternate operational plans. This approach is especially appealing in the case of the Command/Control system of a police department where experimentation with the real system might compromise the operational effectiveness and jeapordize the safety of the public and officers. In addition tactical and strategic plans to meet special situations and needs can be developed and tested whereas otherwise they could only be speculative.

Several significant operational changes in the Command/Control System were formulated and tested. In the Command/Control Center the Complaint Officer and Radio Operator positions were combined. Output for the simulation model indicated that this was not a viable operating alternative. It did not significantly reduce response time and it also required special capabilities in the personnel which would require additional training.

The System effectiveness was also examined against projected incident demands up to 1980. The model was used to evaluate installation of an Automatic Vehicle Locator unit.

A Command/Control mangement game was structured to train personnel in the Complaint Officer function. Although designed for manual implementation, it can be upgraded into a complete assisted training device, if desired. The game was set up in two rooms such that the instructor could observe and note the Complaint Officer performance without being in the game room. The game room was equipped with a Force Status Display Board of the City and a Complaint Desk Work Station Layout.

The instructor may select from environmental scenarios which include tactual situations requiring immediate decision. After this is presented to the Officer by a briefing, the Force Status Board was keyed to reflect the stiuation and the game begins. The Instructor institutes the calls and tests the response of the Officer.

The preformance rating is determined from evaluation of several effectiveness criteria: Form Completion Time, Information Accuracy, Decision Capability and Tact. These were defined and weighted to reflect through relative importance in job analysis interviews with Command/Control Center personnel. A standard scoring profile was determined by obtaining performance ratings on Complaint Officer personnel currently performing adequately in the position.

The game was used on several candidates and the resulting performance ratings correlated well with the evaluation of supervisory personnel of the candidate in the actual environment. It is recommended that the game be expanded to become part of each police trainee's course work.

SECTION II

PURPOSE OF PROJECT

- Importance of Command and Control in Police Operations
- Advantages of Evaluation by Simulation Model
- Objectives and Potential Benefits of Project

All police departments utilize some system by which they direct and control their field forces in a dynamic response environment. This system of Command and Control must have the inherent capability of rapid and complete information assembly, decision making and execution which will assure rapid response to the threat situation and minimize the danger to both citizen and police officer.

It is important then that each such system be studied and alternate operational schemes be evaluated to improve its effectiveness. It is not generally feasible, however, to experiment with the real system since it might jeapordize the response capability. A system simulation model offers an attractive alternative. It can be used as a base for experimental investigation at lower cost and less time because it is easily modified to determine the effectiveness of alternate plans under a number of given conditions without risk to real system performance.

The immediate objective of this project focused on evaluation of methods to improve the effectiveness of the Orlando Police Department Command/Control System. A computer simulation model was used, supported by a statistical data base which described the actual operation in sufficient detail that operating changes could be readily formulated and evaluated. The human factors aspect of the System were also addressed by developing a training simulator to familarize new personnel and maintain/upgrade the capabilities of on-board personnel in Command/Control operations. Future goals of the research include technological spin off to other police agencies.

IMPORTANCE OF COMMAND AND CONTROL IN POLICE OPERATIONS

A Command and Control System capable of rapidly responding to all complaint calls is necessary for the effective coordination and deployment of police operational forces.

Command and Control is typically a military terminology for the activities associated with planning, direction and control of operations. A Command/Control System in turn can be defined as "an organization of personnel and facilities to perform the functions of planning, situation intelligence force status monitoring, decision making and execution."[1] All operations management whether industrial, military or law enforcement require some type of Command/Control System to perform these functions.

In most police departments, the Communications Center is the focal point of all public calls and other inputs to the system. The Center houses the personnel and equipment necessary to relieve and integrate all information pertaining to routine or emergency situations and control and coordinate the men and equipment needed to respond to the situation. Personnel typically include Complaint Officers to receive the incident calls, assess the force status situation and assign the necessary response and Radio Operators to communicate with the field forces. The communications system consists of an integrated network of radio circuits and land lines linking the Center with the public, the Department forces and other law enforcement agencies. Key components in a manual system are phone lines, VHF/UHF radio and control console, teletype links to other agencies, a force status display board, and a computer information display terminal. A computer augmented system would include the capability of integrating all pertinent information on a complaint call with the nearest available approval of the dispatcher.

The Figure on the opposite page is a simplified functional block diagram of the Basic Command/Control Process. The diagram defines the relationship of the functions necessary to discharge a command responsibility and the importance of dynamic feedback from the field to control and respond effectively. The commander must know the dynamic environment in which the forces are operating as well as the plans, procedures and capabilities of his command. The threat is the forcing function on the system. Unfortunately it cannot be evaluated until after the complaint call is completed, and the information must then be integrated into the overall tactical situation for analysis and decision of the type of response. Once the decision has been made it is executed by dispatch of field forces. As the forces respond it is vital that the commander monitor the field operations and use this information to update his estimate of the current situation and respond accordingly.

Any Command/Control operation must have the inherent capability of rapid and complete information assembly, decision making and of execution. In

1 Institute for Defense Analysis, Task Force Report: Science and Technology (Washington, D.C.: President's Commission on Law Enforcement and Administration of Justice, 1967), p. 21.

the police apprehension process, for example, studies[2] of the Los Angeles Command/Control System showed that the Communications Center delay accounted for 30 to 50% of the total response time on emergency calls. Here response time is defined as the period from receipt of the call until the patrol vehicle arrived at the complaint site. It is apparent that speeding up the Command/Control process offers an effective method of improving the effectiveness of a police apprehension system. Again referring to the Los Angeles study, a correlation of percent of arrests in relation to response time showed a sharp increase in arrest probability with a decrease in response time. The curve could be described as an exponential function exhibiting a shart increase in arrest probability for response times of less than 4 minutes. In addition many calls which are initially termed routine escalate into emergency situations due to the delay in response. An effective Command/Control System is a vital part of both citizen and police safety.

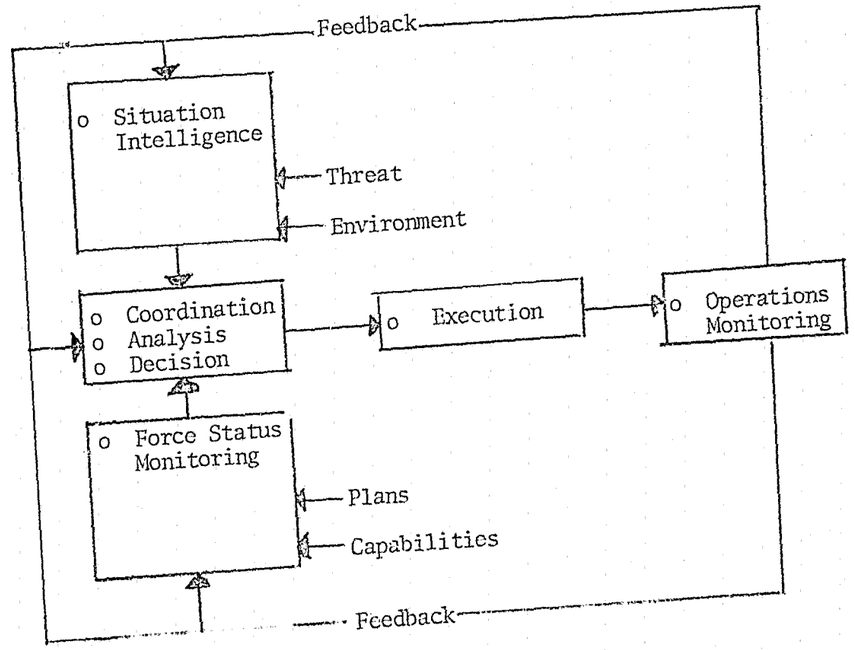

Figure 1 Functional Block Diagram Of Basic Command/Control Process Shows Its Dependency On A Closed Loop Feedback System.

2 Ibid

ADVANTAGES OF EVALUATION BY SIMULATION MODEL

A system simulation model can be used as a basis for experimental investigation at lower cost and less time because it can be easily modified to determine the effectiveness of alternate plans under given consitions without risk to the real system performance.

Simulation is essentially a working analogy of a system where analogy may be defined as a simularity of properties and their relationship without regard to specific identies. The analogous system can then be observed to obtain measurements and predict the reaction of the orginial system.

A Simulation study then initially involves the development of a working model which duplicates the behavior of the system under consideration. A model can be viewed as a simplified representation of an operation in the problem under study. It is noted that the term "simplified" does not necessarly mean simple and further that many compromises and much effort may be necessary to obtain a workable model. Essentially the comcept is to develop a model which validly describes a complete system in its essential elements such that it can be used for controlled research.

Models have become widely accepted as tools to study complex phenomena and their form varies greatly. A physical model is most easily understood but is difficult to change for experimental purposes. They are usually physical replicas often on a reduced scale, of the system under study. An abstract model is one in which symbols rather than physical devices are used to construct the model. It is generally more common than the physical model and more easily manipulated.

A mathematical model is a special form of abstract model and one which lends itself well to simulation of a system such as the Command/Control operations.

Police operations are particularly well suited to digital computer modeling.[1] The random nature of inputs to the system whether from citizen complaint or incidents observed by patrol vehicles can be closely approximated be well known statistical distributions. For example, it has been shown that patterns of incoming telephone calls can be closely approximated by random sampling from the Poisson distribution.

It should also be recognized, however, that exact mathematical modelling using closed form expressions would be difficult and extremely time consuming to police operations because of the broad spectrum of possible inputs and responses. Accordingly a computer simulation model is most effective.

The value of a simulation model derives from its ability to improve our understanding of behavior characteristics more effectively than observing the real system. Mathematical simulation is typically used to study a problem for a number of reasons:

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1 Julius Surkis, Gilbert R. Gordon, and Norbert Hauser, "A Simulation Model of New York Police Departments Responce System," Digest of the Second Conference of Applications of Simulation (December, 1968, pp 218-221)

- o For purposes of experimentation or evaluation to predict the consequences of a change in policy, conditions or methods without having to extend the resources or take the risk of actually changing the real system;
- o As a means of learning about new systems in order to redesign them;
- o As a tool to familiarize personnel with an operating situation which may as yet not exist in real life;
- o For verification or demonstration of a new idea, system or approach;
- o As a means for projecting into the future to provide quantitative bases for planning.

In summary then plans, design or concepts can be tested and revised prior to committing them in real terms, and through the use of computers the result of several years operation under different conditions and assumptions can be obtained within hours.

The concept of mathematical model application is illustrated by the diagram in Figure 2 . The real system is translated into a simplified model through observation and manipulation of the variables. The model is then validated to ensure that it will adequately respond to exogenous variables and inputs. After validation, controlled experimentation can be used to predict the response of the real system and evaluate alternate operational plans.

This approach is especially appealing in the case of the Command/Control system of the police department. Clearly it is not possible to experiment with the real system since it might compromise the operational effectiveness and thereby jeopardize the safety of the public. In addition it is highly desirable to develop tactical and strategic plans to meet special situations and future needs which at this point can only be speculated. A further use of the model would be to train Command/Control operating personnel prior to their encounter with the real system.

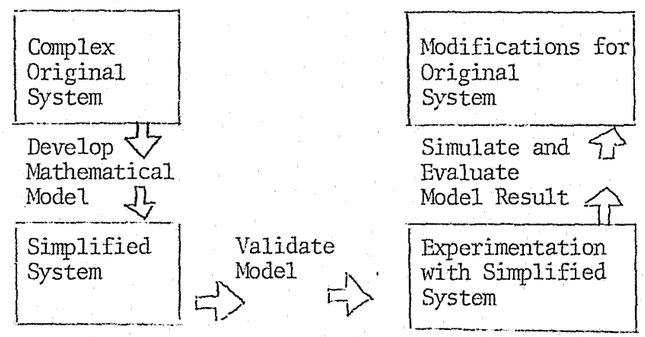


Figure 2 Simplified Flow Diagram Of Model Simulation Show Basic Activities And Events Involved In Typical Application.

OBJECTIVES AND POTENTIAL BENEFITS OF PROJECT

The objectives of the study can best be described as multidimensional because they include not only evaluation and improvement of the Orlando Police Department Command/Control System but also development of the analysis methodology such that it could be applied to other regional police agencies. Additionally, the time dimension was added to study the operation in both current and projected situations and environments.

The immediate objective of the proposed research is concerned with evaluation of methods to improve the Orlando Police Department Command/Control system to more effectively cope with the exponential rate of increase in criminal activity forecast for the area. The effort included developing a valid model of the operation which was used to evaluate alternate methods of improving operational effectiveness, tactical operational and emergency situation plans, and training department personnel. Future objectives focused on development of background experience from which a model of the Central Florida regional police operations can be effected.

On a regional basis it must be recognized not only that criminal activity will greatly increase but also that it does not recognize political boundaries. In determining means to combat this threat all county or municipal police agencies within the Region should be viewed in their totality as a police system. Each is established as an independent entity but functionally each is dependent on activities of the others to discharge its responsibility to the public. This interdependency network must be recognized and defined so that it can be used to strengthen the individual and regional police operations. This would be exhibited as improved Communications and Command/Control operations for all law enforcement agencies within the area.

Recognizing however, that a model of the overall Central Florida regional police operation would be difficult to implement initially because of political as well as technical problems, the primary goal of this research was generation of a valid model of the Orlando Police Department Command/Control operations. It is expected that this would be a demonstration study which could be incorporated at a later phase into a regional police operations model.

The goals of the proposed research can be classified as immediate or future for specific identification. The immediate goals were concerned primarily with evaluation of methods to improve Municipal Police Department Command/Control operations. Table 2 presents a listing of goals and anticipated benefits which have been classified as immediate and future. These goals are recognized as subobjectives which support the primary objectives of evaluating the Orlando Police Department Command/Control requirements and developing alternatives to improve system performance. A simulation model was used to provide an inexpensive tool with which to analyze the system under various operating modes. It was supported by a statistical data base which described actual operations and in sufficient detail such that operating changes could be readily formulated for evaluation. Inherent in these evaluations was development of suitable performance criteria which could be observed for the effect of each alternative on the system. A future objective was to predict system performance against exogenous variables introduced by the environment. The resulting information could be used to plan and control operations to respond effectively to future

or other projected situations. The human factors aspect of the system was addressed by developing a training simulator to familiarize new personnel and maintain/upgrade the capabilities of on-board personnel in Command/Control operations.

The future goals of the research are focused on benefits which will accrue as technological spinoff to other police agencies. Typically it is difficult to adequately describe the advantages of more abstract technologies such as statistical analysis and Operations Research to police administrators, who as action oriented individuals, depend on their more tangible resources. This study will hopefully provide a tangible example of how Operations Research can augment and improve their capabilities. As this becomes evident a simulation model of regional police operations will become feasible. Such a model will offer tremendous benefits to police operations in the area.

TABLE 2

LISTING OF GOALS AND ANTICIPATED

BENEFITS OF THE PROJECT

IMMEDIATE:

- o ESTABLISH A VALID MODEL OF THE ORLANDO POLICE DEPARTMENT COMMAND/CONTROL OPERATIONS AS A RESEARCH TOOL.
- o BUILD A STATISTICAL DATA BASE TO SUPPORT THE RESEARCH MODEL; INCLUDING DATA REPORTING, VALIDATION AND REDUCTION.
- o DEVELOP AND EVALUATE ALTERNATE METHODS OF IMPROVING EFFECTIVENESS OF DEPARTMENT OPERATION. THIS INCLUDES IDENTIFICATION OF SUITABLE EVALUATION CRITERIA.
- o DEVELOP AND EVALUATE TACTICAL OPERATIONAL PLANS FOR RESPONSE TO PROJECTED SITUATIONAL ENVIRONMENTS.
- o DEVELOP A TRAINING SIMULATOR WHICH CAN BE USED TO FAMILIARIZE AND TRAIN NEW PERSONNEL IN COMMAND/CONTROL OPERATIONS OF THE DEPARTMENT AND ALSO MAINTAIN/UPGRADE DECISION LEVEL OF EXISTING PERSONNEL.

FUTURE:

- o DEMONSTRATE THE ADVANTAGE OF ESTABLISHING A STATISTICAL DATA BASE AS A TOOL TO MANAGE POLICE OPERATIONS.
- o ESTABLISH A SYSTEMS METHODOLOGY WHICH CAN GENERALLY BE USED BY OTHER POLICE AGENCIES.
- o ACQUAINT THE REGIONAL POLICE AGENCIES WITH THE METHODOLOGY AND BENEFITS TO BE REALIZED FROM A SIMULATION MODEL OF REGIONAL OPERATIONS.

SECTION III

PROJECT RESULTS AND RECOMMENDATIONS

- Major Results And Observations
- Recommendations For Orlando Police Department Operations
- Additional Research Planned By Orlando Police Department

The observations generated by a study of this size are not only numerous but also reflect a broad spectrum of existing and projected operating conditions. For purposes of discussion they were classified as those primarily related to management structure and those affecting operations.

Administratively more emphasis should be placed on understanding the Command/Control System as a total entity in accomplishing the mission of the Department. In the apprehension process neither the Communications Center nor the Field Forces can respond to an incident call on an individual basis; it requires the coordinated activities of both functions to form a strong team.

The Communications Center assignments should be upgraded. It must be recognized by all Department personnel that the Complaint Desk and Radio Operator are key positions. The Complaint Officer is many times the first and only contact of the citizen seeking help. On the other hand, the Radio Operator may be the only link the Field Officer has with his source of help. These personnel must be selected on the basis of their job related abilities and trained specifically for the position. The Simulation Training Model of the Complaint Desk work station developed in this report should be expanded and used both to train and evaluate the proficiency of the Communications Center personnel.

It was noted that there is a need to establish Standard Operating Procedures to govern special tactical situations in the field so that all personnel understand the game plan. These would range from designation of an alternate field unit when the district unit is engaged to redeployment of all field units to meet a stress situation. The Unity of Command must be preserved at all times.

A policy should be adopted for planned introduction of technology into the Command/Control System to improve its effectiveness. This would involve a technological "fusion" of personnel, technology and management techniques toward eventual implementation of an Automated Command/Control System. Clearly this must be a long tern continuing commitment. Initally the computer simulation model developed in this study should be expanded to increase its flexibility and detail since its capabilities make it an excellent tool to evaluate and plan new system concepts. Spin-offs from the present simulation study includes a formative operations data base and basic Command/Control Training Simulator.

The next major effort should be directed at defining an Automatic Patrol Vehicle Locator and Force Status Display System. A study is necessary because there are a number of alternate approaches and the design should reflect the specific conditions of the Command/Control System under consideration.

MAJOR RESULTS AND OBSERVATIONS

The performance of the Orlando Police Department Command/Control System generally compares favorably with that of other departments documented in similar studies; however, it could benefit from clarification of command-authority relationship through a better understanding of the total System, a subsequent upgrading of the Communication Center personnel and status, and introduction of selected technology such as on Automated Vehicle Locator on a planned basis.

Observations generated by a study of this size will typically not only be numerous but also represent a broad spectrum of operating conditiions. For purposes of discussion they can be classified as those related to administration or management structure and those affecting field operations. Superimposed on this list are the ramifications deriving from projected future requirements or stress conditions. It is also noted that observations resulted directly from analysis of the operation as well as through applications of the simulation model.

Generally it was noted that more emphasis should be placed on understanding the Command/Control System as a total entity. The Field Forces and Communications Center are of equal importance in discharging the primary police mission. In the apprehension process neither the Communication Center nor the Field Forces can respond effectively to an incident call on an individual basis; it requires the coordinated activities of both functions to form a strong team. A provincial attitude between these groups will create an administrative problem which is generally evidenced as an operational problem and loss of System effectiveness.

The Communications Center is experiencing administrative problems. The Complaint Desk assignment is considered undesirable, and among many of the sworn personnel this assignment has the connotation of a punishment. Officers are normally assigned for six month tours of duty and few choose to remain longer; the civilian turnover is also high. Psychologically, the position is demanding with much responsibility, little status, and frequent abuse from both citizen and field officers. Physically, it is confining and does not satisfy the urge for action sought by the typical police officer. The use of civilian personnel in the position appears to only compound the problem. The civilians generally lack knowledge of field operations and their exercise of functional authority in directing field forces is not readily accepted by the field officers. In addition the understanding of the law and total operation of the System is marginal.

It must be recognized by all personnel that both Complaint Desk and Radio Operator are key positions in fulfilling the mission of the Department. The Complaint Officer is many times the first and only contact of the citizen seeking help from the Department. On the other hand the Radio Operator may be the only link the Field Officer has with his source of help. Personnel manning these positions must be carefully selected for their job related abilities and further trained in their duties to be required proficiency, or rejected as unacceptable. The Communications Center can be molded into an elite group comparable to special uniformed units.

There is a need for simulation training away from the real system position. The present practice of on-the-job training has the inherent

danger of a foulup which could endanger the safety of both citizen and police officer. In addition, the training scenario cannot be controlled to include the necessary stress situation, and instructional feedback on performance is not feasible.

In the Uniformed Field operations there are several observations pertaining to administration and organization which should be mentioned. The field commanders may revise field unit assignments made by the Communications Center based on their knowledge of field conditions. This is frequently advantageous to operations but involves an inherent risk to the Unity of Command. It is very possible that a call may go unanswered if the field reassignment is not made carefully and confirmed by the Communications Center. The field Commander must realize he is assuming responsibility for all assignments when he breaks in and assumes command. Further, he remains in this position until he formally relinquinishes authority to the Center

It was noted that there are no standard procedures for designating alternate field units when the district unit is engaged. Apparently, each field commander has his own plan which is unknown to the Communications Center. An optimum procedure should be developed and adopted.

Generally response performance of the System compares favorably with that of other similar police systems published in the literature. The simulation model further predicts that, excluding stress conditior , the present Command/Control design will suffer only a slight degregation in performance when responding to the projected 1976 requirements. However, as in the military and other public safety systems, the desired performance should be measured against emergency or stress conditions. This consideration will require that the System continue to be upgraded toward realization of the ultimate "instant cop" concept through introduction of improved technology and training. It is noted that Complaint Officer utilization in the present system is relatively low in the present system. It is suggested that some could be assigned other duties nearby and called when activity in the Center requires additional manpower.

The PREP system provides good communications within the City and adds much to the safety of the individual officer. It can also be easily expanded as the City grows and represents an excellent use of technology.

An Automatic Vehicle Locator (AVL) system would be the most cost effective capital investment in the Command/Control System at this time to meet the demand of projected operational requirements. As the area of the City increases it appears that continuation of the district response system will become more costly than instituting an umbrella deployment system using AVL so that the nearest available unassigned unit can be dispatched. The AVL system also offers the potential advantage of faster response times and improvement in the safety of field officers through knowledge of his location at all times.

Addition of a third Radio Operator console station to handle channel 1 traffic appears to offer several operating advantages. All Criminal Investigation Bureau communications could be handled through this station. In addition it could serve as a hot pursuit coordination station without disrupting the other Radio Operator traffic.

RECOMMENDATIONS FOR ORLANDO POLICE DEPARTMENT OPERATIONS

The immediate recommendations address upgrading the status and effectiveness of the Communications Center functions and planned introducation of technology into the Command/Control System. To this end, several follow-on studies have been recommended in the areas of Automated Command/Control and Computer Augmented Training simulation.

The recommendations which resulted from this study are offered primarily for consideration of the Orlando Police Department and are aimed at improving specific problem situations. The suggestions do not limit the details of their implementation however since it is recognized that these will differ with the individual situation and timing and it was not the intent of this report to detail the actions. It is noted, also that a number of the recommendations address problems of general concern to officials of all police agencies.

For clarity the recommendations have been categorized as those primarily concerned with administrative or technological aspects of the operations.

Administrative

Institute a program to upgrade the status and effectiveness of the Communications Center functions. This will involve a long term commitment in training and education of both on-board and new personnel in the importance and operation of the Command/Control System with special emphasis on understanding the interdependencies of the Communication Center and Field Forces. It is emphasized that this must be accomplished on a planned continuing basis involving a number of paralled efforts.

- Implement a Simulation Training Model of the Complaint Desk work station. The model would have the flexability of different tactical situation scenarios representing degrees of difficulty for training or maintaining a degree of proficiency.

- Select personnel to man the Communications Center on the basis of their job related abilities and performance of the Simulation Training Model. Each candidate must have a satisfactory knowledge of the law and total System Operation prior to assignment. On-the-job training should be minimized.

- Establish standard operating procedures to govern special tactical situations in the field so that all personnel know the game plan. These would range from designation of an alternate field unit to respond when the district unit is engaged to redeployment of all field units to meet a stress situation. It is vital that the Unity of Command be preserved in all situations at all times.

- Install a third Communications Console which would be designated to handle channel 1 traffic. This typically consists of Information Requests from the field, CIB and Hot Pursuit communications. The console would provide the focal point for Command/Control of the CIB field units which presently does not exist. Also it is important to establish an emergency communications command post where a senior command officer can direct the field forces.

Technological

Adopt a policy of planned introduction of technology into the Command/Control System to improve its effectiveness. This requires a technological fusion process by which technology and management techniques can be integrated into an effective system, and a well planned system will also have the inherent capability to incrementally add the necessary components of men and equipment to meet the operational growth needs as they develop. The technological fusion process requires three areas of effort - personnel training, development of new management techniques, and specification of equipment - all of which must be phased and yet occur simultaneously.

- Continued to apply and expand the computer simulation model to increase its flexibility and detail. Its capabilities make it an excellent planning tool in which the three aspects of the system - technological, personnel and administrative, can be related and examined. The data base should also be maintained and upgraded to assume the validity of the model output as the environment changes. The computer program should be modified to run more efficiently and better reflect the real world operation.

- Commission an Automatic Vehicle Locator (AVL) System feasibility study. This appears to be the most cost effective equipment with which to satisfy projected operational requirements. The study is necessary to determine the most feasible system for the specific operational and environmental requirements of the Orlando police Department from available alternatives. The effort would include development of a system concept and performance specifications for the AVL and associated Force Status Display systems.

- Prepare a Computer Assisted Training (CAT) project which would define the applications of advanced instructional technology to meet the increasing training demands imposed by the increasing level of equipment sophistication. This would commence with an expansion of Complaint Officer Training Model using computer capabilities as described in this report; however, it is comtemplated that it would also determine how other phases of officer training could be improved by CAT simulation. These might include special stress training situations which could not be feasible or easily duplicated by on-the-job training.

ADDITIONAL RESEARCH PLANNED BY ORLANDO POLICE DEPARTMENT

The Computer Simulation Study of the Command/Control System at Orlando Police Department is part of an overall plan to effect a technological "fusion" of personnel, technology and management techniques toward implementation of an Automated Command/Control System.

Police Administrators throughout the nation today are becoming increasingly aware of the advantages which a technological "fusion" of men and new technology may offer their operation. They visualize the added leverage which the technological tools such as secure communications, automatic patrol vehicle locators, information storage and retrieval and computer aided dispatching can contribute to their response capabilities toward the concept of near instantaneous arrival of officers at the crime site.

It must be recognized, however, that technological fusion is not an instantaneous process. It must be planned and organized such that each component will blend into the total system. Interfaces must be recognized, defined and reflected in the conceptual planning. A well planned system should have the inherent capability to incrementally add to necessary technical system support to meet the operational growth needs. This approach is being used by Orlando Police Department to build toward a fully automated Command/Control System which uses a digital computer to perform the overall integration function.

Figure 3 is a logic diagram which relates the planned studies needed to implement an Automated Command/Control System within Orlando Police Department. The initial step is the Computer Simulation of Command/Control Operation project which is described in this report. The simulation model can be easily modified to determine the feasibility and effectiveness of alternate operational methods which introduce new technological concepts and field force assignments against emergency and projected tactical situations. Those studies which are underway or completed have been indicated by shading the area on the diagram.

Three parallel areas of effort are necessary for an effective technological fusion process. These generally can be defined as personnel training, development of new management techniques and specification of technology requirements. Too often the focus is on technology. This approach can only result in a less effective system since the personnel have not been trained to fully utilize it and management may not have the knowledge or tools to direct and control the resulting system.

Currently, as spin offs from the Simulation study, a Command/Control Training Model is in operation and a Statistical Data Base is being compiled. The next proposed study is to define an Automatic Patrol Vehicle Locator and Force Status Display System. This necessitates a study because there are a number of alternate approaches, and the design must reflect the specific conditions of the Command/Control System under consideration. This system would continually update the location and status of all patrol units in the field in a back lighted map of the City. This display board would also be equipped to show the incidents to provide a visual correlation to

facilitate dispatch of the nearest available unit.

Correlation/Regression Analysis is planned to provide background for a Resource Allocation System (RAS). Its primary objective is to provide management with a method to plan and control their response to a predicted requirement. Its forecasting capability would include predictions of the numbers, kinds, time and general locations for the occurances of incidents and the numbers of patrol units necessary for varying levels of service to satisfy their demands.

The Computer Assisted Training (CAT) study would be directed toward application of advanced instructional technology to meet the increasing training demands imposed by the increasing level of equipment sophistication. For example, the original Complaint Officer Training Game would be computer augmented for increased flexibility and effectiveness. This would also introduce the requirement of typing capability to communicate with the computer to enter and extract information thus duplicating the real Automated Command/Control System. It would precede the implementation so that personnel could be trained and available.

The Complete Automated Command/Control System would require that the Complaint Officer answer the call and enter the information in the computer. The computer would search its memory for any pertinent information on the incident site and also locate the nearest unassigned patrol unit. This recommendation would be displayed for decision by the Complaint Officer who may override the computer if he choses. If the recommendation is acceptable he can transfer it to the Radio Operator for transmission to the field.

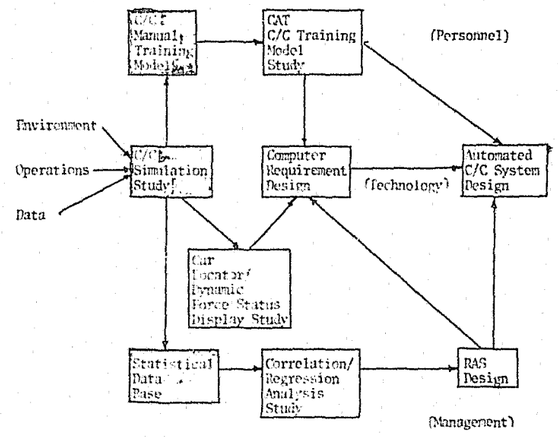


Figure 3 Logic Diagram Relating System Studies And Determination Of Design Requirements For Orlando Police Department Automated Command/Control System Shows The Three Parallel Efforts Required.

SECTION IV

ORLANDO POLICE DEPARTMENT OPERATIONAL SCENARIO

- o Organizational Structure of the Department
- o Incident Profile
- o Response Capabilities
- o Physical Environment
  - o Regional Influences

A Scenario provides a composite description of the operational situation against which projected revisions in the Command/Control System can be evaluated.

The Orlando Police Department uses a functional organizational structure. The major line functions are assigned to four Bureaus - Uniformed, Criminal Investigation, Detention and Administrative, each of which reports directly to the Chief of Police. The Chief is supported at the management level by staff sections in Inspectional Services, Research and Development and Community Relations. The Department presently has a complement of 333 sworn personnel.

The Incident Profile of the Department is reported by Part I, II, and III classifications, reflecting the Uniform Crime Reporting Program, and a category of Other Aided Cases. This latter category includes all incidents which require a response and case number but are not identifiable under the other categories. Orlando is presently experiencing an exponential increase in the crime rate. A computer curve fit of the data shows a projected increase of 44% within the next five years. It is noted also that the Part I crimes closely follow this projection.

The response of the Orlando Police Department is keyed to a district system. The City is currently divided into 18 districts which have been designed such that the normal load bases on the number of incidents and service time requirements is relatively equal. One uniformed patrol car is normally assigned to each district and is responsible for all complaints within that district. There are four sector cars manned by assistant squad leaders and four sector station wagons manned by squad leaders. These units are as backup for the district cars in their respecting sectors. In addition special service cars such as K-9 and traffic control are used to handle special incidents; two accident investigation cars are assigned to each watch. Motorcycle and investigation cars are dispatched on incident calls only in emergencies.

Demographically and economically Orlando has entered an explosive growth period. It is the Economic Center of the eight county Central Florida region which is one of the fastest growing in the nation today. It is projected that the population of Orlando will increase over 40% within the next five years; present population is 107,000.

The topography is flat with many lakes which effectively increase the travel distance from point to point. Through annexation of large unincorporated areas south and west, it is expected that the area of the City will increase approximately 30% in the next five years.

The climate is mild and semitropical. Police operations however are affected by heavy percipitation and wind from tropical distrubances, thunderstorms, and infrequent tornadoes.

ORGANIZATIONAL STRUCTURE OF THE DEPARTMENT

The Orlando Police Department is organized on a functional basis with similar activities combined within four operating Bureaus which report to the Chief who has staff sections in Research and Development, Inspection Services, and Community Relations.

Organizing can be defined as the process of segmenting the overall task into controllable subtasks which are disigned to optimize the specialization of labor. It thus involves a grouping of activities to attain the objectives of the Department and delegation of authority to complete the assignments. The resulting organization structure must effectively define the resulting activity-authority relationships and provide for coordination among them both vertically and horizontally to ensure effective coordination and team work.

An organization chart is a graphic presentation of the formal organization structure, and is used to define the organizational functions, functional relationships, lines of authority and responsibility. Individual blocks can be used to show a functional responsibility or title of the individual assigned to it.

The Orlando Police Department uses a functional type organization structure as shown by the chart in Figure 4. The chart identifies the major line functions as Bureaus and their subfunctions as sections. The rank of the supervisor of each section is shown together with the number of personnel currently assigned to the section; these figures include both sworn and civilian personnel. The Department presently has a sworn complement of 333 personnel.

The Chief reports to the Director of Public Safety who in turn is responsible to the Mayor and City Council of Orlando. The Department is also responsible to a Civil Service Board for its personnel practices.

The Uniformed Bureau is charged with achieving a primary objective of the Department - crime prevention. It is organized around a patrol section which functions to preserve the peace, protect life and property and prevent crime. It also provides a substantial effort in preliminary investigation. Other activities of the Bureau are organized to meet specific situations in dynamic environment where high mobility and special skills and training are required.

The Criminal Investigation Bureau is responsible for investigating serious crimes, recovering stolen property and preparing cases for court. Its activities are typically after-the-fact and consist primarily of identifying and arresting perpetrators of major crimes, and collecting and organizing cases to convict these perpetrators in court. It is organized in five sections which are keyed to the crime type.

The Detention Bureau is charged with operating the detention facilities. It is organized around maintaining the security and well being of all prisoners committed to the facilities.

The Administrative Services Bureau is responsible for those activities which generally support the other operations. It maintains records, processes data, prepares budgets and furnishes statistical analyses on operations and fiscal committments.

The Internal Inspection Section is responsible for conducting staff inspections of the condition of personnel, equipment, operations, and procedures and investigation of complaints which allege misconduct by any member of the force. The intelligence gathering function is also located in this section and investigates incidents involving civil disobedience, subversive groups and labor disputes.

The Research and Development section provides assistance to the Chief, information Department policy and performs such other activities as the Chief may direct.

The Community Relations section provides the social interface with the citizen community.

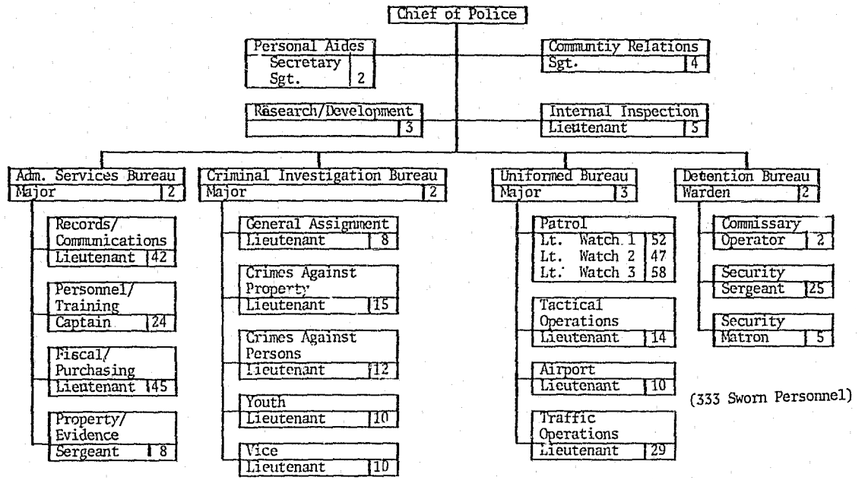


Figure 4 Organization Chart of Orlando Police Department Shows It Is Organized Along Functional Lines.

INCIDENT PROFILE

The Incident Profile experienced by the Police Department is typically expressed in terms of descriptive statistics so that trends and special situations which are necessary for effective administrative and operational decisions can be more readily detected.

The Incident Profile can be defined as a description of the threats to the lives and welfare of the citizens to which the police department responds. The incidents range over a broad spectrum of types from offenses which jeopardize life to those which involve simply serving a warrant. Each must be clearly defined in order to effectively analyze the operation of a department and standardize if it is desired to communicate with other agencies. To meet this need the Federal Bureau of Investigation organized the Uniform Crime Reporting Program. Under this program the Uniform Crime Reporting Handbook[1] is used to identify and calssify offenses.

Offense Incidents are categorized for analysis into three major classes. These are listed together with numbers known to the Orlando Police Department for the last two years in Table . Appendix lists the offenses which the Orlando Police Department included in each class.

TABLE 3

OFFENSE BY CLASS AND NUMBER KNOWN TO

ORLANDO POLICE DEPARTMENT

OFFENSE CLASS	TOTAL RECORDED 1970	1971
Part I	7932	8997
Part II	6644	6127
Part III	4090	4602
Other Aided Cases	33813	39125

Although the Police function is typically associated with the more hazardous Part I offenses, a police officer assigned to patrol is generally confronted with few serious crimes in the course of his watch. The numbers in Table 3 show that he spends considerably more time keeping order and servicing accidents than he does in responding to incidents that require arrest action.

Orlando is presently experiencing a period of explosive growth which can only result in making the Police Department task more difficult. This is emphasized by reference to Figure 5 which is a plot of total and Part I offenses and for Orlando over the last 12 years; both have assumed an exponential form.

1 U. S. Department of Justice, Uniform Crime Reporting Handbook (Washington D.C.: Federal Bureau of Investigation, July, 1966).

A computer curve fit program was used to analyze this data. The resulting equation predicted a 44% increase in the next 5 years, as shown in the plot of the projected data.

On a working level basis the Incident Profile can also assume added dimensions. For example, the incident by district typically varies with the physical characteristics of the district. A study[2] in Orlando based on a random sample showed the offense rate correlated most positively with population density, total population, poverty income and area of the district.

The incidents can also vary significantly by watch both by number and type. Typically, Watch 2 experiences the highest frequency of incidents followed by Watches 1 and 3. Days of the week also exhibit different Incident Profiles. Sunday is lowest, about 0.70 of the average and Saturday the highest at 1.7.

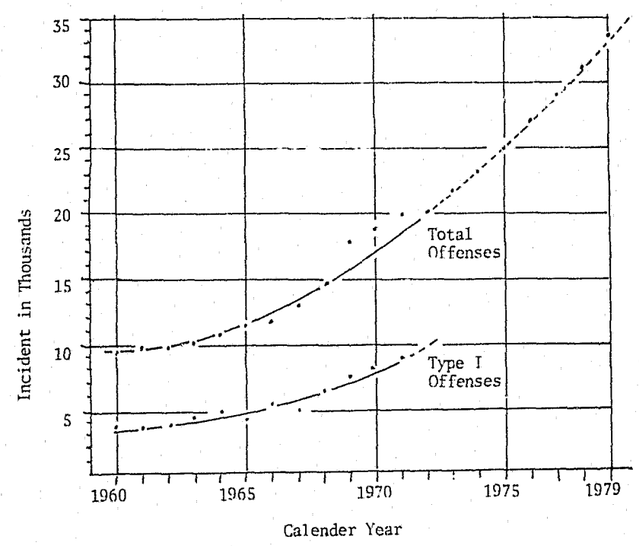


Figure 5 Graphic Display Of Actual And Computer Predicted Offenses By Year, Shows Characteristic Exponential Increase Pattern

2 R. D. Doering, A Statistical Study of Orlando Police Department Operation, Report to the Administrative Services Bureau, Orlando Florida, April, 1971 (Orlando, Florida: Orlando Police Department 1971)

RESPONSE CAPABILITIES

The Orlando Police Department utilizes a response system which requires all complaint calls originating within a District be answered by the uniformed patrol unit assigned to the District; backup is provided by four Sector supervisory vehicles.

The response of the Orlando Police Department is keyed to a district system. The City is currently divided into 18 Districts which have been designed such that the work load, based on number of incidents and service time requirements, is relatively equal. One uniformed patrol car is normally assigned to each district and is responsible for all complaint calls within that district. There are also four zone cars manned by Assistant Squad Leaders (ASL) who act as backup when required. All district cars are supervised by four squad leaders (Sergeant) who patrol each of the zones.

The map of the City on the opposite page shows the districts and their relationship to the two major freeways. These freeways, I-4, which runs north-south and US 50, which runs east-west, effectively divide the City into four sectors since they restrict free passage across them.

There are also special service patrol cars such as K-9 and traffic control which are used to handle special incidents. Two accident investigation cars, AI 42, AI 43, are identified on the district map to handle traffic incidents east and west on I-4, respectively. Investigative and motorcycle units move in all districts but are dispatched to complaints only under emergency conditions. The primary assignment of the motorcycle units is traffic control and these units typically focus on traffic problem areas.

Under normal conditions the standard operating procedure is to dispatch the district patrol car to service a complaint which occurs within the district. If the primary car is unavailable the squad leader may move in to answer the call followed by special assignment cars, investigative and motor units generally in that order. Since the Communications Center does not have information on the specific whereabouts of field units, except within his assigned district, this appears to be the best method of operation; it assures primary and backup coverage for each complaint.

The Orlando Police Department averages 29 Uniformed Bureau patrol units per watch. The three shifts change at 6:30 a.m., 2:30 p.m., 10:30 p.m. and are scheduled to provide a 30 minute overlap to assure continuous field coverage. Because of illness, vacations, or car repair, all patrol units may not be available for duty during the watch. This requires reassignment of the units to cover all districts. There are a number of additional uniformed vehicles available for special duty; these are identified in the corner of the district map of the City.

A previous study[1] based on a random sample of one week operational data showed the average time was 4.4 minutes for all offense complaints

1 R. D. Doering, A Statistical Study of Orlando Police Department Operation, Report to the Administrative Services Bureau, Orlando Florida, April, 1971 (Orlando, Florida:Orlando Police Department 1971)

over all shifts and days of the week. The highest was 7.5 minutes for District 36 and lowest 2.5 minutes for District 24. Referring to the district map, it can be reasoned that much of the longer response time in District 36 might be attributed to the travel time associated with odd shape and distance from end to end of the coverage area. District 37 was also high, 6.0 minutes, and again the effect of the large dimensions of the area is apparent.

The Deaprtment is also a member of a mutual and net consisting of all Orange County Law Enforcement Agencies. Under this agreement the participants provide men and equipment to handle major civil disturbances. In addition Orlando has a Police Reserve Organization whose members are available as backup to the regular force; however their activity is limited to special events such as ball games or the County Fair.

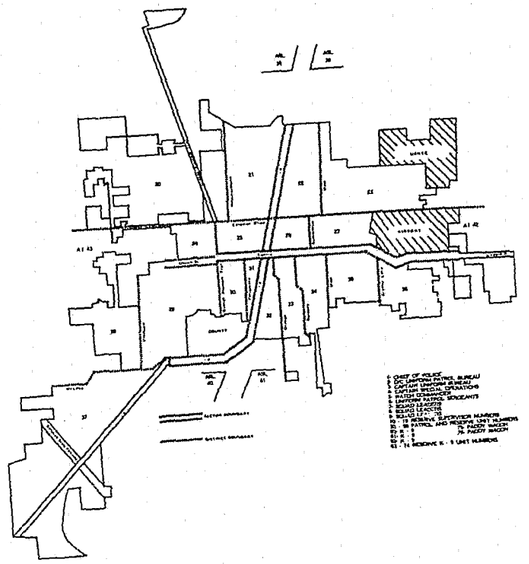


Figure 6 Reduced Scale Map Of The City Of Orlando Identifying Police Patrol Districts Shows The Relative Difference In District Areas And Distance Which Contribute To Difference In Response Times.

PHYSICAL ENVIRONMENT

The physical environment in which the Police Department operates is of concern in the study of the Command/Control System because it directly influences the input of incidents and the field force response capability.

The environment in which any system functions influences its ability to accomplish the assigned mission through the interface relationships which are inherent in the operational Scenario. An effective system design will examine and define these interfaces and how they are affected by changes in the environment so that the system can readily adapt to a dynamic situation.

The effect of the physical environment on the Command/Control System occurs in two basic areas. Both the Incident Profile and response of Field Forces are directly dependent on the characteristics of the environment. As discussed earlier the incidents occuring in a given district can be readily correlated with the physical characteristics of the district. Likewise, the travel portion of the system response time reflects the topography features of the district and weather conditions. Accordingly, for purposes of this study the physical environment can best be described in terms of demographic-economic, topographical and weather characteristics associated with the City. A summary profile of these characteristics is contained in Table 4 .

Demographically and economically Orlando is entering an explosive growth period. It is projected that the population will increase over 40% within the next 5 years; this compares with a 30% increase in the 10 year period from 1960 through 1970. This projection reflects the expected annexation of additional large unincorporated areas south and east of the present city limits. The major population growth of the City can be generally described as a transition of land use from agriculture to commercial, apartment and residential subdivisions. In turn the population impetus is the result of the strong economic growth of the area reflecting regional influences such as Walt Disney World, Kennedy Space Center, the Naval Training Center and Florida Technological University. Population and economics of the City are also geared to the large influx of tourists which occurs mostly in the winter months. The tourist population is now estimated to exceed 8,000,000 annually and to contribute over $106,000,000 to the greater Orlando area. In addition there are a number of smaller residential communities surrounding Orlando, such as Winter Park and Maitland whose citizens either work in Orlando or move through it each day on their way to work.

The topography is flat with no canyons or hills to create natural barriers; however there are over 60 lakes presently within the City limits. Although most are relatively small they effectively increase the travel distance from point to point. Two other large barriers are the Municipal Airport and Naval Training Center both of which are within the City limits and effectively block out free surface movement in a large area in the eastern part of the City. Two major freeways, N-S and E-W, effectively also divide the City into four quadrants impeding movement across the right-of-way. Through projected annexation, it is expected that the area of the City will increase approximately 30% in the next 5 years with corresponding changes in dimensions as summarized in Table

The climate can be classified as mild, semitropical. There are no severe winter storms or snow; however the temperature infrequently does reach minimal freezing conditions. In summer there are frequent heavy rains which impede surface movement for short periods of time. Also in late summer hurricanes form in the Caribbean but their movement into Central Florida is infrequent. When experienced, hurricanes typically disrupt normal traffic and communications due to wind damage, flooding and trees which fall in the street or on power and telephone lines.

TABLE 4

CHARACTERISTICS OF PHYSICAL ENVIRONMENT IN ORLANDO AREA

	1972	1976
DEMOGRAPHIC		
Population	107,000	140,000-160,000
TYPOGRAPHY		
City Limits		
Area, Sq. Mi.	35	50
N-S Dimension, Mi.	8	11
E-W Dimension, Mi.	6	12
Streets, Miles	414	550
Lakes	62	75

WEATHER

	Low	High	Average
Temperature, °F	31	102	72
Spring	60	100	82
Summer	24	102	73
Fall	24	81	63
Winter			
Precipitation, Inches			
Mar.-May	3.4	15.0	10.2
June-August	8.6	31.4	22.4
Sept.-Nov.	33.8	74.2	51.2
Dec.-Feb.	3.0	11.0	6.2
Max. Rate In./Hr.	2	4	
Patchy Ground Fog in Winter & Spring			

SEVERE WEATHER

Hurricanes	Annual Average-One
Tornadoes	Infrequent-Random Location
Thunderstorms	Annual Average-62

REGIONAL INFLUENCES

Orlando is the Economic Center for the eight county East Central Florida Region which has become one of the fastest growing in the nation today and consequently is experiencing severe demands in its public safety organizations and social service facilities.

Knowledge of the structure and relationship of the economic, social, and demographic variables in the environment is essential to effectively plan the governmental services. It has also become increasingly evident that government at every level is playing an increasing role in influencing and guiding the growth pattern. At Federal and State level monetary, social and environmental controls have been instituted to guide and stimulate growth. At the local level government must plan and invest in recreation and cultural facilities, airport and services such as police. Additionally it is noted that at the local level the regional factors may interact strongly or combine to accelerate and shape the growth of a particular area.

The Orlando area is experiencing such a growth pattern and is in its second boom of the modern era, the first being the space boom in the late 50's. From 1965 to 1970 Florida grew at the rate of 14% while the nation grew at 5% and the Orlando Metropolitan Area grew 38% in population. It is projected that from 1970 to 1975 the Orlando Metropolitan Area will increase in population by 31% while Florida grows 11% and the nation grows 10%. The metropolitan area has moved from 82nd to the 69th among metro areas in the nation during the past decade.[1] As shown in Figure 7 Orlando is located in Orange County in the central part of the State midway between the two coasts. It is bounded by Kennedy Space Center in the east and Walt Disney World in the west.

Kennedy Space Center triggered a fast-growing aerospace electronics industry which has had great impact on the industrial development of Orlando. It is also a large tourist attraction. It is generally agreed, however, that the single most important factor in the region in the present growth pattern is Walt Disney World. This resort-amusement complex is presently directly employing over 11,000 people and attracting visitors at the rate of 10,000,000 annually which exceeds the total population of the State. Also to be considered is the influence of a new state university, Florida Technological University which opened in 1968, now has 7,500 students and is continuing to grow toward a 25,000 enrollment.. It is located a few miles east of Orlando. In 1968 the Navy also opened its third Recruit Training Center on the northeast fringe of the City limits. This is continuing to develop on a 1,100 acre site toward a planned capacity of 8,000 recruits and 7,500 permanent Navy personnel.

These factors combine to form a future growth profile for Orlando Area:

- It is a major trade center and is becoming a leading center for precision manufacturing supported by the new technological base presented by the University.

- It enjoys a major supporting role to the aerospace activities centered at Kennedy Space Center.

1 Orlando Area Chamber of Commerce, Statistical Data Orlando Metropolitan Area (Orlando, Florida: Economic Research Department, 1971)

- It has become a major tourist destination due to the drawing power of Walt Disney World.

- Corporate Orlando will receive less of the total population influx into the County, although it will continue to grow at a phenomenal rate through annexation, multifamily housing and high-rise structures.

It is noted, however, that all these gains are not without problems. With population growth comes increases in crime and social needs. A tendency on the part of the disadvantaged in other areas to migrate to boom areas is standard, so the Orlando Area is experiencing something of a strain on its social service facilities such as the Salvation Army housing for transients. Impartial observers probably would say that crime increases, including the use of drugs, have been about what you would expect in a growing metropolitan area of the size of Orlando.

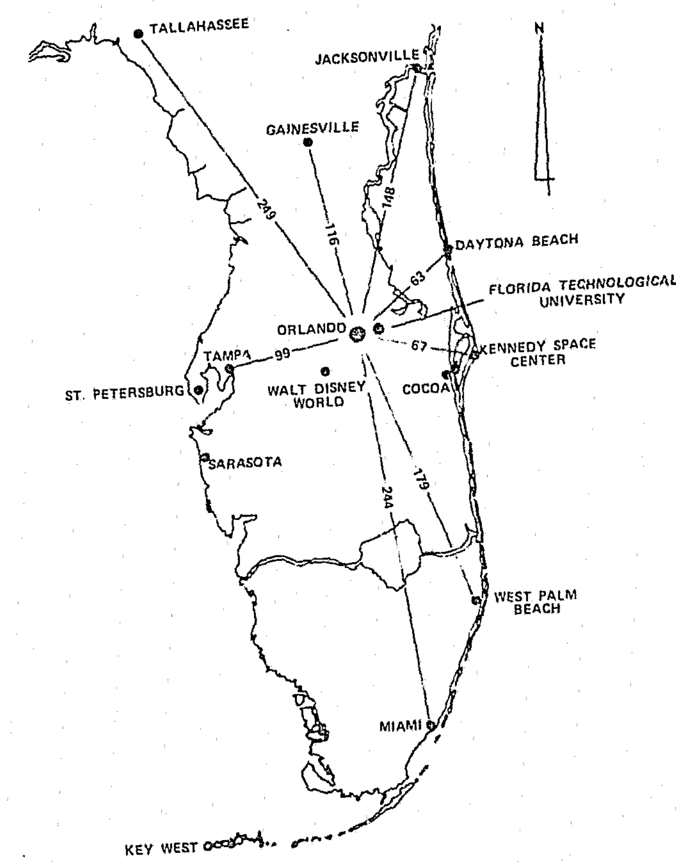


Figure 7 Map Of Florida Mainland Shows Geographical Location Of Orlando In Relation To Other Major Population Centers.

SECTION V

ORLANDO POLICE DEPARTMENT COMMAND/CONTROL OPERATIONAL SYSTEM

- Command/Control Center Organization
- Command/Control Center
  - Command/Control Functional Analysis
    - Complaint Officer
    - Radio and Teletype Operators
    - Uniformed Field Patrol Force
- Command/Control Communications Equipment
  - Control Console
  - PREP Radio

A police operational system includes specialized personnel and equipment whose activities must be planned, organized, directed and controlled to most effectively protect lives and property of the citizenry.

A key element in this operation is the Command/Control Communications Center. It provides a point contact between the inside world and the field forces, integrates the sources of information and has functional authority to direct and coordinate the field activities. Input to the Center can be initiated by the public via telephone, other law enforcement or public service agencies via telephone, radio or teletype and field units via radio or telephone. Typically an input to the system requires a data screening and analysis at the Complaint Desk station, information dissemination at the Radio and Teletype stations and information renewal at Teletype station.

Staffing the Command/Control Center for continuous operation requires personnel skilled in these three work areas. An average watch manning includes a Supervisor, two Complaint Desk Officers, one Teletype Operator and two Radio Operators. Personnel are trained in the functions of each work station so that they can relieve each other as required.

The field patrol units are organized under a Watch Commander with four Sector Commanders supervising the Patrol Units in their sector. Each patrol unit has an assigned area or district in which they cruise and respond to calls. A patrol unit receives and responds to a dispatch order from the Communications Center. All assignments are monitored by the Sector Commander and other patrol units, and the Sector Commander may modify the dispatch order based on his knowledge of the field situation.

Operation of the system requires special communication equipment. All voice communications via radio and teletype are recorded on a continuous time synchronized tape. Department radio communications are via four channel UHF equipment which is designed as a PREP (Personal Radio Equipped Police) system.

This permits two-way officer to officer or officer to headquarters communications. Several VHF channels are also available for vice and investigation communication as required and one for intercity police transmissions. The teletype system is tied to both FCIC and NCIC. The Complaint Desk and Radio Operator stations are connected by intercoms and have multi-extension phones for incoming calls and direct lines to F.H.P., O.C.S.D., Electric Securities, Fire Departments and ambulance services. A Force Status Board located in the Radio Room is visible at the other stations and maintains the status of all patrol and detective units on watch.

COMMAND/CONTROL CENTER ORGANIZATION

The Command/Control Center organizational structure reflects the functional authority which it has been delegated to discharge the task of communication interface between Field Forces and calls for service.

The Command/Control Center organizationally reports to the Lieutenant in charge of the Records and Communication Section. It is charged with providing an effective communications interface between the person calling for service and the field forces, between various units of the Department and other law enforcement and emergency agencies. The Center is responsible for manning telephone, teletype, telegraph, computer terminal and radio communication facilities necessary to provide effective Command/Control communications capability within the Department. The unit thus has both an operational and technical orientation.

The organization structure consists of three operational areas--Complaint Desk, Radio Dispatch and Teletype as shown on the Organization Chart in Table 5 . Personnel staffing consists of both civilians and sworn personnel. Typically the Radio and Teletype Operators are civilians and the Complaint Desk position utilizes both sworn and civilian personnel. The current number of assigned staff in each position is shown in the small box in the corner of each block of the organization chart.

The Command/Control Center Supervisor is responsible to the Lieutenant for the effective operation of the unit. The duties of this position include typical management functions such as planning, organizing, staffing directing and controlling. It is noted that the planning and organizing functions are unique in that the internal policies and operating procedures of the unit must directly reflect and complement the operational field forces procedures.

It is important to note that the Command/Control Center has been assigned functional authority in dispatching the field forces. This is necessary to preserve the unity-of-command principle which is essential for effective response. The line responsibility for response by the field forces however remains within the Uniformed Bureau and the watch or sector commander may modify a dispatch order based on his assessment of the field situation. When this procedure is used, the field commander must realize that he is interrupting the normal event chain and is now assuming responsibility for dispatch. He must ensure that he is aware of all service needs and can respond to them appropriately. He also has the responsibility to inform the Command/Control Center via the Radio Operator of the new dispatch assignments and that he is now returning fuctional authority to the Center.

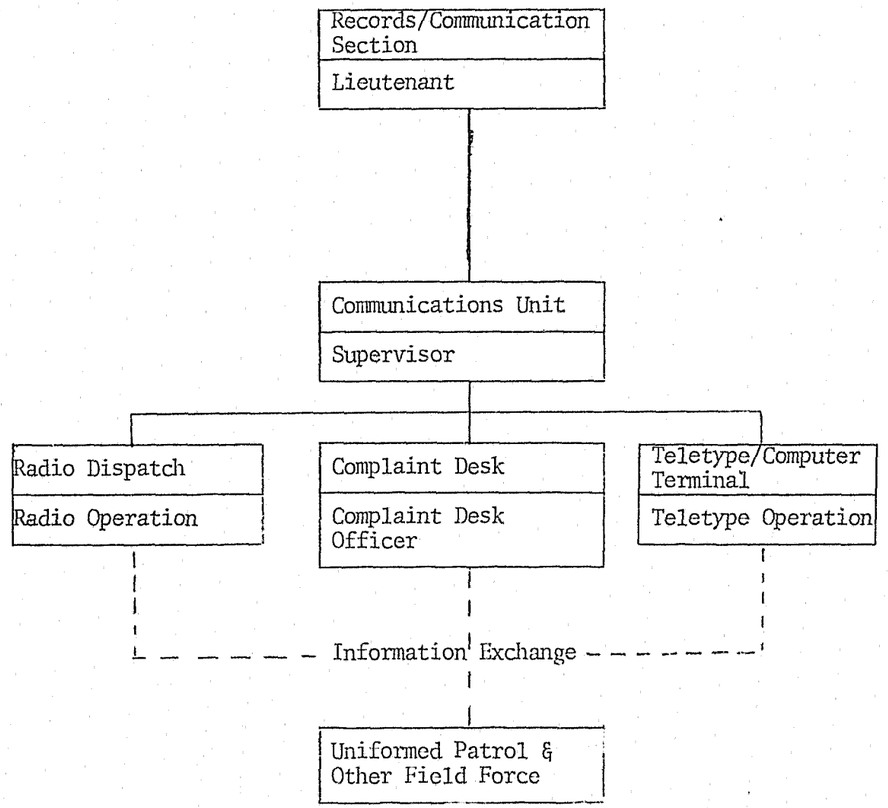
Under the Supervisor in direct line command are the Complaint Desk personnel. When the Supervisor is not in the Command/Control Center, the responsibility of command rests with one of the Complaint Desk officers. In the general functions of the Command/Control Center, the Complaint Desk coordinates the Radio-Dispatch and Teletype operations to ensure a smooth orderly flow of information and assignments to the field units. Unusual telephone inputs or incidents are reported to the Supervisor or acting supervisor for disposition.

The Radio-Dispatch and Teletype Operators also report to the Supervisor. Each has direct responsibility within the total Command/Control function and must advise the Supervisor of unusual communications and/or incidents. Both Radio-Dispatch and Teletype interact with field forces and with the Complaint Desk. All Broadcasts received from N.C.I.C. and F.C.I.C. must be approved by the Complaint Desk before Teletype can relay the information to Radio-Dispatch. This ensures that there is no unintentional repetition in information broadcast to the field units.

TABLE 5

ORGANIZATION CHART OF THE

COMMAND/CONTROL CENTER



COMMAND/CONTROL CENTER

The Command/Control Center is physically divided into three rooms to minimize noise and traffic interference and maximize the security associated with simultaneous activities, however each is provided with audio and visual communication to ensure joint effort.

The Command/Control Center is within the Police wing of the Criminal Justice Building in downtown Orlando and houses all communication equipment and personnel needed to provide the interface between the Field Forces and calls for assistance. The Center is located directly behind the records area and is visible to the general public from the information counter and the operation can be observed by the public through glass windows in the main East wing.

The functional floor plan of the Command/Control Center is based on a functional decision of tasks involved in operation. There are three basic functional tasks which are housed in separate rooms as seen in Figure 8 . Each area is interconnected by door and large glass windows to provide visible contact between the activities. Although each function is separate to minimize noise and confusion of activity, all must work closely together to accomplish the objective of effective Command and Control.

The Complaint Officer, Radio-Dispatch Operator and Teletype Operator require specific support equipment to discharge there functions. For the Complaint Officer to receive telephone inputs, gather information, make decisions and complete the necessary forms, a quiet, well lighted area must be provided. Since the Complaint Officer must be aware of the force status of the patrol units, he must be able to observe the force status board.

The Radio Operator's immediate area should be quiet and in an area of low traffic. Subdued lighting is required so that the signals can be observed and a small high-intensity light at each console provides the light necessary to read any information. The teletype room is a high noise area. The teletype equipment is similar to a manual typewriter in noise level and must be insulated to contain the sound since it is connected to both the Complaint area and Radio Room.

Telephones and electronic time stamps are standard equipment in all rooms. The four channel VHF radio system and Force Status Board are located in the radio dispatch room. The teletype machines and information computer terminal are unique to the T/T room. All inbound and outbound telephone and radio communications are recorded on continuous time keyed tape decks; one can be used to extract information while the others continue to record.

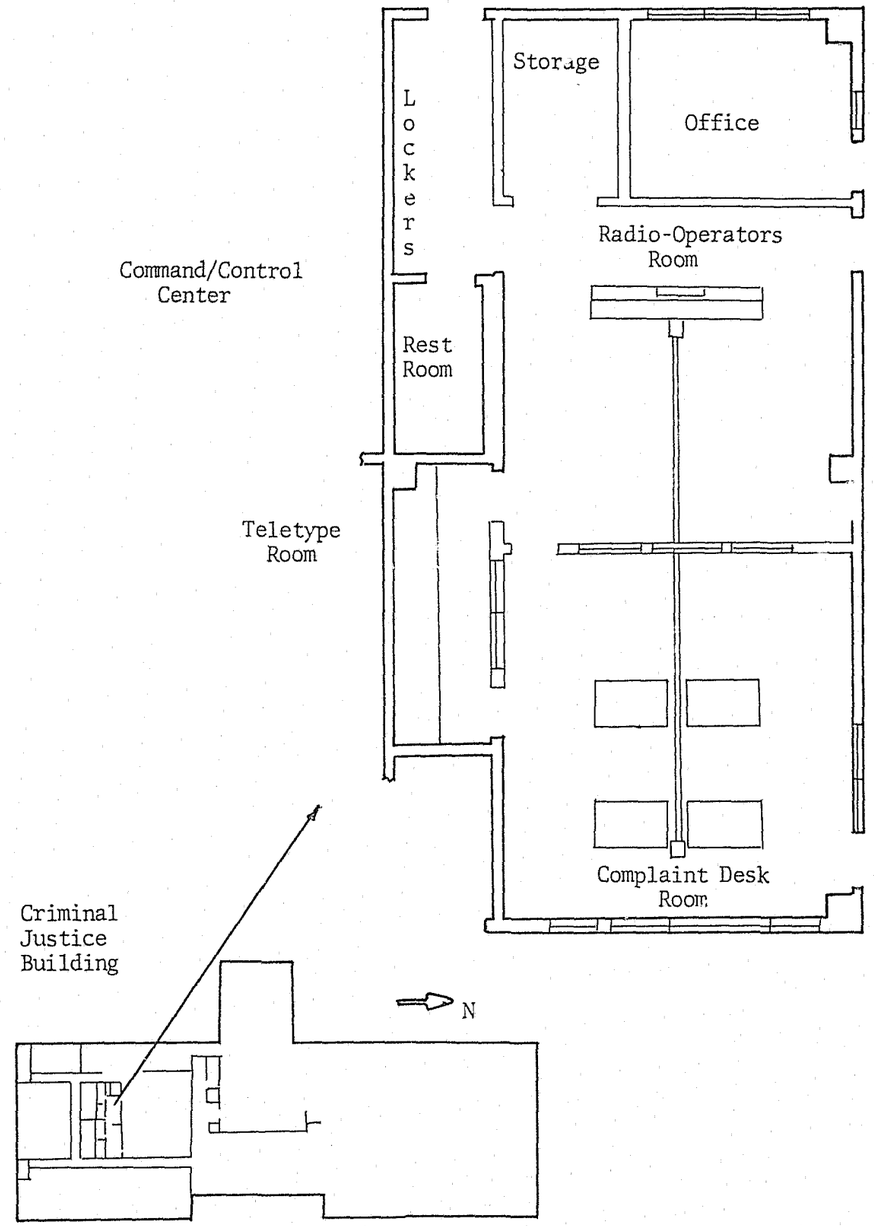


Figure 8 Showing The Three Work Rooms Of The Command/Control Center And Their Locations Within The Criminal Justice Building

COMMAND/CONTROL FUNCTIONAL ANALYSIS

Four operational modes were defined in order to ensure that all the functional steps within the Command/Control Center could be accurately described and keyed to interactions with the Uniformed Field Force, other Public Safety Agencies and the General Public.

To discharge its mission the Command/Control Center must interface with the General Public, all police functions within the City of Orlando and other law enforcement and Public Safety Agencies. In addition there are a number of operational modes to be considered which add to the complexity of the system. Each interface may require a different response from the Center. For example, the actions may include giving watch personnel assignments, calling an ambulance, answering questions on laws, relaying information and dispatching police units. Each response may involve one or more conponents of the Command/Control System which must work in unison to perform the function. Although procedures exist, they clearly cannot cover all situations and required actions. It is possible to categorize the response by type of operational mode required. Accordingly, four operational modes were defined and have been used to analyze the Command/Control Operations. The result was a functional analysis which described the actions of components in the system, given a specific operational mode. The operational modes are listed in Table 6 together with their definitions.

The first operational mode is termed Routine. This mode includes normal daily activities which do not result in a permanent case or file number being required. The Complaint Desk action include answering an information request on a call that requires a 602-09 form. The routine functions of the Teletype Operator would be a query to NCIC or FCIC and find a negative response to the questions. The Radio Operator's routine operational mode require monitoring the assigned channels and transmitting 602-09 assignments. Interactions between the Command/Control Center and the Uniformed Field Units exists in the Routine Mode.

The Incident Mode does not differ significantly fron the Routine. The 602-03 form is completed by the Complaint Officer however, which creates a permanent Police file on the incident. In the Incident Mode a crime has been committed or a suspect arrested. The functional responsibility for clearing the case is with the Field Unit and the responsibility for dissemination information in aid of the unit is with the Command/Control Center.

Whenever an in-progress crime is reported, or a "unit-needs-assistance" call is received or any personal injury is reported all sections of the Command/Control and Field Forces assume the Emergency Operational Mode. This mode may be initiated at the Command/Control Center or Field Unit may be on patrol and witness an armed robbery, a citizen may require an ambulance, or a routine identification check may result in hot pursuit when the on scene unit would require assistance. The Emergency Mode requires close interaction between the Command/Control Center and the Field Force.

The final mode requires no interaction between the sections of the Command/Control System. The Internal Mode is comprised of operations or tasks which are unique to the subsystem involved.

For each mode a detailed functional flow diagram relating the major subsystem activities was prepared; this has been included in Appendix A for reference. The true complexity of the operation can be visualized when it is realized that at least 24 uniformed patrol units may be in the field and each unit may be in any mode. The Command/Control System mode depends upon the type call being processed, the type of call being answered on the telephone, the type of teletype information requested and the type of radio traffic existing at any given time.

TABLE 6

DEFINITIONS OF SELECTED OPERATIONAL MODES

FOR THE COMMAND/CONTROL SYSTEM

Routine mode - normal nonemergency and/or general daily operation of Command/Control System which does not result in a case or file number.

Incident mode - those daily operations which would result in a case number being required, but which did not include any personal injury or require more than one regular patrol unit to answer call.

Emergency mode - those operations which arise from incidents requiring response by more than one regular patrol unit, personal injury and/or in progress crimes.

Internal mode - those periodic operations or functions which are unique to the several subsystem operations involved in the Command/Control System.

COMPLAINT OFFICER

Whether answering general information questions or gathering pertainent facts, the Complaint Officer must be thorough, tactful and efficient because he is the primary interface between the Police Department and the General Public and his ability to obtain the required information and act accordingly contributes directly to the success of the Department in its primary mission.

Telephone calls from the general public account for approximately half of all the calls answered by the Complaint Officer. The remaining calls are from other activities within the police department and other law enforcement agencies such as the Florida Highway Patrol and Orange County Sheriff's Department.

The general public calls the Police Department when it needs emergency aid, wishes to report a crime or suspicious activity, or many times simply desires information. In Orlando the Police Department "emergency" number is on the front inside cover of all telephone directories and on every "marked" patrol unit. Dialing this number will automatically place the caller in contact with a Complaint Officer at the Command/Control Center. Although the caller may never see this officer, his very life could depend on the officer's decisions and actions. To this citizen the complaint officer is the Police Department; how he conducts himself over the phone will be equated with the actions of all uniformed police.

Until it is determined otherwise, a call to the Complaint Officer's desk must be considered an emergency. The call must be answered, information obtained, all requisite forms completed and a patrol unit dispatched if required, within the shortest possible time. How the information is obtained is based on training and experience, but the same general information is required of every incoming call before any decisions may be made.

The Complaint Officer must determine:

- o Name and location and telephone number of the caller;
- o Location of the incident;
- o Nature of the call, that is, to report a crime or distrubance, to report an accident, or to request information;
- o Names of any involved persons;
- o Whether the call required immediate or emergency assistance, such as an ambulance.

With this information the Complaint Officer determines if the location of the need is within the Orlando Police Department jurisdiction, whether a patrol unit should be sent, an ambulance or other assistance should be dispatched, and if a case number for a permanent police record is required. These decisions may have to be made for all incoming calls, although the order in which they are made vary by Complaint Officer.

If a call comes into the Complaint Desk where the Orlando Police Department has no jurisdiction, the Complaint Officer may either record all the information and then relay it to the appropriate agency, or the Complaint Officer may interrupt and give the caller the telephone number of the appropriate agency if it is a non-emergency call.

If a call does require a police unit, the complaint officer will complete either a 602-09 or a 602-03 form. These forms summarize the information pertinent to the call and enable the complaint officer to indicate the patrol district and patrol unit to be assigned if available. The 602-03 form is completed whenever a patrol unit is required.

The 602-03, however, has a sequenced record number in the top right corner and is completed when a police report file will be created on the incident. When either form is used, the time of day and date is electronically stamped on the card before it is deposited in a conveyer belt, which transports it to the Radio Operator.

Table 7 shown below, lists the Complaint Officer's responsibilities and shows that he has duties other than answering the telephone. All "messages" or "local-look-outs" must be approved by the Complaint Officer. This is done to minimize the broadcasting repetitive information on the field units. He is also responsible for informing owners of businesses where burglaries have been attempted, and notifing other law enforcement agencies of the incident which could effect communities outside of Orlando. He is the advisor as to which units to dispatch and the source of information to the field unit relative to pertinent information on the incident, such as the general mood of the caller. The Complaint Officer interfaces with all other functions within the Command/Control Center, the Orlando Police Department, other safety agencies and the general public. He is the focal point of force status and compla nt information which is the head of the Command/Control operation.

TABLE 7

LIST OF FUNCTIONS PERFORMED

BY COMPLAINT OFFICER IN

DISCHARGING HIS RESPONSIBILITIES

- o MONITOR AND ANSWER ALL PHONE EXTENSIONS WITHIN A SPECIFIC NUMBER OF RINGS
- o ASCERTAIN NATURE OF CALL
- o ASCERTAIN JURISDICTION
- o DETERMINE THE NATURE OF ASSISTANCE REQUIRED
- o COMPLETE 602-03 OR 602-09
- o LOCATE DISTRICT IN WHICH REPORT PERTAINED
- o RECORD TIME RECEIVED AND TIME GIVEN TO RADIO OPERATOR
- o COMPLETE 602-03 FROM FIELD REQUEST
- o CONTACT RESPONSIBLE PERSONS OF BURGLAR ALARMS OR REPORTED B & E'S AT THEIR PLACE OF BUSINESS
- o NOTIFY LAW ENFORCEMENT AGENCIES OF SERIOUS CRIMES -
- o COMPLETE "LOCAL-LOOK-OUT" FORM FROM T/T OR PHONE INFORMATION
- o SIGN T/T "MESSAGE" FORMS FOR BROADCAST
- o CONTACT LOCAL NEWS MEDIA OF INFORMATION FOR BROADCAST TO PUBLIC TO ASSIST POLICE

RADIO AND TELETYPE OPERATIONS

The Radio and Teletype Operators are an essential part of the Command/Control System since they provide the respective information interfaces between the Complaint Officer and Field Force and the Complaint Officer and other police and public safety agencies.

A continuous flow of information must be exchanged quickly and reliably between the Communication Center and Field Forces in order for the Command/Control System to operate effectively. The Radio Operator relays dispatch assignments and information to the Department patrol units and receives request for clarification and/or additional information via four channel UHF radio. Additionally this position can communicate via radio and direct telephone lines with other regional law enforcement agencies and fire and ambulance services.

Inputs to the Radio-Operator may originate from four sources:

- o A form completed by the Complaint Officer,
- o Monitoring the city wide alert channel,
- o A "message" from the Teletype Operator through the Complaint Officer, and
- o Field force requests via radio.

The actions by the Radio Operator keyed to the respective input sources are summarized in Table 8 on the opposite page. These operational steps are designed to assign a patrol unit, investigative vice unit, K-9 or "motor" unit to the area of need as quickly as possible. To facilitate determination of the nearest available patrol unit a Force Status information system is used which indicates all units assigned on the particular watch together with their primary assigned district and their immediate status.

When a card is received via the conveyor belt, the Radio Operator checks the Force Status Board and calls the designed unit if available. The time at which the unit is called, and the time when the Radio Operator has completed transmitting the information to the unit are recorded on the form by time stamp. This card is then filed in the numbered slot corresponding to the number of the unit dispatched. This action causes a light keyed to the unit on the Force Status Board to change from green, which signifies the unit is available, to red, which signifies the unit is on a call and not available.

When the unit arrives at the incident site it calls the Radio Operator and reports 10-6 or "at the scene". The Radio Operator then removes the form from the status file slot, stamps the time reported 10-6, and replaces the form in the status file. At the discretion of the Radio Operator, a status check of that unit may be instituted by calling the unit and determining if it requires assistance. A status check is recorded on the reverse side of the form. This status check is routine when an "in progress" crime call is answered or when an unusually long time has passed before the unit has cleared the scene. When the unit has completed the assignment it reports code 10-8 to the Radio Operator; this time is also stamped. The Radio Operator is also notified when a unit requests a change of status. This may be instituted to indicate

unavailability due to mechanical difficulty or investigation of observed suspicious activity, for example. When this request is made, a form with the unit number and location is stamped and put in the status file and the corresponding light for that unit shows red on the Force Status Board.

Input to the Teletype (T/T) Operator may occur from a Departmental field unit. The National Crime Information Center (NCIC) or the Florida Crime Information Center (FCIC). When a field unit request information, it calls on a UHF channel, other than the dispatch channel, directly to the T/T Operator. If T/T Operator has the requested information on file, the response is immediate. A query is always made as to NCIC and/or FCIC and the results transmitted via radio to the unit by the T/T Operator.

NCIC and FCIC also communicate to all law emforcement agencies information on stolen items, persons wanted and other pertinent information. The T/T Operator receives this information, updates the appropriate files and relays the pertinent information to the Complaint Desk, or other Bureaus as appropriate.

TABLE 8

FUNCTION RESPONSIBILITIES OF THE

RADIO AND TELETYPE OPERATORS

RADIO FUNCTION	o OBTAIN 602-03 o ASSIGN NEAREST FIELD PATROL UNIT OR UNITS TO INVESTIGATE REPORTED INCIDENT o RECORD DISPATCH TIME, UNIT ARRIVAL TIME, AND UNIT CLEAR TIME o PERFORM UNIT STATUS CHECK o MONITOR CHANNELS FOR UNITS REQUESTED CHANGE OF STATUS OR REQUESTING AID OF INFORMATION o RELAY INFORMATION TO THE FIELD UNIT AS REQUESTED o MONITOR STATUS BOARD TO KEEP IT ACTIVE o COMPLETE 602-03 PER UNIT REQUEST FROM FIELD FOR CASE NUMBER o MONITOR "INTERCITY" RADIO FREQUENCY AND COMPLETE "LOCAL LOOK OUT" FORM o BROADCAST INFORMATION FROM "LOCAL LOOK OUT" o SEND "LOCAL LOOK OUT" FORM TO COMPLAINT DESK o BROADCAST INFORMATION FROM "MESSAGES" TO ALL CHANNELS FOR ALL UNITS o RELAY BY PHONE IF FIELD UNIT REQUESTS SPECIAL UNITS (NON O.P.D.)
TELETYPE FUNCTION	o RELAY INFORMATION TO FIELD UNITS VIA CHANNEL 1 o RECORD "MESSAGES" FROM T/T OR PHONE o SEND "MESSAGES" TO COMPLAINT DESK o BROADCAST VIA T/T TO OTHER LAW ENFORCEMENT AGENCIES INFORMATION REQUESTED o BROADCAST TO NCIC AND FCIC INFORMATION REQUESTS AND ANSWERS TO INFORMATION REQUESTS

UNIFORMED FIELD PATROL FORCE

The Uniformed Bureau field operating units are organized on three levels or line authority each of which may receive functional direction from the Command/Control Center in order to discharge the mission of the Department.

The police function can only be served by a concerted team effort between the unit on patrol and the Communications Center. This effort is two fold. First, communications necessary for the assignment of patrol units to the areas of need must be concise and accurate. Secondly, all unnecessary or personal air traffic must be minimized so that the necessary communications can be broadcast. This team effort also includes informing the Command/Control Center of any changes in unit status or change in normal patrol assignment during the watch.

At the first level of authority it is the Watch Commander's primary responsibility to ensure a team effort exists between his Uniformed field units and the Command/Control Center. His more detailed responsibilities are listed in Table 9 and are supervisory in nature. The Watch Commander has responsibility for all patrol units during his watch, monitors all the channels of communication, and may redirect the assignment of units by the Command/Control Center. In any reassignment of units the Command/Control Center must be aware to ensure a primary responsibility for each call.

The second level is the Sector Commander. As a front line supervisor, he is assigned a quadrant of the City which contains several Districts and is responsible for the supervision and training of the patrol units in his sector. In the field the Sector Commander monitors all unit assignments in his sector and may modify these as his experience and knowledge of field conditions indicate. He also functions as a patrol unit which is available for assignment by the Command/Control Center. This is not common but does occur when a serious incident is reported and no other units are available.

The Sector Commander will assist any patrol unit in his sector as the type of call indicates. This backup may be simply patroling the district until the unit on assignment is again available, or it may mean direct supervision to train a patrol unit in techniques of investigation, rules of evidence, or other pertinent police procedures. Whenever a suspect must be taken to the police station and booked, the Sector Commander will assist supervise the procedure. His responsibilities also include administrative duties such as inspection, scheduling extra duty and vacations and is also the council on personal or professional problems for the men under his supervision. He reviews the crime statistics and training progress on a periodic basis with the Watch Commander and must also investigate reported misconduct and submit written reports.

The third level of responsibility is the Patrol Unit. After the watch briefing meeting, the unit proceeds to the assigned district and relieves the previous unit. While on patrol the unit will receive and acknowledge assignment from the Command/Control Center and the Sector and Watch Commanders. After each assignment the unit resumes patrol activities. If while on patrol, the unit stops to investigate

suspicious activity, it must inform the Command/Control Center of its location and the type of activity. During this investigation the unit may require information as to stolen goods or warrants. This information is available through the teletype operation of the Command/Control Center. The patrol unit and the Command/Control Center form a team in which each is dependent of the other to discharge their responsibilities to the Department. Regardless of the level of authority and responsibility of the patrol unit, a concise flow of information to and from Command/Control Center is essential for the peak effectiveness of the patrol unit.

TABLE 9

THE FUNCTIONAL RESPONSIBILITIES OF THE WATCH COMMANDER, SECTOR COMMANDER AND PATROL UNIT IN THE UNIFORMED DIVISION

WATCH COMMANDER	o MONITOR E/W VICINITY ASSIGNMENTS VIA RADIO (CHANNEL 2 OR 3) o INVESTIGATE VICINITY CALLS o MONITOR PERSONAL AIR TRAFFIC o ENFORCEMENT OF CIVIL SERVICE AND O.P.D. RULES o REVIEW AND RECOMMEND DISCIPLINARY ACTION o REVIEW MANPOWER DISTRIBUTION WITH THE SECTOR COMMANDER o REVIEW CRIME STATISTICS BY TYPE AND LOCATION WITH SECTOR COMMANDER o LISTEN TO PERSONAL PROBLEMS OF MEN THAT THE SECTOR COMMANDER COULD NOT HANDLE
SECTOR COMMANDER	o MONITOR ALL DISTRI 'E CALLS o MODIFY CAR ASSIGNMENTS MADE BY RADIO DISPATCHER AS REQUIRED o BACKUP ALL SERIOUS CALLS o NOTIFY WATCH COMMANDER OF ANY UNUSUAL PROBLEMS AND/OR CALLS IN HIS SECTOR o INVESTIGATE MISCONDUCT AND REPORT TO WATCH COMMANDER VIA WRITTEN REPORT o REVIEW CRIME STATISTICS AND MANPOWER DISTRIBUTION WITH WATCH COMMANDER o PREPARE VACATION SCHEDULE o LISTEN TO PERSONAL PROBLEMS OF MEN o CONDUCT 15 MINUTE A.M. INSPECTION
PATROL UNIT	o PATROL ASSIGNED AREA o RECEIVE ASSIGNMENT VIA RADIO o ACKNOWLEDGE ASSIGNMENT VIA RADIO o ACKNOWLEDGE ARRIVAL ON SITE o REQUEST INFORMATION FROM T/T OR COMMAND/CONTROL o RELAY INFORMATION TO OTHER UNITS o REQUEST CHANGE OF STATUS o RESPOND TO SECTOR COMMANDER OR WATCH COMMANDER FIELD COMMANDS o REQUEST ADDITIONAL UNITS AND/OR SPECIAL UNITS (NON O.P.D.)

COMMAND/CONTROL COMMUNICATIONS EQUIPMENT

The specialized tasks of Command and Control require sophisticated communications equipment for the effective operation of the Complaint Desk, Radio-Dispatch and Teletype work stations.

Each work station in the Command/Control Center is equipped with special equipment designed to provide the communications needed to accomplish that function. The Complaint Desk, Teletype and Radio-Dispatch function form an interdependency network of sequential operations which requires a reliable multiple mode communications network which in turn varies with the response made of the Command/Control System. Figure 9 is a layout of the Communication Center and shows the location of all communications equipment relative to the work station.

The communications equipment at the Complaint Desk station consists of a multiextension phone for each desk and an electronic security alarm system. Each phone has the maximum capability of 29 direct extensions or lines. At the present time not all lines are assigned; however, eight direct lines including two to fire, one to Florida Highway Patrol, one to Orange County Sheriff's Department, one to Electronic Securities Company, two to ambulance companies in the area, and one to a towing service are active. Six emergency number direct lines are in service. When the caller dials 843-5000 the call will automatically be routed to a line which is free. Each phone is also equipped for intercom communication with the two Radio-Dispatch stations, the Information Desk and with each of the other Complaint Desks. A Wells-Fargo type signal system is mounted on the South wall of the Complaint Desk room. This is a direct to station alarm system with 24 locations presently connected. It is actuated by company alarm circuit which automatically actuates a panel at Orlando Police Department.

A multichannel, multideck tape recorder is also installed in the Complaint Desk room. This provides a continuous record of all telephone inputs and outputs at the Command/Control Center and the Information Desk as well as all radio transmissions.

The teletype equipment consists of one I.B.M. 2740 teletype machine which is connected directly to the NCIC and FCIC networks. A R.C.A. 70-752 Video display is connected to the Orange County Criminal Control System and is used to store and retrieve information from a computer on a County wide bases. Two single extension telephones and a single channel UHF radio complete the physical communications equipment at the Teletype Station. Support equipment includes a time stamp, Line-O-Dex file system for local warrents, and a typewriter.

The radio room houses the major Police communications equipment. This consists of a duplex channel UHF "PREP" Radio System. Transmission towers are located on the City Hall and Criminal Justice Building. Satellit receivers are located at strategic points around the City to provide high quality communications on an officer to officer and officer to headquarters basis. Radio control is through two consoles manned by two Radio Operators. The console also has two telephones, one for emergnecy incoming calls and the other for direct line communications simular to the Complaint Desk telephones. The emergency phone is used

only when activated by the Complaint Desk personnel. The Radio-Operators also have a radio paging system for City officials and high ranking police officers. Support equipment consist of a Force Status Board which displays the status of all on duty police personnel. It is monitored and updated manually by the Radio Operator.

EQUIPMENT LIST
1 - Telephone
2 - Electronic Security Alarm
3 - Tape Recording Equipment
4 - Teletype
5 - Video Display
6 - Single Channel Radio
7 - Time Stamp
8 - Typewriter
9 - "PREP" Radio
10 - Emergency Telephone
11 - Force Status Board

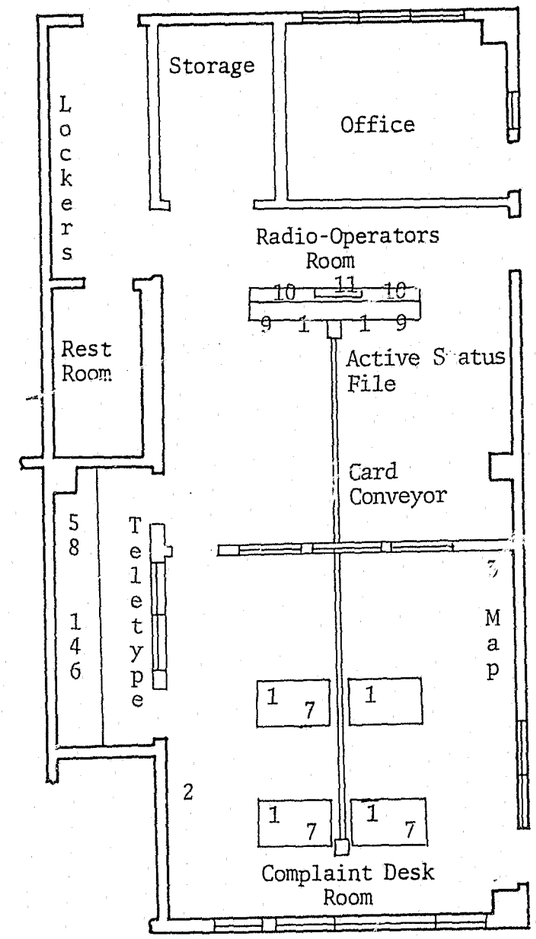


Figure 9 Showing Major Equipment Locations For Each Specialized Task Of Command And Control.

CONTROL CONSOLE

The Radio/Dispatch work station requires the most sophisticated communications equipment in the Command/Control Center complex because it must interface with the field forces and outside agencies as well as the other work-stations in the Center.

The Radio/Dispatch work station is the coordination point for all incoming and outgoing communications between the Command/Control Center and the field forces. It is manned by two operators who share the workload on an East/West division of the City. Two control consoles are provided and each is a duplicate of the other to provide an operational redundancy capability.

Auxiliary equipment includes Force Status Board and Active Complaint Status File. The interface equipment consists of a Complaint Card Conveyer to move assignemnt cards between the Complaint Desk and Radio/Dispatch work station and the radio and telephone communications network. Figure 10 is a pictorial diagram of the work station identifying the equipment and showing how it is designed to facilitate the operational functions.

The radio communication controls are directly in front of the operator since this is the most frequently used portion of the equipment. The console is equipped to monitor the four Orlando Police Department channels as well as Orange County Sheriff's Department and Florida Highway Patrol transmissions and other selected local police agencies. The operator can selectively transmit and receive on the four U.H.F. channels or on all frequencies at once in an emergency. Radio communication is also provided to the local police agency network. A headset microphone is normally used for transmission but a console monitored microphone can also be used.

At the left of each operator are the telephones. One is a multiposition set duplicating those at the Complaint Desk station. Another handset is provided for push to talk communication to the Sheriff, Florida Highway Patrol, local ambulance service and Fire Department. The operator can either talk and receive with the handset or switch to a speaker position for receiving. The console also contains 12 push to alert switches which are used to reach selected command officer personnel.

The Force Status Board is positioned above the Central Console between the Radio Operator position. The Board contains a back illuminated map of the City with each patrol district outlined and identified. To identify each patrol unit the Board has two small lights one red and one green located within the district. To each side of the map there are groups of number corresponding to vice, detective, K-9, motorcycle and other special Police units which can be illuminated to indicate the unit is on duty and its status. The Board thus provides the status of every Police unit on duty by either a red or green light. All units on the Force Status Board are equipped with a PREP radio.

Connected with the Force Status Board is the Active Complaint Status File. This File is designed for the temporary storage of computer size assignment cards. The Status File is wired to the Force Status Board so that when a card is placed in a numbered slot in the File the corresponding

number on the Force Status Board changes from green, which indicates available, to red, which indicates unavailable for assignment. At the beginning of each shift the Radio-Operator verifies which special units are on duty and turns the corresponding light on the Status Board to green. Then as assignments are made and assignments completed the Status File and Force Status Board indicate the status of all on duty units at any given time.

Seated at the Control Console each Radio-Operator can communicate with any on duty field unit using the PREP system, know the status of any unit, communicate by direct lines to other local law enforcement agencies, fire and ambulance, as well as communicate to the Complaint Desk via the intercom. The Control Console with its components is the heart of the Command and Control System Communications.

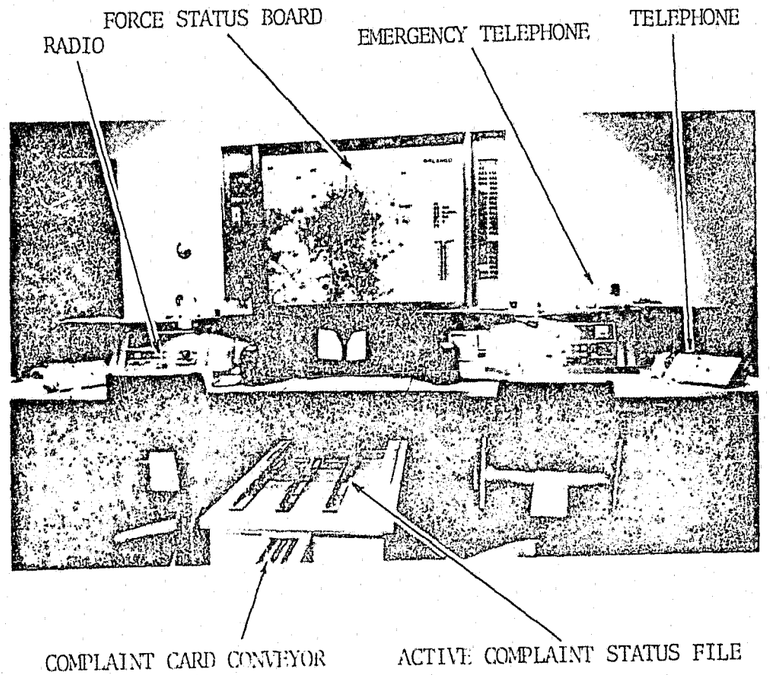


Figure 10 Photograph Of The Radio Operator Work Station Showing Major Equipment Position.

PREP RADIO SYSTEM

The primary element in the communications network is a PREP (Personal Radio Equipped Police) system which provides reliable voice communication among individual field units and between the Communication Center and all field units.

The Orlando Police Department PREP communications system incorporates some of the latest technological and system design techniques. The system is a four-channel duplex UHF radio network designed to cover an area of approximately 25-mile radius. It utilizes four based transmitters, one for each channel with radiated power output of 250 watts. The antennas are located atop the City Hall and Criminal Justice Buildings to decrease the vulnerability of the System to hostile acts by individuals or the natural environment.

The satellite receivers subsystem consists of 24 receivers, one for each channel located at six sites. These sites are strategically located on elevated structures within the City and immediate surroundings so that the receivers will pick up all signals within their area. These are demodulated and the audio signal is relayed through land lines to the Communication Center. Since more than one satellite station will receive a field signal a signal Comparator at the Center is used to select the optium receiver and release the others. This selection is accomplished on signal strength which is coded at each receiver station.

The performance of the system has been excellent. Good voice communications can be established anywhere in the coverage area using one watt portables. In addition there is no apparent degregation in system capability even when a receiver site is disabled. Figure 11 relates the system coverage to the City configuration and satellite receiver sites both existing and planned. It is noted that coverage can easily be extended by addition of more receiver sites.

Each police officer is issued a one watt portable transceiver when he goes on watch. The unit clips to his belt and has an extension speaker-microphone which fastens at the shoulder. Normal operation is push to talk duplex, although some units can operate simplex channel for local (stake-out) activities. Mobile units are not used since each officer can be reached at all times through his personal unit.

There are basically four configurations of the portable transceivers: all have the same power. The model used by the uniformed field officers has two channel (1&2 or 1&3) capability. Those used by detectives and special forces operate on channel 1 with either channel 2, 3, or 4 for standby. These units can also be equipped to operate on additional frequency in simplex mode. Command officers are issued units which have all channel capability. The staff model has four channels with paging; these are used by Mayor, Chief of Police and City Council members, and police officers with rank of major.

A multiple position battery charger and radio storage rack at headquarters is used to refurbish and check each unit. Radios are assigned on a watch basis such that each is equipped with a fresh battery when it is issued.

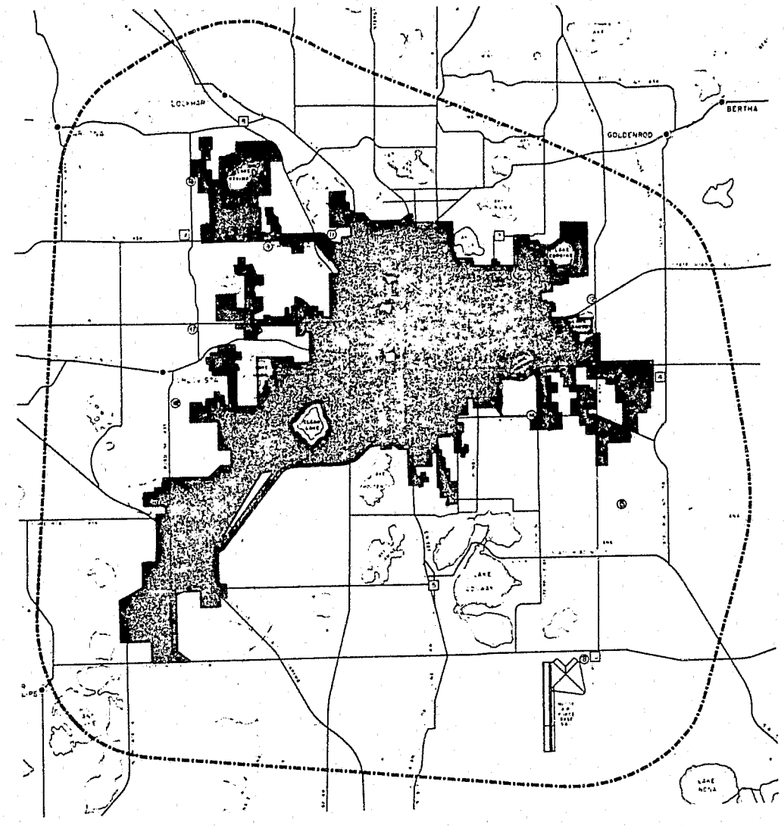


Figure 11 Map Of City With System Coverage Shows Range Of Communication Extends Well Beyond Normal Requirements

SECTION VI

COMMAND/CONTROL DATA ANALYSIS

- o Data Collection Methodology
  - o Selection Of Activity Elements
  - o Sample Size/Assumptions
  - o Sampling Procedures
- o Summary Data Analysis
  - o Descriptive Statistics For Elements Of Time Study
  - o Descriptive Statistics For Telephone Frequency Count Study
  - o Validation Of Data By Statistical Hypothesis Testing
  - o Observations And Recommendations

In order to simulate the Command/Control System, the input, output and intermediate operational steps must not only be defined, they must be described in quantitative terms suitable to the simulation model. The data was obtained primarily from random sampling of the operations as they occurred although historical data was also used where available.

The timed elements were selected on the basis that they were functionally independent, could be readily measured and would provide the required degree of validity for the model. Each element had an audio or visual cue which clearly indicated the beginning and end of the activity. Times were obtained by using stopwatches and standard work sampling techniques.

The sampling procedure was carefully planned and documented to ensure randomness and validity of the data. A two step process was used to determine the sample size since no knowledge of μ or σ for the population existed. Initially the sample size was approximated using apriori knowledge of key personnel in the Communications Center and then refined using selected α and β error tolerances for each timed element.

Police recruits were used to obtain the data on a 24 hour basis. Since specific skills not associated with police training were required, special classes were conducted for those personnel participating in the program. The classes were primarily concerned with practicing stopwatch techniques and entering data correctly on the appropriate forms.

The raw data was reduced by special computer program to determine descriptive statistics and histogram information for each element. Validation of the sample statistics was accomplished by statistical hypothesis testing. This analysis was performed to identify any significant difference between sample means by day of week and shift and the population mean. Two tailed test and the Student-t statistic were used to accomplish the analysis. All sample data so tested was within the 90% confidence interval.

Observations based on the sample statistics singled out several areas where use of standard procedure on handling the complaint calls can appreciable reduce the 10-4 times. It was also noted that the Communications Center operation might benefit appreciably from a work design analysis using Industrial Engineering Techniques.

DATA COLLECTION METHODOLOGY

Careful applications of statistical sampling techniques and analysis to ensure the validity of the input data were a prerequisite to an effective Command/Control System Simulation Model.

In order to simulate the Command/Control System the input, output and intermediate operational steps must not only be defined, they must be described in quantitative time elements. Two approaches were used to obtain the requisite data - random sampling of the operation as they occured and historical data, where available. In both instances, the data was analyzed statistically to determine its validity as a confidence level.

Four major studies were required to generate the data for the simulation model. Initially a study was conducted to supply information on the total telephone activity of the System from the General Public within Orlando Police Department from other Police and Public Safety Agencies and all calls originated by the Command/Control Center personnel. In this case the sample consisted of a continuous three month period in the Spring during which 74137 calls were recorded. These were entered in the "Command/Control Telephone Frequence Count Study" form by a stroke count in the appropiate columns (Appendix B). It is noted that all calls during the sample periods were recorded. This required monitoring all telephone activity at the Complaint Desk and the Radio-Dispatch work stations. This study formed the basis for all other studies because it included the entire telephone activity of the Command/Control Center.

The telephone input was further described by an "Inbound Telephone Rate Study." The purpose of this study was to determine the rate at which calls were received at the Complaint Desk as a function of the time of day. This data was used to form a histogram showing the lapsed time between inbound calls. The sampling procedure utilized a random selection of the day of week and a census of all inbound calls for that chosen day.

These two studies describe the input call profile to the Command/Control Center. They employ both random sampling and a total or census counting to gather the numbers necessary for the statistical analysis. The third study concentrated on describing the operations within the Center after a telephone call was answered and the fourth concerned itself with the output of Center, focusing on the assignment of patrol units.

The Command/Control Time Study documented the lapsed time between specific work activity elements which describe the operation of the Command/Control System. This involved a continuous stop watch time study of randomly selected inbound calls. The total calls sampled was a subset of the census of calls recorded in the Command/Control Telephone Frequency Count, therefore a check on the randomness of the study was possible. The timed elements were selected to be independent so that their summation would represent the time to process a call from first ring of the telephone to the point where the assigned unit has again assumed available status.

The final study was the historical documentation of each patrol district by case load. Data was obtained from the Orlando Police Department records to determine the number of assignments made to the patrol unit on station in each patrol district. Since these assignments were made by the Radio-Operator, this also provides the work load by district by the Radio-Operator. The periodic realignment of districts limited the sampling period to after March of 1971.

Table 10 summarizes the purpose and type of sampling procedure used for each study. All sampling was performed by the Orlando Police Department personnel who were trained for the special procedures required by each of the different studies.

TABLE 10

THE PRUPOSE AND TYPE OF

SAMPLING PROCEDURE USED IN

EACH OF THE FOUR STUDIES

NAME	PURPOSE	TYPE SAMPLING
Command/Control Telephone Frequency Count Study	To determine total calls from generalize input sources and the resulting total - 602-03's and 602-09's	Census count
Inbound Telephone Rate Study	To determine telephone utilization for inbound calls	Randomly selected days - census of all unbound calls
Time Study	To determine process times for predetermined elements of entire Command/Control	Random Sampling-continuous stop-watch timing
District Loading	To determine patrol unit activity and Radio-Operator utilization	Historical Data

SELECTION OF ACTIVITY ELEMENTS

The activity elements used to simulate operation of the Command/ Control System were selected on the basis of criteria which ensured that they were independent, could be timed by stopwatch techniques and were of sufficient number to support the detailed analysis.

The primary purpose of the System Time Study was to determine process times for predetermined elements which describe the Command/Control operations. The choice of these elements was determined by four factors: Ease of measurement, completeness of the operation times, indepence from other elements and the total of all the elements must be representative of the entire operation.

Initially it was important that the elements chosen be easily measured. The data logging was to be accomplished by Orlando Police Department trainees who were not familiar with engineering time study techniques. Prior to their assignment they were instructed in a special class in continuous stopwatch techniques. In addition special data froms were designed to facilitate actual data logging and minimize confusion of the trainee.

The initiating point of each timed element must have an audio or visual cue and a clear and unmistakable termination so that personnel taking the data can accurately measure the elapsed time. Each element must measure one specific activity subset of activities in the total operation which must be completed before another begins. In other words each element is independent of preceding elements so that the summation of timed elements will actually describe the total operation of the Command/Control System. Clearly this will not be the case if one element is part of another. The associated time element can then be used in the simulation model to generate valid and realistic output information.

To simulate the Complaint Desk operation three simulation parameters were timed. These were designated "D1", "ANFO", and "F1". They measure, respectively, the time delay in answering the telephone, the time necessary to gather all required information as well as the decision time and finally, the time to complete the appropriate form given that one is required. The parameter "RAD" is a measurement of the travel time for the form to reach the Radio-Operator and an information recheck time used by some Complaint Officers prior to placing the form in the conveyor. The elements separating each of these parameters is either an audio cue, such as, a teletype ring or electronic stamp or the visual cue of the telephone reciever at the ear of the Complaint Officer.

Three parameters were also used to time the Radio-Dispatch function. The "D2" parameter indicates the time delay once the form is available to the Radio-Operator and the time for the unit assignment decisions. The total time for the Radio-Operator to give the information to the field unit was measured by parameter "CALU". The last parameter which is a measure of the Radio-Operator is "D3", the delay time occurring from a unit Status Check. The audio cues for the elements defining these parameters were principally the voice of the Radio-Operator calling the assigned unit.

The three remaining parameters are "TRVL", "ANV1", and "ANV2" which are a measure of the time for the assigned unit to travel to the location of need and the investigation time required to clear the incident. The audio cues are the electronic time stamp when the Radio-Operator records the 10-6 time and 10-8 time in the appropriate locations on the Complaint Card.

A maximum of ten simulation parameters were timed and subsequnetly analyzed statistically. The number of parameters that will be timed for any given call, depends upon the type of form completed at the Complaint Desk.

TABLE 11

ACTIVITY ELEMENTS SELECTED FOR TIME STUDY

TO PROVIDE SIMULATION PARAMETERS

Element Number Start	Finish	Simulation Parameters	Parameter Description
1	2	D1	Time delay in answering telephone.
2	3	ANFO	Information gathering and decision time for telephone call.
3	4	F1	Total time to complete the necessary forms if one is required.
4	5	RAD	Travel time or delay in completed form reaching the Radio-Dispatcher.
5	6	D2	Radio-Dispatcher delay in assigning unit
6	7	CALU	Unit information gathering time form Radio-Dispatcher.
-	8	TRVL	Unit travel time to address given
8	9	ANV1	Investigation time
9	10	D3	Status check delay time
10	11	ANV2	Investigation time

SAMPLE SIZE ASSUMPTIONS

The assumptions and constraints used to determine the sample size were tested by application of statistical techniques to ensure an acceptable sample size.

Each activity element was defined so that it was independent and could be readily sampled; however, statistical information on the elasped time parameters μ and σ for the population was not available. Certain assumptions were therefore made to determine the size of the samples since the duration of the sampling and the type of sampling procedure was dependent on sample size. The sample size in turn is dependent on the desired reliability of a sample mean $\bar{x}$ as an estimation of μ.

A two step process was employed to determine the size of the samples necessary for statistical analysis. The first method was an approximation based on apriori knowledge of the distributions. Apriori knowledge of each variable can be surmised based on its relationship to other variables. Parameter "D1" should have a sharply peaked distribution because the Complaint Desk personnel strive to answer each inbound telephone call within four rings of the telephone. The information gathering time (ANFO) is expected to be relatively flat because the length of time to receive the information varies with the type of call, the method of questioning the caller as well as interruptions to answer other telephone extensions. The time required to complete the necessary forms (F1) should be moderately peaked because the only variables would be inexperience of the Complaint Desk personnel in determining the districts in which the call originates or the concise description of the incident on the form. The travel time of the form to get to the Radio-Dispatch (RAD) is comprised of a standard belt speed time component and a variable Complaint Desk delay time which is usually a recheck of the completed form by the personnel, therefore the expected distribution should be sharply peaked about the mean. The delay time for the Radio-Dispatcher to assign a unit (D2) is a function of the load on the channel over which the assignment is to be made; therefore a relatively flat distribution of this parameter can be expected. The use of "10" codes and "dispatch signals" should result in a moderately peaked distribution for the unit information gathering time (CALU). Travel time (TRVL) is a function of traffic conditions, size of unit and relative location of the unit to the scene of the complaint; therefore, a flat distribution can be anticipated. The investigation time (ANV1 and ANV2) parameters are a function of the type of incident for which the unit was dispatched. The distribution of the parameters was anticipated to be extremely flat since an investigation might take longer than one hour. Very sharply peaked distribution for the status check delay time D3 is anticipated because of the use of signal codes.

Table 12 shows the maximum sample size initially used for each parameter found by using the graph in Appendix B which presents a family of curves relating sample size, n, and ratio of σ/μ for a 90% confidence level.

This initial approach to determining the sample size did not consider the end use of the statistics for each parameter. The second method for calculating sample size was based on three desired characteristics for the statistics. These included that the standard error of the mean be less than 10% of the numerical value of that mean and that the α and β errors be limited to 10%. If these desired statistical characteristics were achieved, a more significant value could then be placed on the standard times for each simulation parameter thus adding to the validity of the simulation study.

After taking twenty samples and noting that since people performance is being measured it appeared reasonable to assume unimodal normal distribution may exist for each parameter. The sample size may then be calculated by solving two independent equations simultaneously.

Case I: $\bar{x} > .9\mu$ then $n = \left|\frac{-s(z_{\beta}+z_{1-\alpha})}{.1\bar{x}}\right|^2 = \left|\frac{1.05s}{.1\bar{x}}\right|^2$

Case II: $\bar{x} < 1.1\mu$ then $n = \left|\frac{-s(z_{\beta}+z_{\alpha})}{.1\bar{x}}\right|^2 = \left|\frac{4.66s}{.1\bar{x}}\right|^2$

where $z_{\beta=.10} = -2.33$

$z_{1-\alpha} = 1.28$

$z_{\alpha} = -2.33$

Case I represents the sample size necessary for an $\alpha = 0.1$ and $\beta = 0.1$ such that the mean of the sample will not be less than 10% of the population mean.

Case II represents the sample size necessary for the same α and β error such that the sample mean will not be greater than 110% of the population mean.

Using the sample statistics $\bar{x}$ and s found in the sampling the corrected sample sizes were calculated and are shown on Table 12 . The sample sizes n, for Case I are the minimum number of samples to achieve a α and β error of 10%.

TABLE 12

SIMULATION PARAMETERS WITH ASSOCIATED DISTRIBUTION

OF TIME AND SAMPLE SIZE

APRIORI DISTRIBUTION SAMPLE SIZE				DETERMINED STATISTICALLY SAMPLE SIZE			
Simulation Parameter	σ/μ	Distribution Characteristics Description	n	$\bar{x}$	s	Case I n_1	Case II n_2
D1	0.3	Sharply peaked	100	.06	.10	307	6033
ANFO	1.0	Flat	385	.90	2.50	851	16745
F1	0.5	Moderately peaked	100	1.00	3.20	1129	22237
RAD	0.3	Sharply peaked	100	.40	2.00	2757	54289
D2	1.0	Flat	385	.80	2.80	1351	26602
CALU	0.5	Moderately peaked	100	.50	1.50	993	19545
TRVL	1.0	Flat	385	8.00	8.00	111	2172
ANVL1,ANVL2	1.0	Flat	385	12.00	38.00	1106	21777
D3	0.3	Sharply peaked	100	.11	.01	1	18

SAMPLING PROCEDURE

The sampling procedures used for each of the four basic studies were designed to minimize personal bias and redundance of information while maximizing the number of samples taken within the available period.

A sampling procedure must be carefully planned and documented. It includes consideration of randomness, how the data is recorded and provisions for supervision and accountability for the result.

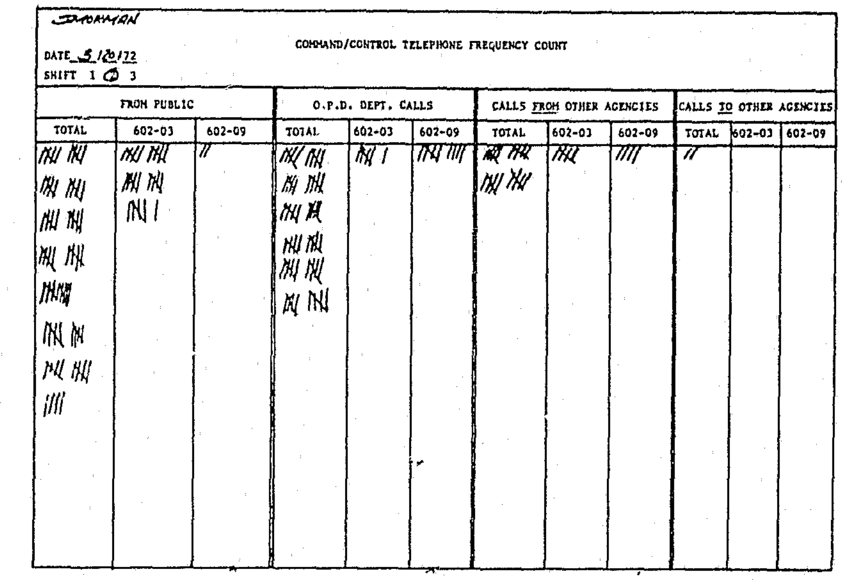
In the "Command/Control Telephone Frequency Count Study" all incoming and outbound calls from the Command/Control Center were recorded on the form (Figure 12) by a stroke count. If that call resulted in a 602-03 or a 602-09, a stroke count was recorded in the corresponding column. All personnel at the Command/Control Center for all three shifts recorded this information. Each form was dated, the shift indicated and the form signed by the person involved. The study started at 0700 hours, on Monday, February 28, 1972, and continued on continuously until 0700 hours Monday, June 5, 1972. The total sampling time was 99 days.

The "Inbound Telephone Rate Study" was conducted for three randomly selected 24 hour periods (Monday, Tuesday, Thursday). The military time of day was recorded for the time of first ring of every telephone call coming into the Complaint Desk. If a call was from a special agency such as the F.H.P., O.C.S.D., Electric Securities, or an ambulance, this information was also noted. The resulting histograms are shown in Appendix B.

While the Telephone Frequency Count was 100% sampling procedure, the "Command/Control Time Study" was designed to gather a random sampling from the population of all incoming telephone calls to Command/Control Center. The technician started his watch at the first ring and timed each subseqnent element in study. He then clocked the next call from frist ring to completion. If a call resulted in the technician waiting a 10-8 for more than ten minutes, he wrote the file number down in the appropriate row in the "Comment" column and stopped timing the call. Approximately 15 minutes before the end of his shift, he searched all completed forms to find the file number, subtracted the reported 10-6 time from the reported 10-8 time. This was entered on his time study sheet and noted by circling. A 10-8 could extend over an hour and no useful purpose would be served by the technician waiting that period of time, when he could be sampling other calls.

All times on the time study sheet are in hundreths of a minute unless the number is circled. Circled times are in hours and minutes and which were subsequently converted to minutes. The Command/Control Time Study Sheet is shown in Figure 12 . In keeping with good time study techniques, each form is dated, and signed by the technician taking the study. Additional information is also required by the time study sheet in order for a more detailed statistical study of the elements. They are, the shift, type of form completed, type of offense and census tract number.

From the monthly records of the Department, the number of 602-03 calls completed by district were obtained for a period of one year (May, 1971 through April, 1972). Although statistics were available prior to 1971 some district boundaries were changed in March of 1971. These changes could have effected the loading by district and were therefore not considered. Loading by district gives a good indication of the work load of the East and West Radio-Dispatchers.



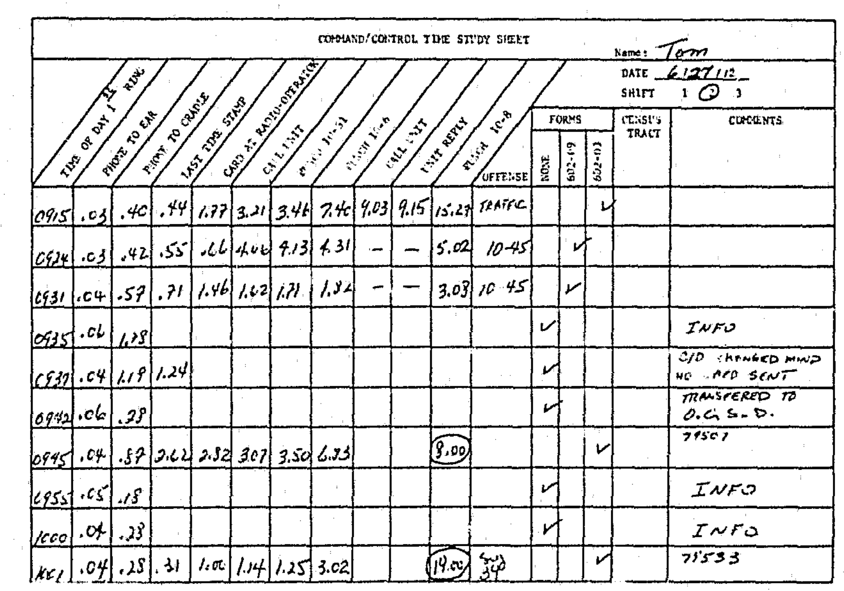


Figure 12 Shows The Actual Date Taken By Orlando Police Department Personnel Using The Forms For The Telephone Frequency Count Study And The Time Study.

SUMMARY DATA ANALYSIS

Time study information on each of the activity elements in the Command/Control System derived from the statistical data analyses exhibited certain characteristics which were used to make pertinent observations on the System operation.

In general it is advantageous to use standard distributions in describing the elements in a computer simulation model. Standard distributions can be more easily described and offer more flexibility in making revisions to the model. Accordingly, an attempt was made to find a closed form expression which would describe each parameter within a given statistical level of confidence.

Initially the histogram for each parameter was examined for basic characteristics. In general each parameter inherently exhibited a positive skewness because it was constrained to start at zero time and have no upper time limit. This was reflected in the standard deviation which was relatively large and characteristic of flat distribution.

A Chi-Squared goodness of fit test was performed on each parameter of the study in an attempt to define a closed form of a probability density function for the sample. Expected frequencies using the Poisson, Normal, Gamma and Log-Normal distributions were calculated and compared with the actual frequencies. Within the Log-Normal a Gamma functions α was varied from $\alpha=1$ to $\alpha=10$ in increments of 1.0, β was varied from $\beta=0$ to $\beta=5.0$ in increments of 0.2. Table 13 indicates the form of the test density functions. None of the test functions approximated the sampled frequencies within 95% confidence levels of the Chi-Square test. The primary reason for this is the high $S/\bar{x}$ ratio and a peaking of each frequency at lower times intervals. Appendix B shows each distribution and in every parameter the mean is to the right of the mode, therefore Normal and Poisson distributions would be poor approximations. The Gamma functions with $\beta=0$ do not fit the sample distributions in the lower time intervals but do approximate the sample when the time interval is larger than the 15th interval. Accordingly the exact distribution were used in the simulation model.

Although the daily volume of telephone calls varied by day of week, the percentage of calls which produced police action was relatively constant. The percentage variation by day of week was twice the percentage variation of the total 602-03's and 602-09's completed at the complaint desk for that day.

Saturday and Sunday exhibited a marked decrease in interdepartmental telephone traffic. This was probably due to the reduction in supportive personnel over the weekend. However the lower interdepartmental traffic was in contrast to increased telephone traffic from the general public on Saturday, with Sunday the lowest volume day of the week.

A 90% confidence level was used to determine the sampling size of the parameters of the Time Study. Complementary criteria included are α and β errors of less than 10% for a deviation of 10% from the population mean. Because of the limited time and personnel for sampling

and the sequential order in which elements were measured, the β error criteria was not meet in all cases. If the sample mean varied less than 10% from the true mean the α and β error criteria of 10% was meet in seven of the eight parameters. For the β error criteria to be satisfied when the mean sample exceeded the true mean by less than 10% more than 51000 samples must be taken. It was decided that the additional reduction in β error did not warrant the additional sampling. If however, the parameters are used to evaluate the performance of the individual functions of the Command/Control System, more sampling would be indicated to insure flucuations due to seasons of the year are accountable.

It appears the total response time of the Command/Control Center could be reduced 25-30% by more intensive training of the Complaint Desk personnel, by work layout analysis of the Radio-Operators work station and by formal documentation of procedures and policies. Complaint Desk personnel must be trained to determine need first, then to complete the necessary forms while actually in voice contact with the caller. This procedure along should reduce the response time by at least 20%. A reduction in the information type calls would also minimize the time delay in answering a call when staffing is minimum or the personnel are already on the telephone.

TABLE 13

PROBABILITY DENSITY FUNCTIONS INVESTIGATED IN THE CHI SQUARE GOODNESS OF FIT TEST

NORMAL	$f(X,S^2,\bar{x}) = \frac{1}{\sqrt{2\pi}\ s}\ e^{-\frac{1}{2}\frac{(x-\mu)^2}{s^2}}$
POISSON	$f(X,\mu) = e^{-\mu}\ (\frac{\mu^X}{X!})$
GAMMA	$f(x) = \frac{1}{\beta^{\alpha}(1-\alpha)!}\ X^{\alpha-1}\ e^{-x/\beta}$
LOG NORMAL	$f(x) = \frac{1}{\sqrt{2\pi}\ \beta}\ X^{-1}\ E^{-(\ln X-\alpha)^2/2\beta^2}$

DESCRIPTIVE STATISTICS FOR ELEMENTS OF THE TIME STUDY

The data on each simulation parameter was analyzed statistically to obtain estimates for the mean and variance of the population and also to investigate the standard distribution which might be used to approximate the actual data.

Raw data on 8710 randomly selected inbound telephone calls was recorded from Feb. 28 through March 31 and from May 15 through June 30. This data was reduced statistically to obtain information which could be used in the simulation.

Initially the elapsed time for each parameter was determined by subtracting the times of the two defining event elements and recording this on the Time Study sheet. The resulting data was transfered to computer cards where each line of the Time Study sheet represented a timed telephone call. A special computer program was then used to determine the mean and standard deviation for each parameter by day of week, by shift and by total time to 10-6 and to 10-8. This program and the accompanying print out are included in Appendix B . This program also generates histogram data with a range of $\bar{x}j + 1.96sj$ for each parameter.

The results of the computer analysis for all sample data is shown in Table 14 . The two investigation parameters ANV1 and ANV2 were combined to give a more accurate description of total time involved. The status check delay time "D3" occurred so infrequently and, as previously indicated, the size of the sample for this parameter was so small that the statistics were omitted from the Table. The mean standard deviation and sample size for all other parameters by day and by shift are shown. The smallest sample size (74) occurs in the cell "Investigation Time" on Saturday. This sample although relatively small is statistically significant. The population parameters μ and σ are approximately by $\bar{\bar{x}}$ and $s_{\bar{x}}$ shown in the "Total" row. Each was determined using

$$\sum_{i=1}^{N} \bar{x}_i \Big/ N \qquad \text{and} \qquad S_{\bar{x}} = \sum_{1}^{N} \sqrt{\frac{\sum_{i=1}^{n} (x_j - \bar{x})^2}{(n-1)}} \ ,$$

where n = sample size
N = number of samples

Analysis of the $S/\bar{\bar{X}}$ ratios indicates relatively flat distribution for all parameters. If each day of the week is assumed to be a separate sample, the range of the $\bar{x}$'s for each parameter are closely grouped and normally distributed about the corresponding $\bar{\bar{x}}$. It is noted that in at least one entry for each parameter the standard deviation is much larger than the other values by day of week, and therefore dominates the estimate of the population standard deviation, $S_{\bar{x}}$.

The histogram for the total sample for each parameter is included in Appendix B . When viewing the histograms caution must be used in interpreting the general shapes. For example "CALU" would appear to be normally distributed, however, the mean is within the 7th interval, the mode is within the 4th interval, and the $S/\bar{\bar{x}}$ ratio is 3.4. The 90% confidence level is $0 < \bar{x} < 3.12$ minutes. The graph only shows intervals to 1.06 minutes because of the extremely small frequencies for intervals greater than 1.06.

TABLE 14

DESCRIPTIVE STATISTICS FOR SIMULATION PARAMETERS

BY DAY OF WEEK AND WATCH

Day of Week / Shift		Response Time to Ring of Phone mins.	Information Gathering Time mins.	Form Completion Time mins.	Travel Time To Radio Operator mins.	Radio Operator Delay mins.	Unit Response Delay mins.	Travel Time To Get To Area mins.	Investigation mins.	Total Time to 10-8 mins.	Total Time to 10-6 mins.
MON	$\bar{X}$	.047	.924	.945	.373	.822	.392	4.535	14.851	22.890	8.039
	S	.039	.935	1.118	.511	1.532	.457	3.588	17.146	17.658	4.221
	N	893	885	206	198	188	164	161	110	896	896
TUES	$\bar{X}$	.046	.913	.894	.459	.649	.432	4.943	17.244	25.582	8.338
	S	.031	1.038	.797	.679	.908	.600	3.525	16.568	17.038	3.973
	N	1507	1497	300	287	270	238	220	118	1507	1507
WED	$\bar{X}$	.053	.911	.900	.597	.872	.402	4.800	13.948	22.483	8.535
	S	.110	1.007	1.941	.772	1.402	.428	3.349	11.533	12.320	4.330
	N	1513	1496	265	248	239	218	199	100	1515	1515
THUR	$\bar{X}$	.052	.864	.825	.504	.709	.416	4.602	17.357	25.329	7.972
	S	.050	.964	.880	.631	1.120	.421	3.219	15.240	15.689	3.729
	N	1297	1284	242	229	216	190	182	92	1301	1301
FRI	$\bar{X}$	.086	.914	.985	.328	.764	.466	4.735	15.580	23.908	8.328
	S	.094	1.084	.724	.496	1.054	.590	3.509	18.199	18.665	4.146
	N	1333	1316	229	220	215	198	180	77	1333	1333
SAT	$\bar{X}$	.054	.997	1.112	.380	.574	.372	4.146	15.307	22.943	7.635
	S	.063	1.037	.885	.563	.755	.514	2.905	18.358	18.667	3.384
	N	1210	1225	212	205	190	179	163	74	1233	1233
SUN	$\bar{X}$	.051	1.094	1.020	.421	1.010	.496	4.421	17.524	26.036	8.513
	S	.048	1.291	1.093	.562	2.033	.806	3.175	16.198	16.776	4.364
	N	923	910	183	184	175	167	153	88	924	924
1st Shift	$\bar{X}$	.077	.945	1.105	.524	.830	.413	3.993	13.958	21.845	7.888
	S	.994	1.121	.988	.749	1.399	.451	2.883	15.958	16.308	3.775
	N	1993	1973	353	341	321	316	288	174	1995	1995
2nd	$\bar{X}$	.050	.859	.891	.379	.657	.421	4.984	18.506	26.747	8.241
	S	.061	.954	1.379	.523	1.313	.675	3.512	18.606	19.073	4.195
	N	3177	3145	625	618	588	504	478	207	3181	3181
3rd	$\bar{X}$	.049	1.004	.915	.464	.837	.436	4.658	15.378	23.741	8.363
	S	.043	1.088	.933	.633	1.200	.484	3.381	14.057	14.634	4.070
	N	3506	3495	632	612	584	534	492	278	3533	3533
TOTAL	$\bar{X}$	.056	.945	.955	.438	.772	.425	4.695	15.873	24.167	8.194
	S	.120	2.796	2.989	1.611	3.494	1.480	8.815	43.178	44.458	10.431
	N	7	7	7	7	7	7	7	7	7	7

DESCRIPTIVE STATISTICS FOR TELEPHONE FREQUENCY COUNT STUDY

Descriptive statistics from the Telephone Frequency Count Study were used to describe the total telephone traffic in and out of the Command/Control Center by day of week and also by shift for application in the simulation model.

Data for the Telephone Frequency Count Study was continuously recorded from Feb. 28 through June 5, 1972. All inbound and outbound calls were characterized by point of origin and type of form required by the call. All Command/Control work stations with the exception of the Teletype were included in the study.

Four major categories by origin or destination were used to classify the telephone traffic; From Public, Within Orlando Police Department, From Other Agencies, and To Other Agencies. A telephone call originated by a citizen was recorded in the total column under the "From Public" classification. If police action was subsequently required as a result of this telephone call either a 602-03 or a 602-09 was logged in the appropriate column under the same classification. Any call from within the Orlando Police Department was logged under "Orlando Police Department Calls". Similarly if Florida Highway Patrol, Orange County Sheriff Department, Fire Department or ambulance service originated a call it was recorded under "Calls From Other Agencies". All outbound calls from the Command/Control Center was recorded as "Calls To Other Agencies". If the outbound call resulted from a 602-03 or a 602-09, the appropriate column was marked.

As indicated by the Operational Flow chart in Appendix B , all telephone calls which are answered by the Radio Operator must first be answered by the Complaint Officer and further be of an emergency or "in progress" type of incident. In Table 15 on the opposite page the Gross Total calls entry represents all telephone traffic. The Net Total calls is the Gross Total calls minus those calls recorded by the Radio-Operators. This is a 15.7% reduction of the total telephone traffic. Within each of the four major classifications are three categories: "Total", "602-03" and "602-09". The percentage of Net calls/category indicates the observed percentage by category for each classification, that is, 50.9% of all telephone traffic came from the general public. Within the classification "From Public" 38.5% of those calls resulted in a 602-03 being completed. This column is indicated by the heading "Percentage by Total Classification".

Correlation of the data from this study by shift and by Day of Week is presented in Appendix B . The total telephone traffic for the Command/Control Center varies by shift, with 3rd shift double that of 1st shift. The daily load builds to a peak on Friday with Sunday the lowest, exhibiting a total variation of 5.9%. However, the percentage of 602-03 and 602-09 is relatively constant showing a total fluctuation of only 3%.

The mean of calls by day is 757 with a standard deviation of 101 calls, where as the mean and standard deviation by shift are:

1st shift $\bar{x}$ = 164 s = 35
2nd shift $\bar{x}$ = 265 s = 58
3rd shift $\bar{x}$ = 327 s = 74

$\bar{x}$ = 756 $s_{\bar{x}}$=100.3

TABLE 15

CUMMULATIVE DATA FOR TELEPHONE CALL STUDY

BY CATEGORY AND CLASSIFICATION

	Gross Total Calls	Radio-Operator Total Calls	Net Total Calls	% On Net Calls/ Category	% By Total/ Classification
From Public					
Total	32142	356	31786	50.9	54.9%*
602-03	12292	72	12220	85.9	38.5
602-09	2131	20	2111	32.4	6.6
O.P.D.Call					
Total	28147	7772	20375	32.6	79.2*
602-03	2395	1330	1065	7.5	5.3
602-09	4111	943	3168	48.6	15.5
Call From Other Agencies					
Total	5916	572	5344	8.6	64.0*
602-03	797	24	774	5.4	14.5
602-09	1199	51	1148	17.6	21.5
Call To Other Agencies					
Total	7932	2958	4974	7.9	94.7*
602-03	1072	901	171	1.2	3.4
602-09	554	460	94	1.4	1.9

* No Action Taken Or As A Result Of No Police Action

DATA VALIDATION BY STATISTICAL HYPOTHESIS TESTING

The data on simulation parameters was subjected to Statistical Hypothesis Testing utilizing the Student-t distribution in order to establish at what level a statistical difference existed among the parameters by day of week and duty watch.

Prior to use as input to the simulation model, the data on each parameter describing the Command/Control System process was statistically tested to establish its degree of validity. Specifically the sample mean for each parameter was required to approximate the population mean within a specified tolerance to be acceptable.

Typically statistical hypothesis testing is a methodology comprised of a number of carefully defined steps; formulating the null and the alternative hypothesis, specifying the level of significance, selecting the testing statistic, establishing decision criteria, doing computations and making decisions.[1]

To formulate the null and alternative hypothesis, the means of the sample means $\bar{x}$ was used as the population mean μ. The basic question was whether there existed any significant difference from this mean and the other means by day and by shift for each of the simulation parameters. Since $\bar{x}$ may be greater or smaller than $\bar{\bar{x}}$, a two-tailed testing procedure is indicated. The null and alternative hypothesis can be expressed,

$$H_o: \ \bar{x} = \bar{\bar{x}}$$

$$H_1: \ \bar{x} \neq \bar{\bar{x}}.$$

A confidence level of 90% was used to be consistant with the confidence level used in determining sampling size. Two types of errors are possible in hypothesis testing. The 90% confidence level is an indication of an α or type I error, that is, 10% of the time, rejection of the null hypothesis will be made when it should have been accepted. The second type of error is termed β or type II error. This is committed when the null hypothesis is accepted when it should have been rejected. The β error is a measure of the power of the test statistic.[2]

The selected testing statistic utilized the Student-t distribution because the small sample size (n = 7) does not support the normal "Z" test statistic and because the population variance was unknown. The degree of freedom for the test will be n - 2 = 5. Two degrees of freedom are lost because the population parameters μ and σ were approximated by $\bar{\bar{x}}$ and $S_{\bar{x}}$.

To establish the decision criteria the following theorem was utilized:

"If $\bar{x}$ is a mean of a random sample size n taken from a normal population bearing a mean μ and the variance σ^2, then $t = \dfrac{\bar{x} - \mu}{s/\sqrt{n}}$, is the value of a random variable having the Student-t distribution with the parameter $\nu = n - 1$."[3]

1 Ya-Lun Chou, Statistical Analysis with Business and Economic Applications (New York, N.Y.: Holt, Rinehart, Winston, Inc., 1969), p. 313.

2 Irwin Miller and John E. Freund, Probability and Statistics for Engineers (Englewood Cliff, N.J.: Prentice Hall, 1965), p. 153.

The corresponding t value for $\nu = 5$ and $\alpha = .05$ is 2.015. The decision criteria is, accept H_o if $| t_{\bar{x}} | < 2.015$ and reject H_o if $| t_{\bar{x}} | > 2.015$.[4]

This theorem was used to test each parameter mean and results summarized in Table 16. For Monday - "Investigation" the required calculations was as follows:

$$t_{\bar{x}} = \frac{| 14.851 - 15.973 |}{17.146/\sqrt{7}} = .17$$

and since $| t_{\bar{x}} | = .17 < 2.015$ the null hypothesis cannot be rejected with a 90% confidence. Table shows that all $| t_{\bar{x}} |$ are less than 2.015 and therefore H_o may not be rejected, each sample mean is the same as the population mean within the assumed confidence on validity level.

TABLE 16

STATISTICAL SIGNIFICANCE LEVELS

FOR SIMULATION PARAMETERS

Day Of Week Shift	Response Time To Ring Of Phone	Information Gathering Time	Form Completion Time	Travel Time To Radio Operator	Radio Operator Delay	Unit Response Delay	Travel Time To Get To Area	Investigation Time	Total Time For 10-6	Total Time For 10-8
MON	t = .61	t = .59	t = .24	t = .34	t = .09	t = .19	t = .05	t = .17	t = .10	t = .19
TUES	.85	.82	.20	.08	.36	.03	.25	.20	.10	.22
WED	.07	.89	.75	.54	.19	.14	.15	.46	.21	.36
THUR	.21	.22	.39	.28	.15	.04	.002	.24	.16	.20
FRI	.06	.76	.11	.59	.02	.18	.14	.06	.09	.04
SAT	.08	.13	.47	.27	.69	.27	.42	.10	.44	.17
Sun	.28	.31	.16	.08	.31	.23	.15	.25	.19	.29
1st SHIFT	.04	0.0	.26	.20	.07	.06	.37	.23	.14	.25
2nd	.17	.16	.08	.20	.09	.01	.23	.24	.02	.23
3rd	.28	.09	.07	.07	.09	.04	.19	.07	.07	.05

BY DAY	BY SHIFT
1 Hypothesis: $H_o: \bar{x} = \bar{\bar{x}}$ $H_1: \bar{x} \neq \bar{\bar{x}}$	1 Same As By Day
2 Level of Significance: $\alpha = 0.05$	2 Same As By Day
3 Test Statistic: $t_o = \lvert(\bar{x} - \bar{\bar{x}})/s/\sqrt{n}\rvert$ $\nu = 5$, $n = 7$	3 $\nu = 1$, $n = 3$
4 Decision Criteria: Reject H_o iff $t_o > 2.015$	4 Reject H_o iff $t_o > 6.314$

3 Ibid., p. 136.

4 Ibid., p. 399.

OBSERVATION AND RECOMMENDATIONS

Based on functional analysis of the Command/Control System and statistics from the sample studies, a number of observation were made some of which clearly indicate action toward improved operations.

Statistics from the Telephone Frequency Count Study generally indicate that much of the telephone traffic handled in the Communications Center is information only. A more specific examination by type/origin further indicates that many of the calls might be eliminated or shunted around the Center.

o Almost half (49%) of all 602-09's completed by the Complaint Desk personnel are a result of interdepartment communications. An example would be a personal request that a officer or field assignment call the originating party. It appears this type of traffic could be received and handled by the Bureau watch commander. If it affected the status of the field unit, he would so notify the center by radio or callbox.

o In addition 79% of all interdepartment calls handled at the Complaint Desk do not require subsequent action. These are information queries and could be answered by the Information Desk Sergeant.

o 64% of all calls from other agencies result in no Orlando Police action. This indicates that the information pool among Police agencies within the immediate area must be upgraded.

o 46% of all calls to other agencies made by the Radio Operators are a result of no Police activity, since any telephone activity concerning Police business must be as a result of a 602-09 or a 602-03.

o Further, of those calls from the public requiring processing by the Complaint Desk Officer, only 45% result in a patrol unit being dispatched. It appears that the Public expects more service and is prone to upgrade an incident beyond what it actually requires. It is realized however, that this situation cannot be readily changed and the Complaint Office must continue to respond to these calls.

The Inbound Telephone Rate Study indicated that the call rate could be generally described by some form of experimental distribution. However the rate was translated to time between calls and frequency histograms prepared by shift for the simulation model to minimize computer time. It was noted that the call rate typically decreased from 1st to 3rd shift as seen in Appendix B .

Examination of the data from the District Loading Study indicated a consistent difference between East and West side operations. Typically the East side districts average 55% of all calls. It is noted however that those are calls only and therefore not necessarily indicative of the actual workload which would consist of incidents requiring patrol unit response and investigation.

The greatest number of pertinent observations on the effectiveness of the operations can be derived from the Time Study data.

o There is no significant difference in response time performance of the Command/Control Center by day of week or by shift. This indicates a uniform operation not subject to differences of day or shift.

o The Time To Answer Phone Variable D1 has a flat distribution. The Complaint Desk personnel answer 73% of the calls within three rings or 0.13 mins.

o The Information Gathering Time Variable ANFO is characterized by a flat distribution. However, the mean and standard deviation for a 602-09 and a 602-03 are $\bar{x}$ = 0.73 and s = .74 and $\bar{x}$ = 1.014 and s = .786 respectively. Both of these distributions are considerably more peaked indicating that, once the decision to dispatch a unit has been made by the Complaint Officer, a routine of information gathering is followed. A longer average time for a 602-03 is indicative of the additional information required by the form.

o The Form Completion Time Variable F1 has a mean and standard deviation for a 602-03 greater than that of a 602-09, indicating a longer time required to complete a 602-03. This parameter is also a good indication of time which under present operation is wasted due to work duplication. In a great many cases F1 time is information transfer time. The appropiate work was not being completed while the caller was still on the telephone. This is an indication of improper procedure since most of the F1 time could be eliminated by completing the required form while gathering the information.

o The Travel Time To Radio Operator RAD is governed by the belt speed of the card conveyor. Typically .12 min. is required for the card to reach the Radio Operator's station. The remaining 0.32 mins. is spent double checking the information on the form. The extremely large standard deviation would indicate poor procedures in completing the form, that is, no consistent pattern is followed when completing a type of form.

o The Radio Operator Delay D2 has a relatively high mean time indicates the decision process of assigning the nearest available unit. The very high standard deviation indicates high traffic on the radio, as well as, a delay in recognizing a form is in the conveyor belt. Better designed work station would greatly reduce both the mean and standard deviation of this parameter.

o The Unit Response Delay CALU includes both transmission time and delay in unit response. The use of "10 codes" and signal codes should convey all pertinent information including the address within .25 mins. The additional time is dead air time awaiting the unit reply to the call by the Radio Operator. The relatively large standard deviation indicates congested air traffic, repetition of information and delay of the unit to respond to its initial call.

o The Travel Time To Get To Area TRVL shows no significant difference in the mean by shifts which indicates traffic conditions are not the primary delaying factor but rather the units relative location within the patrol district. The average travel time per call could be sign-

ificantly reduced by a car locator system and possible realinement of the patrol districts.

o Investigation Time ANV1 has a uniform distribution whose mean is dependent upon the nature of the investigation. However, possible procedure changes are indicated because the function of the patrol unit is to patrol. When a unit is detained for up to one and one half hours with investigations another unit must cover that patrol area.

o The 602-03 total response time to 10-4 is $\bar{\bar{x}} = 3.72$ and $s = 2.11$ mins. 54% of the mean time is involved with gathering the information and then transferring to the 602-03 form.

o The 602-03 total response time to 10-6 is $\bar{\bar{x}} = 8.19$ and $s = 10.56$ mins. 55% of this average time is unit travel time.

o The 602-03 total response time to 10-8 is $\bar{\bar{x}} = 24.17$ and $s = 44.45$ mins.

o The 602-03 unit response time (time from unit called by Radio Operator to time reported 10-6) is $\bar{\bar{x}} = 5.27$ and $s = 3.39$ mins.

o Variables D1, ANFO, F1, D2, CALU, and TRVL have the desired characteristics of a Type I or α error less than 10% and a Type II or β error such that the mean of the parameter will not be less than 10% of the population mean more than 10% of the time.

o Variable D1 has the desired characteristics of both α and β errors are less than 10%.

o The grand mean $\bar{\bar{x}}$ for each parameter is the "standard time" for that parameter. Therefore, the work load of the Complaint Desk personnel may be evaluated and staffing by work load could be realized.

SECTION VII

SYSTEM SIMULATION MODEL

- o System Simulation Analysis
- o Computer Program Logic
  - o Input Data And Assumptions
  - o Output Information
  - o Modification Of Model
- o Validation Of Simulation Model
  - o Statistics Of Validation

The Orlando Police Department Command/Control System computer simulation model, outlined in the figure below, represents an abstract working model of the actual system operations, and provides an effective research tool for the law enforcement analyst.

Orlando Florida Environment → Calls For Service → Complaint Desk Officers → Radio Operators → Field Units → Completed Calls

Figure 13 Call Processing In Computer Model

The model is structured according to the design of the actual system and operates as a dynamic, Monte-Carlo simulation by generating calls from known or postulated statistical distributions, passing these calls through each processing step a call would encounter in the real system, and by gathering data on individual system component operations and overall processing time values. As is the case with any computer model, the program does not exactly match real world system outputs, but rather serves as a close approximation to actual system operations. The long run statistical averages of model outputs and real system historical data, however, are sufficiently close to permit management to make use of model outputs in analytic and decision-making applications.

Suggested revisions in present operating policies and procedures may be easily incorporated into the program logic and used to obtain predictions of overall system performance modifications resulting from these changes. Similarly, the expected increase in system activity over the next several years may be simulated using the model in its present form. Alternative system designs may be simulated with the model, albeit at the expense of making revisions in the basic program logic flow; this procedure was used to model a proposed system combining complaint officers with district-oriented radio operators.

SYSTEM SIMULATION ANALYSIS

The Computer Model used to describe the operation of the Orlando Police Department Command/Control System provides an inexpensive, easily-used tool for describing system acitivity under a wide range of operating environments and design configurations.

Experimentation and data collection activities concerning the operation of complex man/machine systems such as the OPD Command/Control Center are difficult to complete when the system must be in continuous around-the-clock operation. Such studies must of necessity be designed not to interfere with the normal operation of the system, and at the same time, provide a detailed picture of the system internal operation to be of any worth to the analyst.

One approach for systems studies which has been receiving considerable attention recently relates to the computer-based simulation of these systems. "Simulation", according to one popular interpretation, is the art of predicting reality from an abstract model of reality formulated by an analyst. Consider for a moment what this process might involve. The diagram on the opposite page represents a system operating in the real would environment. The system may be thought of in the engineering sense as a "Black Box", which transforms, or converts, a set of inputs into a set of outputs. The system operation is often constrained by outside restrictions, such as legal aspects, economic conditions, and possibly even humanitarian and moral considerations. The managers and workers in an organization may be thought of as generating additional control inputs within the system sturcture to further influence the transformation process.

The Orlando Police Department Command/Control Center operation may be related to the "Black Box" system operation in the following manner: Citizen requests for assistance and information comprise the majority of the inputs to the system. The system, defined as the Command/Control Center and its on-duty personnel together with the Uniformed Field Forces, transform these calls into field unit assignments for further investigation and action when deemed appropriate, resulting in outputs representing completed tasks. Constraints acting on the system are primarily those relating to legal procedural rules and physical equipment limitations, e.g., radio system capabilities and patrol unit availabilities.

A computer simulation model, then, represents a working system by imitating the "Black-Box" representation of the system. The basic system description is supplied to the computer in the form of a set of instructions. Also required are the known limitation on the system performance capabilities, e.g., the number of available telephone lines for receiving input calls. The computer program is then given representative inputs and asked to predict the related outputs that the real world equivalent system would generate for the same conditions. The actual computer outputs are tested for validity and the model is changed or expanded until these outputs reach the desired degree of correspondence with their real world counterparts.

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The advantages of experimentation with a model of a real system rather than with the system itself are several: (1) the real system is not

disturbed by data collection activities, (2) proposed changes in the system are easily tested by changing a few computer cards in the model, (3) the modelling approach is both faster and less expensive than actual field work for the reasons cited above.

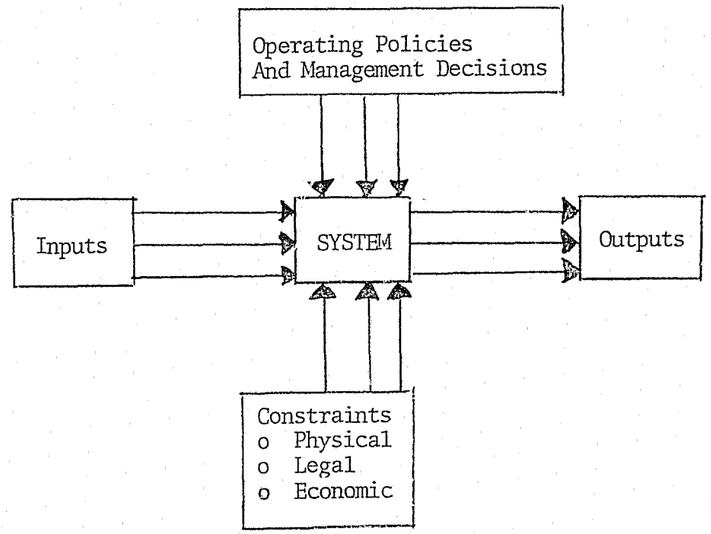


Figure 14 "Black-Box" Diagram Shows System Operating Environment.

COMPUTER PROGRAM LOGIC

The IBM Program Product: General Purpose Simulation System/360 (GPSS/360) was used to develop and exercise a comprehensive computer model of the Orlando Police Department Command/Control System..

The criteria used for the selection of an appropriate computer language to be used for a given simulation model involve several interlocking considerations. Perhaps the foremost of these is the inherent suitability of the language for implementation of the particular set of operating data and structural information available for the system under study. In the case of the Orlando Police Department Command/Control System project, a detailed flow chart of the operating procedures has been developed previously to support the computer work. In addition, statistical data in the form of means, standard deviations, and graphical distributions had been developed for the various times associated with the operation of the Command/Control System. These two factors suggested the use of a block-oriented simulation language to minimize the programming effort required to achieve a working model. Such language was available in the IBM GPSS/360 and this system was used for all subsequent computer runs on this project. GPSS/360 is one of the so-called user-oriented languages. This means that much of the internal operation of the program is transparent to the user of the language, and the analyst can construct a simulation model simply by selecting one language element, or command, for each block in the flow chart of the real-world system.

Consider the flow diagram on the facing page. It represents an overview of the basic simulation logic which will be presented in somewhat more detail in subsequent sections. The block along the left of the page represent activities in the servicing of a typical call through the Command/Control System. Calls arrive at the system according to some pattern depending on such factors as the time of day, the present level of criminal activity in the community, the weather, etc. Complaint Desk clerks answer the phones, gather the information as to the location and severity of the incident being reported, and if necessary, generate an Orlando Police Department form 602-03 or 602-09 form for subsequent Radio Operator use. Information-only requests and other calls not requiring field unit attention are not documented on a form. A conveyor transports the completed forms to the Radio Operator who in turn contact the appropriate field unit to service the call by consulting the duty roster and field unit assignment map board. The field unit assigned to a particular call must then travel to the location of the request and perform any necessary investigative and action services. When this processing is completed, the calls are removed from the system by the Radio Operator.

The corresponding system operation in the computer model is accomplished by the use of program devices called "transactions". These may be thought of as individual calls passing through the system. The computer uses statistical call arrival information from the real system to produce service requests at random intervals from the "generate" command. The resulting transactions pass through the remainder of the model just as the service calls would pass through the actual system, e.g., when a transaction passes through a Complaint Desk officer, it encounters a time delay determined by statistical sampling of the time delays encountered by real-world service calls at the complaint desk. This correspondence of model/system

activity is maintained throughout the simulation process, and thus allows statistical data observed from observing and timing on transactions to be used to predict these numbers for calls passing through the actual system. Along with these statistics, GPSS/360 simultaneously generates output statistics on the performance of structural components of the model, e.g., the percentage of time during an eight-hour shift that a unit was "busy".

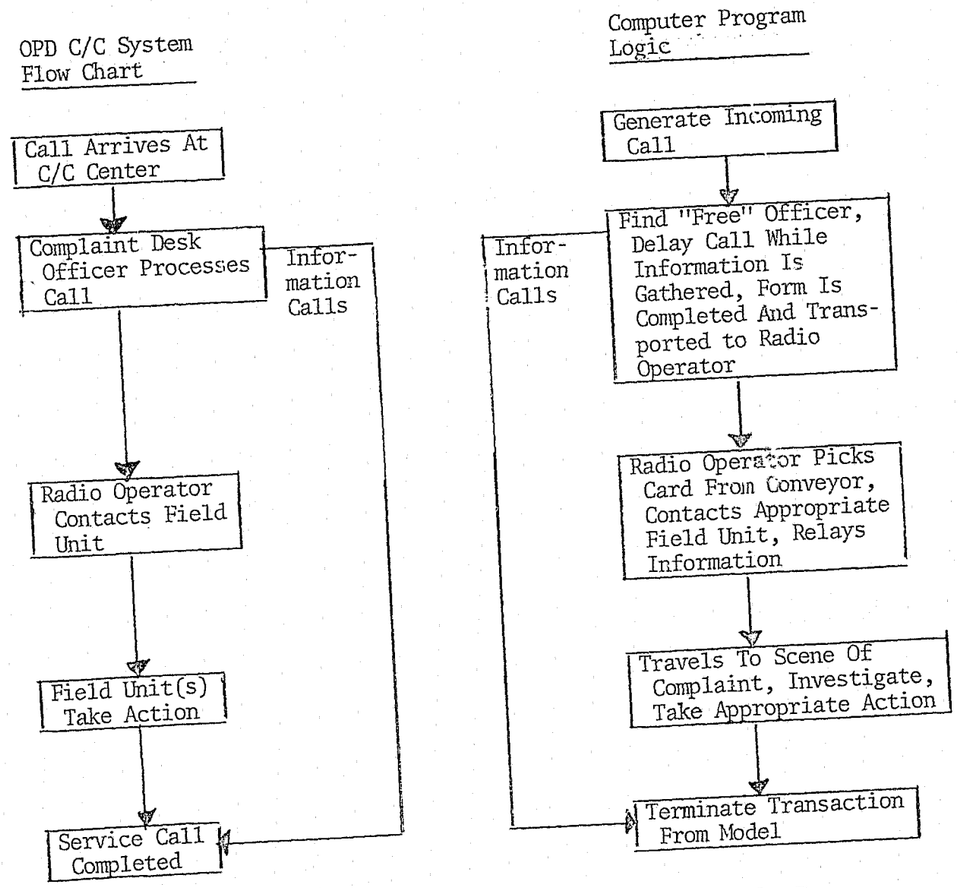


Figure 15 Shows Equivalence Of GPSS/360 Program Logic Blocks To Flow Chart Of Actual System.

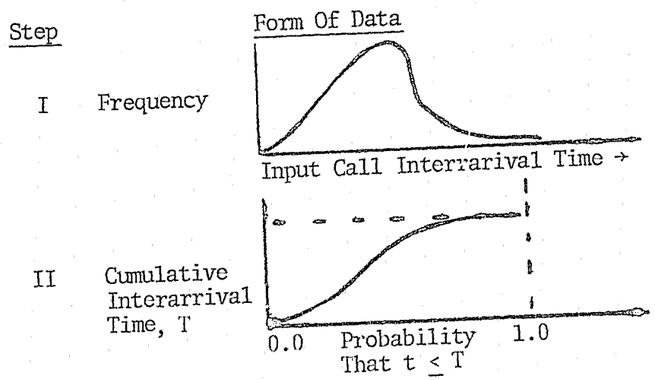
INPUT DATA AND ASSUMPTIONS

The computer model data input for system action times for the Orlando Police Department Command/Control System was based on extensive statistical sampling of the actual system operation on a 24 hour basis for two six-week periods in early 1972.

The construction of the computer simulation model used in this project required essentially two types of data about the Command/Control System. The first of these categories was fixed structural data on the configuration of the system, e.g., how many Radio Operator and Complaint Desk stations were to be considered for each simulation runs, or somewhat more detailed data, such as which radio channels were assigned to what field units. This data was typically obtained from physical plans of the Command/Control Center and from discussions with Command/Control enter personnel and supervisors. The second major category of data was that relating to operational characteristics of the system. This classification included such things as the determination of times for the human operator actions required to service an incoming call requesting police action. This particular data collection process for the model of this study was a major effort in and of itself, and is described elsewhere in this report. However, it would be instructive at this point to consider how a representative data item was obtained from the actual system operation and transformed into a form suitable for the computer model.

Consider the problem of generating service request calls to the System which simulates the actual calls seen at the Command/Control Center. The timing of the intervals between the arrival of successive calls over a long period of time allows the specification of a statistical interarrival time distribution for these times. This distribution can be entered into the computer simulation program in the form of a table of numbers, called a "FUNCTION" in GPSS/360. This procedure, outlined in the table on the facing page, requires an intermediate step consisting of the preparation of a cumulative statistical distribution on the time variable involved. This second step distribution gives the probability that the particular time element in question is less than or equal to some stated value. This cumulative distribution is then converted to a sequence of (x, y) data points and punched onto computer cards in the format shown in level III of the figure, representing a GPSS/360 "FUNCTION" statement. The name "SHIFT 1" is a symbolic name for the data curve in the function; whenever this name is referenced in the computer model, this curve will be selected for processing. The statement elements "RN 1, C 17" indicate that the curve is to read when needed by selecting an arbitrary random number in the range 0.0→ 1.0, and that the data curve itself is a continuous curve comprised of 17 pairs of data points. When in operation, the simulation program selects a random number from one of the built-in generators, and addresses in SHIFT 1 function to obtain the next call's interarrival time. This value is added to the master simulation clock time to determine the time at which the next outside call will enter the Command/Control system. The function naming connection was selected to distinguish the SHIFT I interarrival time curve from those of the 2nd and 3rd shifts, SHIFT 2 and SHIFT 3, respectively.

All of the Command/Control Center operational time elements were entered into the model in the manner described above, resulting in a total of some 17 time functions in the final model. The standard caution directive that "a computer model is only as good as its input data" was noted throughout the data collection and preparation process; every attempt was made to use only valid data values.



III Function To Describe 1st Shift (2300-0700)
Call Interarrival Times

```
SHIFT 1   FUNCTION  RN1, C 17
0.0  0.0  .11  50.  .22  100.  .33  150.  .41  200.  .47  250.
.51  300. .60  350. .65  400.  .71  450.  .78  500.  .86  550.
.89  600. .91  650. .94  700.  .99  750.  1.0  1600.
```

Figure 16 Steps In The Transformation Of Basic Statistical Data About The Command/Control Center Into Form Useable By The Computer Model

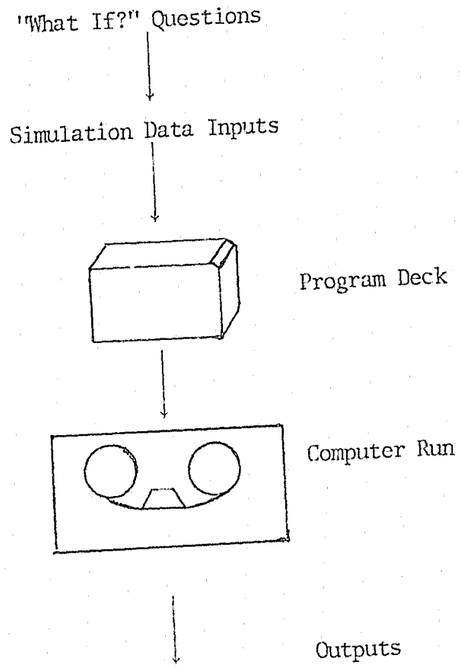
OUTPUT INFORMATION

The GPSS/360 simulation model of the Orlando Police Department Command/Control System provides a range of simulation data outputs useful in analyzing present and anticipated system operations.

The output information from the computer simulation model was used for two major steps of the systems study process: model validation, and testing of proposed system design changes and environmental evaluation factors. In the first phase, model outputs such as those depicted on the facing page were compared with known system performance data for standard and non-standard operating conditions. The model was then refined through data resolution changes or structural modifications to bring its outputs within an acceptable correspondence to those of the real world system. In GPSS/360 modelling, this process of model "tuning" typically occupies a significant portion of the total model preparation time. As with any Monte-Carlo simulation procedure, GPSS/360 is sensitive to the various values selected as initial conditions on the random number generators providing the dynamic stochastic behavior of the model. For this reason, several runs with different random number multipliers were made for each proposed system design or data change to assure thet the range of model variation due to this condition was adequately represented.

The various model outputs can be extremely useful in both design and analysis applications once the model has been validated, as mentioned above. For example, suppose the present Command/Control system was under study. The statistical properties of the external call input times and the corresponding field unit 10-6 times, representing the time delays encountered in getting a field unit to the scene of a complaint, could be obtained from a computer run. It would then be a simple matter to test the net effects to the system operations by placing more patrol units in the field, for example. The model would be re-run with everything save the number of available field units exactly as on the first run. The times to get a field unit at the scene of a complaint with the additional field units in place could then be compared to the corresponding time values with few field units active. Since the response time of a patrol unit to a complaint request can be shown to correspond directly to the probability of achieving a subsequent arrest of those persons responsible for the commission of an offense, the two computer runs could be used to promulgate a "cost-effectiveness" type of analysis relating to the utility of placing additional patrol units in the field with respect to achieving higher overall department success ratios in cleared crimes. This would be an example of the use of the model for analysis and exploration relating to management questions.

In the design phase of a system study, the model's significant contribution it its ability to identify those alternative designs which merit further investigation, and those designs which are clearly unacceptable and should be disregarded. For example, the internal queues, or call waiting lines, observed for the 1 Screening Officer/4 Radio Operator Command/Control Center design discussed later are clearly too long to be acceptable for efficient and reliable System operation.



Facility Utilization	Number of Calls Generated	System Queue Behavior At Clerks, Radio Operators	System Timings
o Complaint Desk Officers o Radio Operators o Field Units o Automatic Bar Graphs	o Calls Requiring Further Attention o Information Requests o Districts Where Originated	o Maximum Number Waiting o Average Number Waiting o Average Waiting Time In Queue	o 10-4 Distribution o 10-6 Distribution o 10-8 Distribution

Figure 17 Range Of Outputs Generated By GPSS/360 Simulation Model Of Orlando Police Department Command/Control System

MODIFICATION OF MODEL

The basic simulation model for the present Orlando Police Department Command/Control System was modified to reflect expected input changes in future years and to test several proposed design and operating changes.

Once the basic system model was completed and tested, several courses of additional development were undertaken. The first of these related to projected changes in the input calls to the Center requiring police attention. Orlando's fast growing population and development activity in the recent past, projected to continue at high levels for several years in the future, has had the side effect of generating significant increases in the community demands for police service. To test the adequacy of the present Command/Control Center design and operating philosophies in future years, the model was adjusted to generate higher numbers of incoming calls for each shift than those encountered in the 1972 Baseline system. The Orlando population was projected through statistical regression to 1976 and 1980 levels, and found to be estimated at some 30% and 80%, respectively, over its 1971 value. Accordingly, the interarrival times for incoming calls used by the simulation model for all three shifts were adjusted to smaller values representing an assumed direct correlation between population and police service requests. Once this capability for adding 1976 and 1980 level input conditions to the model had been implemented, all further runs for new designs or system capabilities were made for nine cases, e.g., all three shifts for the years 1971, 1976, and 1980.

One of the areas receiving a considerable amount of attention in the search for technological aides to law enforcement is the proposed "car locator" systems. These hardware systems automatically track the location of all field units equipped for such a system and continually update unit positions on a central display board at the Command/Control Center location. The premise justifying such systems is that the dispatch of vehicles to crime locations can be done in such a fashion as to assign the "nearest available unit" to the call, and thereby reduce average response times for all calls. To implement a full capability in the computer model to handle such a system, it would be necessary to track the (x,y) position coordinates of each field unit at all times during the simulation process and to make unit assignments to call requests a function of a geometric decision process, as has been done in the Loa Angeles Police Department.[1] This approach necessitates a model complexity considerably beyond that of the series of models used in this project and additionally, requires significantly more computer time per simulation run. For these reasons, a different approach to representing car locator system operation was adopted. A statistical description of the average expected unit response time reduction for a car locator system was developed and used to decrease unit travel times on a probabilistic basis.[2] This technique does not provide the resolution, or degree of accuracy, that the previous method does, but is sufficient

1 D. L. Bussard, Los Angeles Police Department Operations Simulation, TP-69-16-29, (Fullerton, Cal: Hughes Air Craft Co., Ground Systems Group, August 25, 1969)

2 Institute for Defense Analysis, Task Force Report: Science and Technology (Washington,D.C.:President's Commission on Law Enforcement and Administration of Justice, 1967), p. 21.

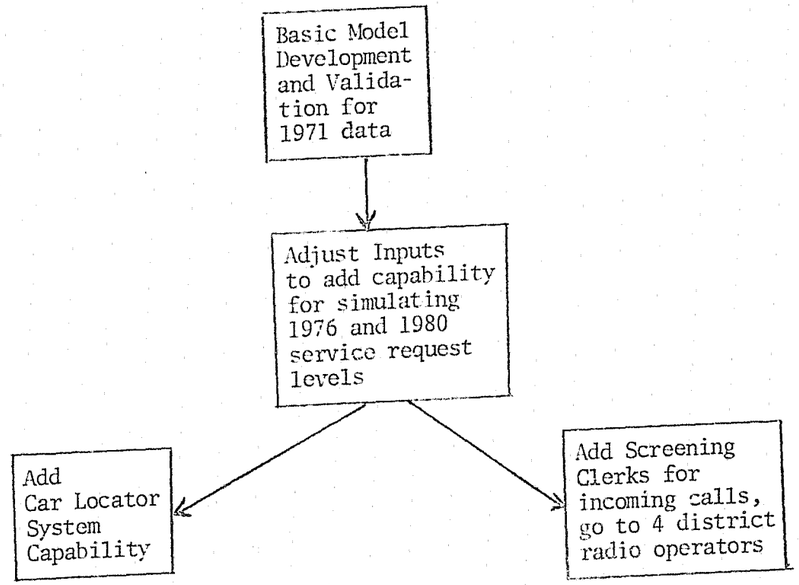
for general conclusions as to whether or not the car locator system merits further investigation.

Other model runs were made to test performance levels of a proposed alternative design configuration to the present system. In this proposed system, calls are answered by 1 or 2 Complaint Desk Officers. These personnel serve only to filter valid action calls from information calls and nuisance calls. The system has 4 district-oriented Radio Operators (NW, SW, NE, SE) and these Operators receive electronic notification of a pending valid call for unit assignment from the Complaint Desk. The Radio Operators complete the required paperwork for each call, assign the appropriate field units, and handle field traffic.

TABLE 17

STEPS IN MODEL DEVELOPMENT

PROCESS USED IN STUDY



VALIDATION OF SIMULATION MODEL

Comparison of the computer model outputs with corresponding parameters from the real world Orlando Police Department Command/Control System was the primary validation mode used for the simulation model.

The concept of the validation of a computer simulation model is often stated in absolute terms, although a more realistic approach may involve working towards relative states of model agreement with reality. One reference[1] has defined the validity of a simulation model as "...the extent to which it satisfies its design objectives." The goal of the Orlando Police Department Command Control System model was not exact duplication of real system performance, which would be impossible to achieve, but rather to achieve a reasonable approximation of real system performance and produce a model that would yield useful information about the system's operations. This goal has been achieved.

There are three basic approaches to assuring model validity;[2] all were employed in the construction of the Command Control System Model to some extent. The first approach requires building realism into the model structure, and typically involves making detailed analyses of actual system operating procedures and translating these into model language statements on a one-to-one basis. See Appendix for representative coding from the model structure for the complaint desk personnel activity and the field unit operations. The model statements, in general, have a direct relationship to known actions in the real world on an elemental basis, which is the rationale for declaring that exact agreement between the model outputs and the actual system operations is extremely unlikely. For example, the Complaint Desk Officer action of answering a telephone call is modelled by a GPSS/360 language statement of the form [illegible]. This has the effect of causing the simulation program to pick a random number internally and use its value to obtain a telephone answering time variable value for the clerk from the data function named [illegible]. This time function was derived from statistical sampling of real answering operations by all of the Officers currently assigned to the Complaint Desk function. Consequently, the probability of selecting a number of telephone answering times which exactly match those observed for a particular human versus those for a simulated officer during the course of an 8 hour shift simulation run by the model is extremely small, if not zero. However, due to the sampling procedure employed in the simulations from the population of observed telephone answering times, the average observed answering time in the model runs and the distribution of observed answering times should be relatively near those computed from the real system. This result is, in fact, the theoretical basis for Monte Carlo system simulation, e.g., the statistical determination of a system operating characteristics may be obtained from the aggregate of a number of samples from the system expected operating [illegible].

1 Maisel and Gnugnoli, Simulation of Discrete Stochastic Systems, (Chicago, Illinois: Science Research Associates, 1972) p.33

2 OP. CIT., pp 55-57.

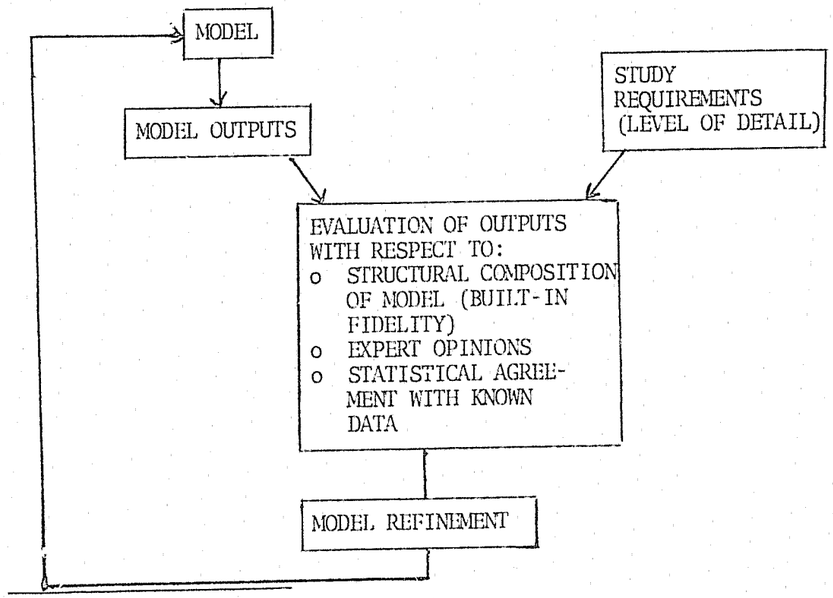
The second validation approach involves assessing the reaction of knowledgeable personnel to the model outputs for familiar operating conditions. It has been pointed out that this action may be helpful in isolating and identifying doubtful results in the model outputs.[3] This comparison was done for the project simulation model and yielded the extremely important information that predicted Radio Operator "busy time" statistics were uniformly too low to represent a reasonable cut at reality. This discrepancy was investigated, and found to be due to the ommission of certain types of background radio message traffic, e.g., detective unit calls and accident investigation car reports. The accurate simulation of the full Radio Operator's task spectrum in the completed model was thus found to require additional statistical sampling of these necessary events.

The third approach to validation relates to formal comparison of simulation model outputs to reference data which may be available for the system being studied. This reference data is typically historical data on system operations under known conditions in the past. Again, the point must be made that exact correspondence of Model/System output is not required or sought, but rather a degree of correspondence satisfying the needs of the study. This approach is covered in some detail in the next section of the report.

TABLE 18

MULTI-STEP PROCESS OF A

MODEL VALIDATION



3 OP. CIT. p. 35.

STATISTICS OF VALIDATION

"An empiricist is one who believes only what his senses tell him; in this case he has made an outrageous leap into the unknown".[1]

The question of the relationship between the problems of validation and inference arising from simulations of human systems is an interesting one. Validation, as mentioned earlier, relates to the degree of "realism" associated with a model, whereas inference, or the methodology of drawing conclusions from data, often requires consideration of the "formalism" associated with a simulation process.[2] The statistical procedures for initial model validation require the analyst to carefully consider these somewhat mutually conflicting concepts. Consider the accompanying chart, taken from Pfaff and Pfaff[3], and representing the range of simulations of human behavior. The Orlando Police Department Command/Control System model would fall somewhere near the "complex all computer experiement" region of the chart, the primary classification criteria being the relative degree of variable interactions that exist within the model structure. The primary effect of this classification characteristic is that variable responses in the model are not independent in nature, and therefore cannot be treated with classical experimental design techniques. Analysis of such models typically then depends on single runs or replications to obtain descriptive model behavioral patterns.

One other theoretical point needs to be addressed with respect to statistical validation of model behavior and this is simply that if a model describes some hypothetical or proposed system, no validation can in fact, be accomplished. This is a natural consequence of the fact that "...if no numerical data exists for an actual system, it is not possible to establish the quantitative congurence of a model with reality."[4] The importance of this fact in the present study is that the output data relating to the future Command/Control systems considered as alternate designs to the present system will have this characteristic.

To illustrate the statistical testing typical of that which can be done to validate the model, the analysis of model behavior for field unit travel time data will be presented. Manual sampling over several weeks with the real system produced a mean of 4.605 minutes for this quantity. The model yielded a man value of 4.14 minutes and a standard deviation of 2.918 minutes for this variable over a series of 3 model runs with the baseline current implementation system. Additional data collection items were not made at this point in the study for this case, as each run was

1 C. W. Churchman, "An Analysis of the Concept of Simulation", Symposium on Simulation Models: Methodology and Applications to the Behavioral Sciences (Cincinnati, Ohio: Southwestern Publishing Co., 1969) pp. 1-2.

2 Martin Phaff and Anita Pfaff, "Statistical Analysis of Simulations of Human Systems", Proceedings of Eighth Symposium of the National Gaming Council, Excelsior Springs, Mo., June, 1969, p. 2.

3 Op. Cit. p. 7

4 G. S. Fishman and P. J. Kiviat " The Statistics of Discrete Event Simulation", Simulation, April, 1968, pp. 191.

costing approximately $21.00 for computer time, and additional development work requiring considerable expenditures was being projected for the model. The applicable statistical test was conducted as follows:

Null Hypothesis: Sample Mean (Computer Prediction) = Population mean (Actual System Value Obtained by Sampling)

Test Statistic: $t = \frac{4.14 - 4.605}{2.918 / \sqrt{3}} = -.275$

Rejection Region: For $\alpha = .05$, reject for $t > 2.920$

Conclusion: Accept the Null Hypothesis

TABLE 19

VARIOUS COMPUTER MODEL SCHEMES BASED

ON REALISM AND FORMALISM COMPONENTS

Degree of realism ←	All-Human Simulation	Man Computer Simulation (Game Simulation)		All-Computer Simulation		
Description	All Human Game	Hierarchical Man-Computer Game	Man Computer Game	Man-Computer Experiment	Complex All-Computer Experiment	Simple All-Computer Experiment
Feedback	very complex & important	multi-level, partly formalized	one-level partly formalized	one-level or multi-level formalized	multi-level all formalized	multi-level all formalized
Data Series	subject-generated	subject-and experimenter generated			experimenter generated	
Replication	not possible	difficult and not meaningful		possible	possible	possible
Experimental	not possible	not possible	not possible	possible	not possible	possible

Degree of formalism →

SECTION VIII

DEVELOPMENT/EVALUATION OF ALTERNATE COMMAND/CONTROL SYSTEMS

- o System Effectiveness Criteria
- o System Response To Projected Requirements
- o Combine Complaint Officer/Radio Operator Function
- o Automatic Patrol Vehicle Locator System

Certain quantitative performance measures are typically associated with the effectiveness of the operations of a law enforcement system. These include such factors as the expected waiting times encountered by citizens calling for service, and patrol car response times to emergency service requests. This latter factor has been found to correspond directly with the probability of apprehending individuals responsible for commissions of crimes, for example, and represents an important law-enforcement management operating parameter. The ever-increasing growth of incidents requiring the attention of the Orlando Police Department dictates the need for studying the adequacy of the present system configuration and operating policies over the next day several years to insure that the goals of the public service responsibilities of the Department are achieved.

Along with the analysis indicated above, the possibility of incorporating more cost-effective Command/Control Systems into the Department Operations must be considered. These systems admit the possibilities of operational performance equivalent to the present system for equal cost factors. Computer simulation studies address both types of study equally well.

Currently proposed alternate designs to the present center configuration include the Car Locator System concept and the geographically distributed Complaint Officer/Radio Operator option. Each system was tested and problems were identified requiring further investigation in greater detail.

SYSTEM EFFECTIVENESS CRITERIA

Careful testing of proposed law enforcement systems and concepts anticipates future environments and expected operating problems to secure high levels of system performance at reasonable costs.

Cost-effectiveness studies for law enforcement systems involve the aggregation of system performance descriptors and cost data to obtain combined measures of system merit. Such studies are an important part of today's municipal systems business, as the acquisition of new law enforcement systems is based on the "best-buy-for-the-tax-dollar" concept. If a new proposed system cannot be shown to improve significantly the field effectiveness of present operations, or alternatively, cannot be expected to perform at the same levels of effectiveness as currently deployed systems with lower total costs, it will probably not be considered as a candidate for future implementation.

One approach to obtaining valid cost-effectiveness measures for certain types of existing and conceptual Command/Control systems is to use a computer model to generate the necessary performance data. This circumvents the necessity of actually constructing physical models of such systems, with the attendant time and money expenditures, and the need for conducting operational trials under simulated system environments. The problem that still faces the analyst in either case is the resolution of the simulation as to the performance of the system is a "real-world" environment, and this question must be considered before approving a system concept and committing resources for prototype systems development. Hopefully, systems analysis and careful modelling techniques will yield information useful to the decision-making process.

An effectiveness measurement technique that deserves some mention is the use of analytical mathematical models of conceptual systems. The queueing equations for certain system conditions are well developed, for example. Unfortunately, the state of the art in analytical modelling does not yet generally permit the degree of accuracy in a model representation of the real world that is needed to yield the required degree of confidence in the study results. The description of modern law enforcement as a non-linear, dynamic, stochastic process with many hard-to-quantify variables, such as shift crew fatigue, is enough to make even limited scope realistic models too complex to be useful on a practical basis. The ever-present constraints of time and money remain active with this type of analysis, with the amounts of each expended being proportional to the complexity (and hence the realism in most cases), of the analytic model. Another major drawback of analytic models is that most people unfamiliar with this approach find the technique hard to understand, and more importantly, believe. This factor must be addressed if a study is ever to achieve its proper acceptance by the management personnel who will be using the system.

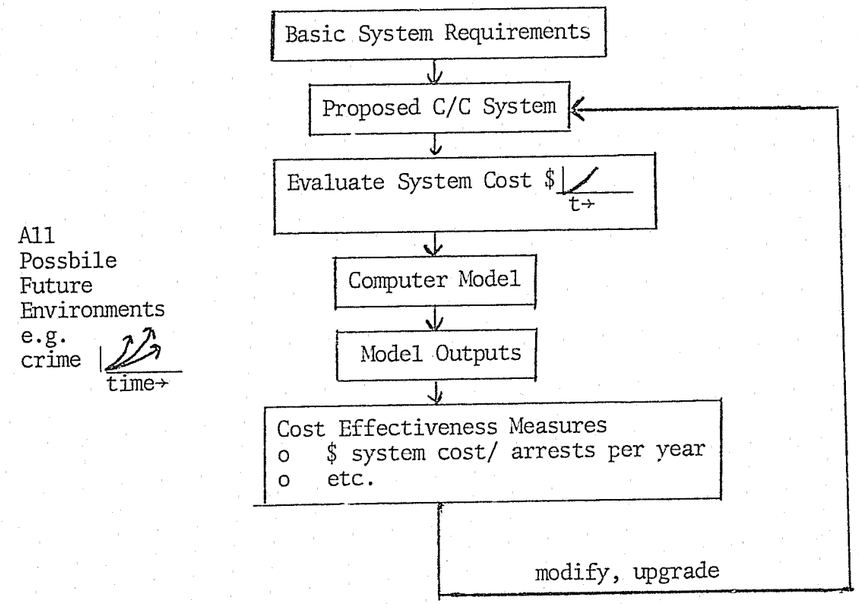
There is a reasonable alternative to analytical modelling, however, as was mentioned earlier. Computer-based, Monte Carlo-structured, models of police system operations can provide the necessary system operating data required. This type of analysis has the property of being relatively quick to implement and is extremely flexible to evolving changes in the requirements for additional output data or sensitivity testing on the

important system parameters. The high degree of experimental control and repeatibility achievable with this type of approach is conductive to making statistical inferences not fully possible with the other methods. The ever-present problem of the model accuracy vs. cost trade-off must still be addressed, but the quantitative measures of model cost-effectiveness, namely computer running time, or dollars, and statistical validity measure for the output data available with this type of study make the problem somewhat more tractable.

TABLE 20

SYSTEMS EFFECTIVENESS

EVALUATION PROCESS



SYSTEM RESPONSE TO PROJECTED REQUIREMENTS

The Orlando Police Department Command/Control System Model provides an effective tool for assessing system growth options proposed to meet future needs.

Statistical projections relating to Orlando population data indicate additional service call input activities of 30% and 80% in 1976 and 1980, respectively, over current levels. The Command/Control System simulation model was used to evaluate system performance for the present system for all three cases. In addition, alternate systems with car locator capabilities and geographically-oriented complaint officer/radio operator stations were tested with the model. The basic results of this testing are presented herein, and should be considered preliminary and tentative at best, requiring additional computer runs and analysis before committing Orlando Police Department resources to implement these new concepts on an operational basis.

Analysis of the computer model runs for the present system indicates that the Command/Control System is operating well within tis capabilities for handling service calls during "normal" operating conditions, and "fails-soft" or starts to become unacceptably loaded in field unit utliziation by 1980. For example, individual field unit "precentage busy time over an 8-hour shift" data from the simulation runs projected numbers in the 70% range in several instances. This result should be studied and confirmed as it indicated a potential need for additional field patrol units by 1980. It should be noted that the model can answer projected resource requirement questions such as how many additional cars are needed in 1980 by making repeated runs with varying levels of resources, and comparing the resulting predicted values for the system operating parameters with the predetermined management goals for these conditions.

The project time frame did not allow the experimentation necessary to model system saturation, e.g., the case where all system components are buried for extended periods of time. However, the normal input rate for calls entering the system was doubled for all shifts for one series of runs to test what has been termed the "Heidi Effect." This generic name refers to a recent television network decision to suspend broadcasting of a professional football game to allow a children's program to be seen at its scheduled time, resulting in a temporary public reaction of telephoning public agencies such as police departments to express their dissatisfaction. The term has come to mean any situation which causes similar call generations to occur, for example, the occurrance of a sonic boom over a populated area. The model response to this stress condition was primarily seen in the extreme waiting time for calls processed in Command/Control center. This resulted in an increase in system call processing time (p.4) of up to 2 minutes. This condition peaked at 10 minutes after onset of stress condition and call processing returned to normal approximately 15 minutes after removal of the stress condition. The stress environment was designed to last 30 minutes. Field unit responses were not affected materially, as would be expected.

The car locator system mentioned earlier was modelled with a simple alteration in the internal program logic to reduce field unit travel times to the scenes of complaint origination on a randomized basis. Analysis of simulation outputs indicated a slight reduction in 10-6 and 10-8 timings, but it was determined that the resoluation of this procedure was not adequate enough to allow meaningful conclusions to be drawn about this mode of system behavior. It is evident that the car locator concept need be treated in somewhat more detail for accurate evaluation to be possible. A model incorporating capabilities for tracking geographic coordinates of field units as the shift progresses and for assessing which unit is nearest the scene of a complaint location at any required time would be helpful, if not mandatory for this application. It should be noted that this level of detail requires a considerable amount of computer time to accomplish its processing. The computer simulation of the Los Angeles Police Department for 8 hours of operation using this approach requires 12 minutes of computer time; the Orlando Police Department Command/Control Simulation uses approximately 30 seconds of computer time to simulate 24 hours of normal system operation without the inclusion of geographic unit tracking capabilities.

A major structural modification to the Command/Control Center Simulation was tested for future implementation consideration. The next report section considers this design in some detail, but essentially the system replaces formal complaint desk clerks with screening personnel to identify valid service calls. The system then pa-ses such calls to one of fou : radio operator/staff officers for transmittal to field units. Simulation runs indicated a potential queueing problem at the radio operator stations, indicating for example, that the 1980 call input loading caused a queue to develop at the screening operator station with an average delay of approximately 30 seconds. This is probably an unacceptable condition to provide efficient public service, especially for emergency calls. Further analysis is required to provide an adequate system specification using this concept. Having these district operators fill out data forms with call information may be the factor causing the problem with the suggested system.

TABLE 21

SUMMARY OF MODEL RUN RESULTS

- o CURRENT SYSTEM ADEQUATE FOR NEAR TERM GROWTH/ SERVICE PROJECTIONS
- o CAR LOCATOR SYSTEM CAPABILITIES APPEAR PROMISING- ADDITIONAL STUDY NECESSARY TO QUANTIFY BENEFITS AND IDENTIFY
- o COMPLAINT OFFICER/RADIO OPERATOR MERGE MAY HAVE QUEUEING PROBLEMS - SUGGEST OPERATOR WORKLOAD ANALYSIS TO ISOLATE CONGESTION FACTORS

COMBINED COMPLAINT OFFICER /RADIO OPERATOR

Analysis an alternate system in which the Complaint Desk and Radio Dispatch functions were combined shows only marginal improvement over the present system and is not recommended as a cost effective method of improving operations of the Command/Control System.

Only 43% of all calls handled by the Complaint Desk result in Police action. On an average day 423 calls answered at the Complaint Desk could be handled as an information call by the Desk Sergeant.

It is observed that the Complaint Desk station exists primarily for information gathering purposes. And once recorded the information must again be assimulated by the Radio Operator so that it can be communicated to the Field Units. This suggests that it may be feasible to combine the Complaint Desk and Radio Operator stations in order to expedite and improve the communications link in the System. In essence this is the configuration used during the emergency mode when the Radio Operator monitors the Complaint Desk call as it progresses. Accordingly two operating configurations both of which combined the functions of the Complaint Officer and Radio Operator were developed and evaluated by computer simulation. This proposed operational unit consisted of four complaint-dispatch personnel each having responsibility of gathering the information for unit assignment in one quadrant of the City. This also required assignment of one radio channel to each station. It is noted that the personnel manning these stations must be well trained in the proper procedures of information gathering and dispatch.

In the first alternative, one additional Information Desk Officer was used to answer all incoming calls. His function was to quickly determine the type of call and which quadrant of the City the reported incident occured so that it could be transferred to the Complaint-Dispatcher for that quadrant for processing. Only those calls which require police action would be forwarded to the Complaint-Dispatcher. Information type calls would be screened and transferred to the Information Desk Sergeant. Clearly the officer screening the calls must be well qualified and experienced to ensure minimum delay in assigning the proper Complaint-Dispatcher.

The second alternative evaluated was the same as the first except two screening officers were used to prevent any delay in answering the incoming calls. Both alternatives were evaluated against incident rate projected for 1972, 1976 and 1980.

The quadrants of the City were determined by dividing City North and South by Central Ave. and East and West by I-4. Table 22 summarizes the data for the two alternatives against the capabilities of the present system through 1980.

The response time of the Command/Control Center under the present system shows no significant increase in 10-4 process time through 1980. In each of the alternatives, the process time increases with the most significant change occuring in the Alternative 1. By 1980 the 10-4 time of the Alternative 1 is 0.8 minutes longer than the projected 10-4 time of the present system. Alternative 2 shows only a slight

increase in process time, and is substantially longer than the present system. If just the total time to process the calls is the decision criteria, the Alternative 2 offers a significant advantage over the present system.

A more detailed analysis of the queues developed by Alternative 2 however shows some disadvantage to this system. The total number of calls which must wait either because the two screening officers are busy or the appropriate quadrant dispatcher is busy , is twice that of the present system by 1980. As seen in Table 22 the duration of the delay is also greater than the present system in all cases.

The two alternative systems exhibit marginal improvement in 10-4 time over the projected present system by 1980 such that the addition investment in communications consoles could not be justified. The present system is very workable up through 1980 and a reduction of 10-4 time can probably be realized more readily by intensive training of the Complaint Desk Personnel.

TABLE 22

COMPARISION OF TIME TO 10-4 FOR ALTERNATIVES COMBINING

COMPLAINT OFFICER/RADIO OPERATOR FUNCTIONS

WITH PRESENT SYSTEM

Year	Present System	Alt. 1 One Screening Officer	Alt. 2 Two Screening Officer	Total Time For A Call In A Queue To Receive Action		
				Present	Alt. 1	Alt. 2
1972	3.13 min.	3.15 min.	2.72 min.	1.09 min	1.89 min	1.16 min.
1976	3.11	3.81	2.76	1.06	2.74	1.49
1980	3.06	3.84	2.82	.98	2.76	1.70

AUTOMATIC PATROL VEHICLE LOCATOR SYSTEM

Incorporation of an Automatic Patrol Vehicle Locator in the Command/Control System was evaluated on an effectiveness basis using the model to determine the difference in responce travel times with and without the locator system as the incident load was increased.

Continuous force status monitoring is typically one of the most effective methods of improving the Command/Control operation since it provides a dynamic display of information combining offense locations and displayment/availability of patrol units. Without the aid of a vehicle locator system, the Orlando Police Department dispatching procedure requires that a patrol unit operating in an assigned district be dispatched to an emergency call if it happens in his district. If he is unavailable alternate units from adjoining districts may be dispatched. The weakness of this system is that there is a relatively high probability that a unit in an adjacent district may be closer than the assigned district unit. To overcome this problem the Radio Operator may query all units in the vicinity and dispatch accordingly; however this would delay the 10-4 response and introduce considerable more radio traffic.

There are a number of vehicle locator system designs which may be applicable. Each has inherent performance capabilities which depend on the operating environment and sensor subsystem used in the design. Consequently, a system analysis is a primay requisite to identify the most cost effective system for a specific police application. For the purposes of this study, however, pnly the accuracy requirement is important since a number of systems are available. Studies presented in the Science and Technology Task Force Report[1] showed that almost all value of a locator system was obtained with a specified accuracy of 0.2 mile. This work also presented the relationships between AVL system accuracy and the average extra patrol unit distance traveled. This information was incorporated in the simulation model to represent the effect of an AV1 system with 0.2 mile accuracy on the operations of the Orlando Police Department Command/Control System.

The quantitive evaluation was based on a comparision of average travel time delay with and without AVL system at varying incident loadings representing 1971, 1976 and 1980. The travel time in each case was obtained as the difference between the 10-6 and 10-4 times generated by the computer simulation model. The resulting data is presented in Table 23 .

Since the number of simulations were limited by the computer funding available, the data has been presented as a distribution of values. This permits a better evaluation of the results based on a statistical confidence level. The mean system travel time is bracketed by the 90% confidence limits. Comparing the travel time for the Basic and AVL augmented systems generates values at maximum and minimum predicted travel time which may be saved as a result of incorporating the AVL system. The data presented represents output from three computer simulation runs each using a different incident demand rate as noted earlier.

1 Institute for Defense Analysis, Task Force Report: Science and Technology (Washington, D.C.: President's Commission on Law Enforcement and Administration of Justice, 1967).

Considering the summary data in Table 23 , it is safe to conclude that at least 0.26 minutes travel time can be saved by use of an AVL system with the present districe assignment operations. As the City expands it can also be expected that this predicted improvement in travel time will improve markedly. The reduction in travel time which the AVL might thus afford translates to a percentage improvement of between 5.5% and 8.0%.

It is noted that this analysis includes all response incidents. The largest improvement would probably occur in the lower priorty incidents since emergency incidents are typically answered by at least the nearest available patrol unit which arrives first regardless of its apparent position to the dispatcher. However, this typically results in extra units converging on the site which would be more effective remaining on their own beats or being strategically deployed along likely escape routes, especially in event a chase is anticipated. The AVL also affords additional safety for the field officers since the Communications Center has information at all times on the patrol unit location. Additionally the AVL system can be equipped with an "Officer Needs Assistance" signal device which the officer can use to unobtrusively summon help in an emergency.

TABLE 23

COMPARISON OF PREDICTED TRAVEL TIMES WITH AND WITHOUT AUTOMATIC VEHICLE LOCATOR SYSTEM

	Base Travel Time Min.	AVL Travel Time Min.	Travel Time Saved Min.	Improvement %
Min. (5%)	3.52	3.24	.28	8.0
Mean	4.12	3.85	.27	6.6
Max. (95%)	4.72	4.46	.26	5.5

SECTION IX

COMPLAINT DESK OFFICER TRAINING MODEL

- o Tactical Scenario
- o Operating Model
- o Trainee Qualification Profile
- o Performance Evaluation Criteria
- o Weighting of Criteria
- o Performance Standards

A Complaint Officer Training Game was developed to provide a means of training new recruits and also to maintain and upgrade the decision making capabilities of on-board Command/Control personnel. Although a simulation game cannot duplicate the real world conditions, care was taken to include the important functions and stress conditions. A Tactical Scenario was prepared to provide a composite description of the operational characteristics for the game so that it could be evaluated against the real world operations.

The Game Model integrates the real world operating situation of the Complaint Desk position with a series of controlled tactical situations which are designed to evaluate the examinee's ability to handle difficult situations and his reaction to stress. It begins with a simulated complainant calling the examinee to provide him with a tactical situation and ends with the evaluation of his performance in the form of a quantitative performance rating.

In developing the model it initially involved establishing a qualification profile for the Complaint Desk candidate, setting up a set of weighted criteria to evaluate his performance, and performance standards to provide a level of excellence. A Qualification Profile was established to reflect the preferred capabilities of potential personnel for the position. This included motor abilities, psychological makeup, and formal classroom training in order to adequately gauge the candidate against the performance of qualified Complaint Desk personnel. On the basis of these three sub-profiles, the qualification and performance level of the individual were related since only on the basis of knowledge of the system input and output can performance be correctly evaluated.

A set of Performance Evaluation Criteria or performance measures, which define the major functions of the Complaint Officer, are requisite to application of the Training Game so that the performance of the examinee can be measured and evaluated. The major evaluation criteria selected to describe the Complaint Desk function were Information Accuracy , Form Completion or Unit Deployment Time, Decision Capability, and Tactfulness. The four performance criteria were then weighted in accordance with their relative importance. The sum of the weighted criteria ratings determine the examinee's overall performance. Three methods of weighting objectives were examined prior to determining the appropriate weight distribution. The resulting weight distribution was: 35% - Information Accuracy, 30% - Form Completion Time, 20% - Decision Capability, 15% - Tactfulness.

Performance Standards were developed using a committee of experienced Complaint Desk personnel who represent an established degree of job proficiency. The performance standards effectively relate the evaluation criteria to the task performance in a given game situation.

TACTICAL SCENARIO

The Tactical Scenario of the Complaint Office Training Game provides a composite description of its operational characteristics which can be used to evaluate it against the real system requirements.

A scenario is a single document which describes the environment and operational characteristics of a system. The scenario on the following page presents an over-all view of the operational characteristics of the Complaint Desk Training Game. It describes the tactical situation which the model will simulate in terms of a General Description, Operating Training Model, Model Flow, Complaint Desk Operational Flow, Types of Incidents and Callers being simulated, and Situation Scenario.

The objective of the model is to effectively train and test new personnel in Command/Control Complaint Desk functions and to upgrade the decision capabilities of existing personnel. The Complaint Officer receives calls which trigger the Command/Control System response. Once a call is received his basic function includes a series of decisions: evaluation of the validity of the complaint, classification of the complaint to determine if a response is in order and determination of the appropriate response action.

The basic training technique of "simulation training" was selected to implement the model due to its learning retention and transfer capabilities[1]. According to Dr. John D. Folley, Jr., a noted behavioral scientist, "For learning to take place, a stimulus must be presented, the subject (examinee) must respond, and feed back must be provided. The training system must, therefore, perform five critical training functions:

1 Stimulus generation - the stimulus to be presented has to be provided.
2 Stimulus presentation - to the trainee.
3 Response acceptance - the trainee needs something to respond to, with, or on.
4 Response appraisal - measurement and comparison with a standard.
5 Feedback presentation - to the trainee"[2].

In the Operational Model the "stimulus generation" is provided by the situation scenario. The "stimulus presentation" is represented by the phone call from the instructor to the examinee. The "response acceptance" function is included, as defined by the examinee's need to extract information from the caller, record the information, and respond by making the appropriate tactical decisions. Through the comparison of the examinee responses to performance standards the "response appraisal" is executed. Lastly, the "feedback presentation" criteria is provided by the postgame analysis in which the examinee is appraised of his performance by the instructor.

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1 B. R. Berstein and B. K. Gongalez, "Learning, Retention and Transfer," Technical Report NAVTRADEVCEN 68-C-0215-1, Vol. 1 (Orlando, FL: Naval Training Device Center, February, 1968), pp. 3-22.

2 John D. Folley, Jr., Ph.D., "Analyzing the Training Problem," NTDC 25th Anniversary Commemorative Technical Journal, (Orlando, FL: Naval Training Device Center), pp. 20-21.

EXAMPLE OF A TYPICAL GAME SITUATION SCENARIO

omment:
This situation takes place on a Friday evening beginning at 2244 hours during which the entire Orlando area is experiencing a thunderstorm with heavy rain and lightning.

Robbery (in progress)

ion:
7-11 Convenience Store at Princeton and Dade. District 22.

ted by:
John Smith, manager of the store.

iption of caller:
Mr. Smith speaks in a fast excited manner.

ent description:
One white man and one black man, both armed with revolvers, held Mr. Smith at gun point while removing approximately $200, in currency only, from the cash register. The black man was about 6 feet tall wearing black trousers and a light blue shirt. The white man was short, about 5 feet 6 inches, with shoulder length brown hair, wearing dirty and ragged blue jeans and a gray T-shirt. After leaving the store, the suspects entered a late model yellow sports car and headed west on Princeton. The only infomation about the car was that Mr. Smith could see it had a Florida tag beginning with a 7.

ing procedure for examinee:
Caller states that he has been robbed by two armed men.
- o Asks caller for location.
- o Askes caller if there were any injuries.
- o Turns on the emergency light to notify the Radio-Operator to pick up the receiver and listen to the caller.
- o Examinee repeats the caller for its verification and also for the benefit of the Radio-Operator) location, incident type, and district number.
- o Time stamp the 602-03.
- o Gets verification from the Radio-Operator that she has received the information.
- o Advises caller that the dispatcher is listening and to slowly give a description of the subjects and any other information requested.
- o Upon completion of verification from the Radio-Operator, request identification of caller and his phone number.
- o Complete the necessary entries on the 602-03.
- o Send 602-03 to Radio-Operator.

TYPES & DESCRIPTION OF CALLERS (COMPLAINANTS)

are many different types of complainants, but for ease of iption they will be categorized into four basic ones:

Type	Description
Hostile	These callers direct verbal abuse at the Complaint Desk Officer as he attents to extract the necessary information on the incident. Typically, the hostile caller has no respect for police, consequently he feels offended at the slightest request for information by the officer.
Mentally Ill	The mentally ill caller is usually the one who makes bogus calls to the police department. These calls range from the individual feeling persecuted for some unknown reason to being afraid for their lives from their neighbors.
Drugged or Intoxicated	This type caller constitutes a substantial percentage of the late evening and early morning callers. They are characterized by their inability to speak coherently and audibly in a sensible manner. They are very difficult to communicate with in an emergency situation.
Average	Fortunately, most callers speak clearly and intelligently while volunteering the necessary information.

though the four basic types have been defined separately, there till a large number of callers that possess characteristics of than one type.

GENERAL DESCRIPTION

The Complaint Desk Officer Training Game provides a device for effectively training and testing of new personnel in Command/Control operations and a device for upgrading the decision capability of existing personnel. The Game was developed to support and enhance the mission of the Command/Control function; which is to perform planning, situation intelligence, force status monitoring, decision making, and execution by initiation of a response to an incident in minimum time. A r .re specific objective of the Game is to train new personnel and upgrade existing personnel in the daily functions of the Complaint Desk Officer who is the nucleus of the Command/Control operations.

Calls received by the Complaint Desk Officer are the stimuli which trigger the many responses of the Command/Control system. Once a call is received by the Complaint Desk Offier, his basic tasks are:

- o To evaluate the validity of the complaint;
- o To classify the complaint as to whether it's a service or personal call, or an incident;
- o To make a decision on the appropriate response for police action.

The tactical situations encountered by Complaint Desk personnel will be simulated with a high degree of fidelity in the Game. Fidelity, which is the likeness of the real-life task, is the key to the effectivity of the Game.

OPERATING TRAINING MODEL

The training model is a system of interrelated activities which combine to result in a performance rating for the Game examinee. The operation of the Game is started by a phone call to the examinee by the instructor (simulated complainant). The examinee uses his on-the-job and classroom training to handle the situation imposed by the incident reported in the call. The examinee objective is to extract information as accurately as possible, to make decisions as correctly as possible, to be as tactful as possible, and to complete these tasks in the shortest possible time.

The general information which the examinee must obtain from the caller, and also will be tested on, includes:

- o Nature of the call, i.e., to report an accident, a robbery, or to request information;
- o Determination of whether the incident requires emergency assistance, i.e., ambulance, fire, and/or rescue units;
- o Location of the incident;
- o Name, location, and phone number of the caller;
- o Names of involved persons if known.

TYPES OF INCIDENTS SIMULATED

To maintain a high degree of realism in the training model, typical incidents will be simulated. These tactical situations will be the product of the experiences of current Complaint Desk personnel and situations based on case histories. In either case, situations will be devised and documented which will cover all common offenses within the Type I, Type II, and Type III categories and the most common emergency situations. Examples by Type which will be used are:

Type I OFFENSES	Murder Rape Robbery Aggravated Assult Burglory Larceny Auto Theft
Type II OFFENSES	Arson Stolen Property Vandalism Narcotics Drunk Disorderly Conduct Prowlers
Type III OFFENSES	Traffic Animal Bites and Control Drowning Information

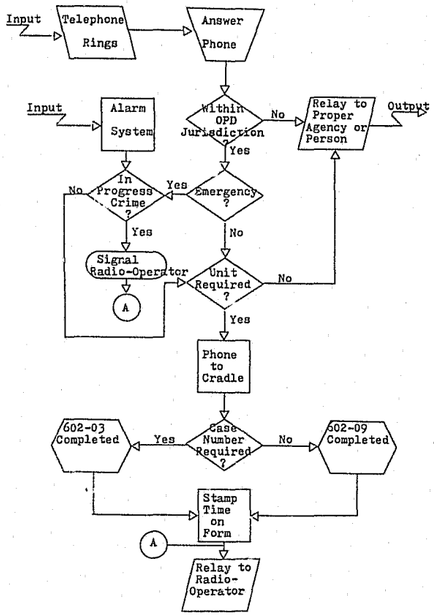
Examples of emergency and/or serious situations which will be simulated include:

Traffic accidents with injuries
Rescue
Fire
Robbery in porgress
Riot
Natural Disasters

COMPLAINT DESK

OPERATIONAL FLOW CHART

The flow chart below depicts that portion of the Complaint Desk operation which the Game is simulating to evaluate the examinee effectiveness. The diamond shaped blocks represent important decision points for the examinee.



EXAMPLE OF A TYPICAL GAME SITUATION SCENARIO

Environment:
This situation takes place on a Friday evening beginning at 2244 hours during which the entire Orlando area is experiencing a thunderstorm with heavy rain and lightning.

Type:
Robbery (in progress)

Location:
7-11 Convenience Store at Princeton and Dade. District 22.

Reported by:
John Smith, manager of the store.

Description of caller:
Mr. Smith speaks in a fast excited manner.

Incident description:
One white man and one black man, both armed with revolvers, held Mr. Smith at gun point while removing approximately $200, in currency only, from the cash register. The black man was about 6 feet tall wearing black trousers and a light blue shirt. The white man was short, about 5 feet 6 inches, with shoulder length brown hair, wearing dirty and ragged blue jeans and a gray T-shirt. After leaving the store, the suspects entered a late model yellow sports car and headed west on Princeton. The only information about the car was that Mr. Smith could see it had a Florida tag beginning with a 7.

Handling procedure for examinee:
Caller states that he has been robbed by two armed men.

- o Asks caller for location.
- o Askes caller if there were any injuries.
- o Turns on the emergency light to notify the Radio-Operator to pick up the receiver and listen to the caller.
- o Examinee repeats (to caller for his verification and also for the benefit of the Radio-Operator) location, incident type, and district number.
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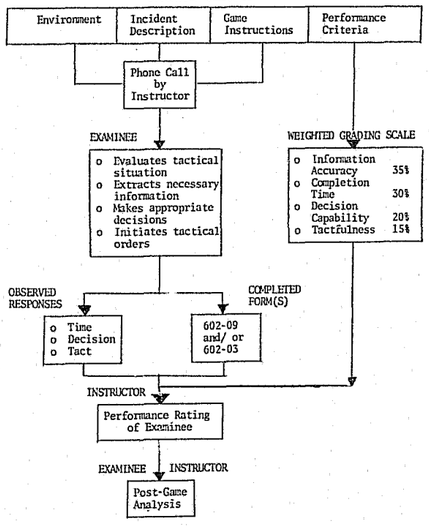
- o Send 602-03 to Radio-Operator.

OPERATIONAL MODEL OF THE TRAINING GAME



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There are many different types of complainants, but for ease of description they will be categorized into four basic ones:

Type	Description
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Average	Fortunately, most callers speak clearly and intelligently while volunteering the necessary information.

Even though the four basic types have been defined separately, there are still a large number of callers that possess characteristics of more than one type.

OPERATING MODEL

The Operating Model integrates the real world operating situation of the Complaint Desk position with a series controlled tactial scenarios which are designed to prove the examinee reaction to stress.

The training model can best be described as a system where the Complaint Desk Officer (examinee) is a transform function who acts on a given input within a selected environment to produce a desired output. This concept is illustrated in Figure 18 . The block diagram views the training model as a system and shows the sequence of interrelated activities combined to result in a performance effectiveness rating for the examinee. In this model a phone call to the examinee is the input which triggers the system into operational response. The phone call is made by the game instructor and/or his assistant(s) who are simulating a complainant in a typical situation. The complainant's phone call will be governed by the help of experienced Complaint Desk personnel. The typical situation scenario contains the following information: detailed scenario has been included in Appendix D for reference.

- o Type of incident for which the phone call is being made, i.e. robbery, auto accident, etc.;
- o Description of the caller and his characteristics, such as white female, intoxicated, voice is soft, raspy, speech is incoherent, with hostile attitude;
- o Description of the incident, in detail, which the caller has available to furnish the Complaint Officer if he is asked to do so;
- o The procedural steps involved in the solution of that situational incident which should be followed by the examinee;
- o Instructions to the examiner for administering the situation;
- o Copy of the correctly completed form(s) which the situation would require in the real-life environment. These would be used to grade the examinee form(s);
- o Evaluation procedures and evaluation sheets for grading the examinee performance on that situation.

The examiner, or instructor, would be selected by the O.P.D. Training Officer from the Command/Control personnel based on his expertise and competence. The instructor is responsible for maintaining a confidential examinee file and directing the execution of the game situation according to the instructions in the situation scenario. During the game he would be positioned at a point behind a two-way mirror in the game control room. The examinee file consists of the examinee qualification profile, a list of the previous training situations which he has taken along with the respective evaluation sheets. A chart showing the scores from previous game sessions would also be maintained to indicate the relative increase or decrease in game performance.

The instructor may be assisted by up to three personnel at any one examination session depending upon the complexity of the situations to be administered. These assistants need not be personnel experienced in Command/Control but would be selected on their ability to imitate, according to written instructions, various types of callers (complainants).

Execution of a game session will begin with the seating of the examinee in the Examination Room adjacent to the Control Room. The instructor would then provide him with a brief orientation on the equipment he will be using and the criteria on which he will be graded, such as speed, accuracy, decision making ability, and tactfulness. The instructor will not reveal any other information. The examinee will be provided with text describing the operational environment. The model Force Status Board will reflect the field situation of the time of the incident sequence. After the examinee has observed the situational information, the game will commence with a call from the insturctor. The exercise will cease when the examinee has completed all forms and actions on the sequence of calls. Upon completion of the battery of situations, the examinee will remain in the area until their evaluation has been completed. A post game analysis will then be conducted by the instructor during which the examinee will be appraised of his mistakes and their corrections, and reenforced on his efficiencies.

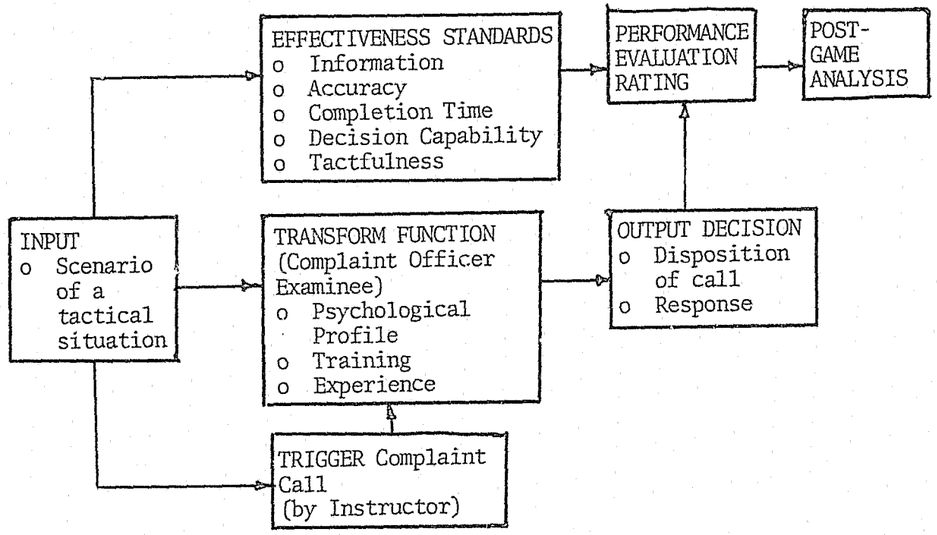

Figure 18 The Block Diagram Of The Operation Training Mode As A System Shows The Interrelated Activities Of The Participants

QUALIFICATION PROFILE FOR THE COMPLAINT OFFICER

It is important that the Training Game be designed to recognize and define motor abilities, psychological makeup and formal training of the candidate in order to adequately gauge him against the performance of a qualified Complaint Desk Officer.

The Training Game addresses not only the efficiencies of the Complaint Desk Personnel but also the techniques of training to improve deficiencies. In order to accomplish these objectives a qualification profile for the Complaint Desk Office was established. The profile consists of three separate areas - physical, formal training and psychological. On this basis both the qualification and performance of the candidates can be determined and related. For example, only on the basis of knowledge of the input as well as output of the system can the performance be evaluated correctly. It is also important in determining the training program which would be most effective in preparing a candidate for the position.

The basic motor abilities requisite for the Complaint Desk Officer include sight, hearing and writing ability, all performed in a sedentary capacity. He should have sufficient eye sight to read relatively small print (i.e., pica type) under normal office lighting. His hearing must be normal since no hearing aid is permitted. He also must be capable of writing legibly and needs only one arm since telephone headsets can be used. He must be capable of getting up and moving across the room rapidly although most of the work is in a sitting position. The long hours in a sitting position require both a physical and mental adaptation.

Through discussions with Command/Control administrative personnel and the Training Officer, it was determined that officers graduated from the academy will have had sufficient course work in preparation for the Complaint Desk function, but civilian candidates should be required to attend certain courses from the academy. These courses are outlined in Figure and described in Appendix D in more detail cover approximately 40 hours of classroom instruction.

Psychologically the profile of the Complaint Officer was determined in terms of how he would function in a general situation which included the environmental stimuli of the Complaint Desk position. Psychological profile tests were given to five proficient Complaint Desk personnel to establish a basic profile of the successful Complaint Desk Officer. Results of these tests are listed in Appendix D for reference. This individual should exhibit the characteristics of extroversion, be a realist in sizing up the situation and rely heavily on logic in making his decisions. A final asset would be the ability to accept the events as they unfold rather than trying to control the situation. This last characteristic differs from the typical uniformed officer who prefers to exert control over the events in a given situation.

In more personality oriented terms these characteristics in combination imply that the person is an adaptable realist, who good-naturedly accepts and uses the facts around him, whatever they are. He notices and remembers more than others. He knows what goes on, who wants what, who does not, and generally why, and does not fight those facts. He

posses a kind of effortless economy in the way he handles a situation.

The Extraverted Sensing person is also a perceptive type. He searches for the satisfying solution instead of defying others and imposing his own ideas, and people generally like him well enough to consider any compromise that he presents feasible. He is open-minded and generally tolerant, patient, and easygoing. He enjoys life and he does not allow himself to get emotionally "hung-up" on day-to-day problems. Therefore, he is capable of easing a tense situation and pulling conflicting factors together.

Due to this person's sensing ability, he has a capacity for handling exact fact, even when separate and unrelated, and the ability to absorb, remember and apply great numbers of them. Also, in a sensing type you find a continuous awareness, a ability to see the need of the moment and turn easily to meet it. Since he is in essence a realist, he retains more from first-hand experience than from books, is more effective on the job than on written tests.

Having a thinking characteristic implies the person has a better grasp of underlying principles, and finds it easier to master the theoretical side of things.

There are a number of ways in which an individual's psychological profile can be determined. There are written examinations available, one of which is the Meyers-Briggs Type Indicator[1] which is designed to determine an individuals preferred mode of functioning in terms of types as defined by Carl Jung[2].

TABLE 24

POLICE ACADEMY COURSE REQUIREMENTS

FOR COMPLAINT DESK PERSONNEL

- INTRODUCTION TO LAW ENFORCEMENT
- ETHICS AND PROFESSIONALIZATION
- HOW TO FIND THE LAW
- PUBLIC RELATIONS
- HUMAN RELATIONS
- POLICE AND MINORITY GROUPS
- SOCIAL AGENCY SERVICES
- DOMESTIC COMPLAINTS
- PROWLER AND DISTURBANCE CALLS
- CONSTITUTIONAL LAW
- CRIMINAL LAW

1 Isabel Briggs Meyers, Introduction to Type (Swarthmore, Penn.: I.B. Meyers, 1970).

2 Frieda Fordham, An Introduction to Jung's Psychology (London, Baltimore: Penguin Books, 1953).

PERFORMANCE EVALUATION CRITERIA

A set of performance measures which will define the Complaint Officer function are requisite to application of the training simulator so that the performance of the trainee can be measured and evaluated.

Performance measures are requisite for successful management of any system. They provide the means to measure system output so that it can be compared to set objectives and corrective action taken to ensure meeting these objectives. In the case of the Complaint Officer function this is a difficult task since it requires measurement of cognative action. These actions are typically associated with decision making capability and consequently cannot be measured directly. Indirect measures are required which will indicate the relative performance. In addition it must be recognized that each evaluation criteria selected must also be assigned a relative value which it contributes to the overall performance.

Accordingly, the general approach was to initially observe the operation and detect factors which might be measurable and provide a good indication of actual performance. This information was augmented by interview of the Complaint Officers and their supervisory personnel to determine what factors they considered were important to discharge the responsibility of the Complaint Officer function. The resulting factors were analyzed and 4 selected; these are listed in order of their relative importance in Table 25 .

The objectives of the criteria are twofold. Initially they were designed to rate the relative effectiveness of Complaint Officer personnel performance. In addition, measurement based on these criteria was designed to promote training in individual or combined evaluation criteria. In this context the trainee is provided the opportunity of practicing the exercise sets which examine the area in which he feels deficient.

Information Accuracy is an important category. If the information obtained from a complaint call is inaccurate or incomplete, the dispatched orders could result in creating a serious or emergency situation. Information extraction can become a complex process because of the physiological state of the complainant during his telephone conversation with the Complaint Desk clerk; example states are intoxication, hysteria, ethnic dialects, and speech impediments. The degree of difficulty is frequently increased by verbal abuse exhibited by the complainant. The various elements of information which must be extracted include incident discription, name of complainant, and address of incident. A more detailed description of the necessary information will be discussed later.

Form Completion Time is an important measurement of effectiveness. This is especially true since one of the primary objectives of the Command/ Control system is to minimize response time for a complaint call. Therefore it is important for the trainee to develop a sense of timeliness in his information gathering.

The Decision Capability will evaluate the trainee's ability to determine the type of call he is handling, which affects the amount of information

to be gathered, and his ability to apply the proper procedure for selecting the field unit(s) for response. There are four types of calls which the trainee must be capable of recognizing to ensure selection of the correct procedure for handling that particular type call. These are keyed to the Operational Modes defined in earlier discussion-Routine, Incident, Emergency and Internal. Upon identification of the type of call, the Complaint Officer must then make a decision on the procedure to be followed and the necessary unit assignment.

Although Tact is listed last, it is also very important. This is a subjectively evaluated criteria to measure the ability to successfully handle difficult situations presneted by the complainant.

Each of the four performance measures must also be weighted according to their relative importance in the overall function to the Complaint Desk Officer in order to derive an overall performance evaluation.

TABLE 25

LIST OF PERFORMANCE EVALUATION CRITERIA

FOR COMPLAINT OFFICER POSITION

Criteria	Description
Form Completion Time	Quantitative measure of the total elapsed time between the time of the first telephone ring and the form (602-03, 09) is completed or unit dispatch is initiated; which ever comes first.
Information Accuracy	Measure based on the number of discrepancies between the information given by the complaintant and the information given by the complainant and the information listed by the examinee.
Decision	This is a measurement of the examinee ability to determine which type of call he is handling in order to extract the necessary information and also his ability to decide on the proper field unit assignment.
Tact	Measurement of the examinee ability to tactfully handle difficult situations presented by the complainant. It will be scored by experience personnel listening to the conversation and evaluating subjectively the method by which the trainee elicts information from a hostile or confused complainant.

WEIGHTING OF PERFORMANCE CRITERIA

Weighting of the performance criteria provides the means by which the relative importance of the individual performance criteria can be expressed.

The performance of a Complaint Officer has been defined as a function of a number of criteria the sum of whose individual ratings determine the overall performance rating. This performance value function must also recognize that each individual criteria typically contributes a different amount to the total performance. Mathematically this could be expressed,

$$V_{performance} = \sum_{1}^{n} f(X_i)\, X_i$$

where V = the total performance rating
X = the individual performance criteria
$f(X_i)$ = the weighting or relative value contributed by each criteria, so that

$$\sum_{1}^{n} f(X_i) = 1.0$$

n = the number of criteria

The validity of this approach hinges on identifying all criteria contributing signficantly to the performance and defining them in such a way that they are independent. In addition some method of assigning the relative importance or weight to each must be devised.

Three methods of "weighting objectives" were examined prior to determining the appropriate weight distribution. The first technique is described by C. Wast Churchman.[1] His procedure fundamentally consists of a systematic check on relative judgments by a process of successive comparisons (the total procedure has been included in Appendix D for reference). Operationally this method involves the programmed questioning of an individual's personal weighting of the criteria involved. He is subjected to two tests, or sets of questioning. Initally the individual assigns tentative weighting quantities between 0.00 and 1.00 to the criteria. He is then presented with questions about his preferences involving combinations and/or exclusions of criteria. For example would he weight criteria A or the Combination of B, C, and D, higher. A simular comparison is then conducted using B versus C and D, etc. until all pertinent combinations have been considered. The method includes the means for revising the individuals first biased weighting assignments. The results using the Churchman method with the Complaint Officer judgments are listed in Table 26.

The second method applied to the data was a technique devised by M. Eugene Nightengale[2] (it is described in detail in Appendix D). This technique

1 C. West Churchman, Russell L. Ackoff and E. Leonard Arnoff, Introduction to Operations Research (London: John Wiley & Sons, Inc., 1957)

2 M.E. Nightengale, "An Approach to Decisions Under Uncertainty," Industrial Engineering Research,Bulletin 1 (Tempe, Arizona: Arizona State University, April, 1965) pp. 19-26.

was developed by Nightengale to aid in making decisions under uncertainty. His purpose was to remove some of the uncertainty from the decision process by utilizing the opinions of experts. The method begins by asking each "expert" to subjectively rank each criteria in order of decreasing importance. According to Nightengale, the responses are assumed to form a normal distribution. The percentage of times criteria, x_i, is ranked more likely to occur than criteria, x_j, is transformed, with the use of the normal probability distribution, into standard measurements of separation. This is then used to generate a relative importance weighting for each criteria. The results of applying Nightengale's method are also listed in Table 26.

The third methods explored were the arithmetic averaging of the relative weights assigned by experts. Table 27 shows that all three methods assign very similar weight distributions. Although all methods produce comparable results Nightengale's was selected on the basis that it was the most appropriate for this particular case. The sampled experts were shown the results and each expressed satisfaction with the final weightings. In general they felt that the values concincided with their own a priori opinion concerning the relative importance of the criteria.

TABLE 26

PERFORMANCE CRITERIA WEIGHTING VALUES,

BY METHOD OF DEVIATION

Resulting Weight Distribution	Churchman Method	Nightengale Method	Averaged Samples
Information Accuracy	.29	.35	.32
Form Completion Time	.26	.30	.25
Decision Capability	.23	.20	.22
Tact	.23	.15	.22
Total	1.01	1.00	1.01

TABLE 27

ASSIGNED WEIGHTS FOR CRITERIA BY

COMPLAINT DESK OFFICER

Assigned Weight	Expert 1	Expert 2	Expert 3	Average Samples
Information Accuracy	.30	.35	.30	.317
Form Completion Time	.20	.30	.25	.250
Decision Capability	.30	.20	.20	.217
Tact	.20	.15	.20	.217
Total	1.00	1.00	1.00	1.001

ESTABLISHING PERFORMANCE STANDARDS

Performance Standards were developed using a committee of experienced Complaint Officer personnel who represented an established degree of proficiency in order to effectively relate the evaluation criteria to the task performance in a given situation scenario.

Performance standards are an important part of any job description and subsequent testing procedure. In addition the standards must be specifically defined so that they can be measured and statistically reproduced under controlled conditions. It is not enough, for example, to state that a Complaint Officer must be an efficient data gatherer. How fast must he extract information to be efficient? What specific information is needed? Performance standards must be stated in explicit quantitative terms to effectively evaluate the level of performance of an examinee.

The maximum possible points that can be achieved on any given situation is 100. The weighting scale previously established was used to factor the points achieved to arrive at the possible points of each evaluation criteria. Table 28 shows the points assigned to each criteria on this basis and the scoring techniques to be used in grading the examinee. Each situation was devised in conjunction with a committee of proficient Complaint Desk personnel. This committee effort included design of several situation scenarios and their alternate performance standards. Performance standards may vary slightly with the degree of complexity of a game situation, but generally adhere to the guidelines discussed here.

Information Accuracy standards were established for each situation and all necessary data entries defined were determined jointly by the committee. The total number of necessay data entries plus one, for selection of the correct format, were assigned equal val e points which total 35, the possible score of the criteria. If a data entry is omitted or incorrect, the examinee receives zero points for that item.

The standards for Form Completion Time were determined by testing at least four proficient Complanint Desk personnel (excluding committee members) against a newly designed situation. The recorded times were then used to establish a standard by finding the statistical estimated population mean (μ) and standard deviation (σ). The grading scale was designed such that a recorded time of less one standard deviation above the mean time will give the examinee a maximum score of thirty points. For each additional standard deviation above the mean the examinee will be penalized ten points up to maximum of three standard deviations. This would yield a thirty point penalty, or zero points score, for the Form Completion Time criteria. Three standard deviations was considered maximum since 2% of the examinees will fall outside of this parameter.

The Decision Capability standards for each situation were established based on the necessary decisions the examinee should make in that real-life situation. These decisions are those which would affect the successful outcome of the dispatched unit, or units. Each decision was assigned weights equal to 20. The weighting to reflect the decision importance, was performed by the committee using the Nightengale method

previously referenced.

The standards for the Tactfulness criteria were established as a basic guide for the instructor to make his subjective evaluation of the examinee technique for handling adverse conditions. Complainants will be simulated which require the examinee to use tact in handling a delicate or stress situation.

The standards discussed here are described in more detail in Appendix D where they have been applied in sample situations.

TABLE 28

EVALUATION CRITERIA AND SCORING TECHNIQUES

FOR PERFORMANCE STANDARDS

Evaluation Criteria	Scoring Techniques	Possible Score
Information	Let N = number of necessary data items for a given situation, P = 1 if the correct form was used, 0 otherwise, T = total items to be scored, V = point value for each item being scored, S = examinee's score Now: $T = N + P$ $V = T/35$ $S = \sum_{i=1}^{T} V_i$	35
Form	Let established mean time = μ, standard deviation = σ, and Examinee's time = x. If: — Score: $x \leq (\mu + \sigma)$ — 30 $(\mu + \sigma) \quad x \leq (\mu + 2\sigma)$ — 20 $(\mu + 2\sigma) \quad x \leq (\mu + 3\sigma)$ — 10 $x > (\mu + 3\sigma)$ — 0	30
Decision Capability	Let E = Examinee's score, N = total number of necessary decisions, $f(x_i)$ = relative value of each decision, such that $\sum_{i=1}^{N} f(x_i) = 20$, the total possible points x = individual decision Now: $E = \sum_{i=1}^{N} f(x_i)\, x_i$	20
Tactfulness	Subjective Evaluation — Score: Excellent — 15 Good — 10 Fair — 5 Poor — 0	15
	Total Possible Score	100

The Training Model was implemented for testing in facilities and on equipment provided by the Orlando Police Department. The physical facilities and equipment requirements of the Training Area for the game were determined primarily from consideration of the functional activities of the Complaint Desk Officer and the operational environment in which the game situations must be performed; another term which is used to describe the operational environment is fidelity. The level of fidelity in simulation training is the degree of realism the training has in relation to the real-life operational task.

Application of the Command/Control Training Game Model, utilizing the selected facilities and equipment, was used to test the validity and applicability of the model. The game was given to 45% of current Complaint Desk personnel. Although the goal of testing all Complaint Desk personnel was not achieved, the results obtained were significant. One observation was that the training game can be an effective proficiency evaluator for existing Complaint Desk personnel.

Computer augmented applications of the manual Training Game were investigated. It was found that by utilizing a computer the Model could provide a more effective and flexible training tool. The computer could handle the accounting functions and control execution of the game. By further sophistication it could be used to present the Scenario and receive the examinee inputs. It was found feasible to apply existing computer equipment to the manual Training Game Model.

The Computer Augmented Training model would be a system of three entities, the Instructor, the Examinee, and the Computer interacting on a realtime basis. Implementing a CAT Model would be a stepwise process. The initial step would be to develop the necessary computer programs and logic to relate the interaction of the three entities while executing the Game Scenarios. The computer model would afford a higher fidelity, more flexible simulation and also train personnel in the future mode of mechanized Complaint Desk input using computer terminal input/output.

Through application of the model, it was observed that there is a growing need for standardized personnel selection criteria, personnel evaluation procedures, and training program to improve high employee turn-over and the overall Command/Control Center effectiveness.

PHYSICAL LAYOUT AND EQUIPMENT SELECTION FOR THE TRAINING AREA

The physical requirements of the Training Area were determined primarily from consideration of the functional activities of the Complaint Desk Officer and the operational environment in which they must be performed.

The training area for the game is located in the police wing of the Municipal Justice Building in downtown Orlando. Two adjoining rooms are used, one for the instructor and the other by the trainee. The physical layout and the equipment used in the game are shown in Figure .

The floor plan requirements for administering the training game were based on the functional requirements; privacy for the examinee, observation of the examinee by the instructor, and adequate sound proofing. Privacy for the examinee is needed to prohibit distractions and to provide him with an environment similar to the real situation. A provision for observing the examinee is necessary on order to time the information gathering phase of the situations submitted to the examinee for solution and to observe the examinee as he functions. Sound proofing is required to keep the examinee form hearing the examiner and his assistants as they control and administer the situations, and to eliminate noises from surrounding offices.

One of the basic concerns in designing training systems is the extent to which the training situation must simulate the operational task. High fidelity training, when the cost is not prohibitive, will achieve a high level of effectiveness in the learning, retention, and transfer abilities of the student[1]. The level of fidelity is the degree of realism in relation to the real-life operational task. A training system cannot provide perfect fidelity unless the operational system is itself the vehicle for training. In training by simulation, the ability of the student to transfer what he has learned to the operational task is dependent upon the fidelity of the simulation. According to Osgood's (1949) model[2], transfer of learning is directly dependent on the degree of fidelity.

The equipment needed for performing all aspects of the game was selected on the basis of its simulation fidelity and the ease with which it could be installed and revised. This latter requirement was necessary to permit the rooms to be used as a conference and interview room by the Youth Section of the C.I.B. Also, the equipment must be capable of ease of storage and/or use in other facilities if necessary.

The selected equipment for the control and observation room as shown in Figure 19 consists of three single line telephones, power supply for the room-to-room phone system, and a clip board with stop watch. Three phones are needed to subject the examinee to three calls simulaneously, which is the average maximum number he will face at any single moment as a Complaint Officer.

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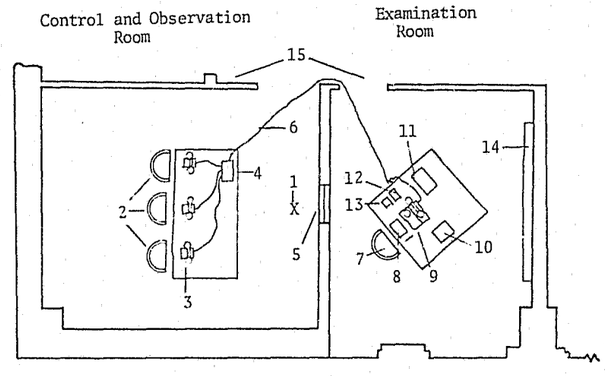
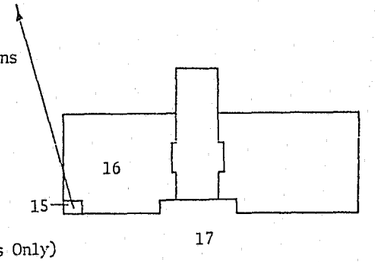
1 B. R. Bernstein and B. K. Gongalez, "Learning, Retention and Transfer," Technical Report NAVTRADEVCEN 68-C-0215-1, Vol I (Orlando, Fla.: Naval Training Device Center, February, 1968), pp. 19-20.

2 C. E. Osgood, "The Simularity Paradox in Human Learning: A Resolution," Psychological Review, (1949), pp. 132-143.

The examination room equipment consists of a large detailed street map (4' x 6'), telephone with three lines to the control room, map book, shift duty rooster (for the simulated shift being administered), forms 602-09 and 602-03, and scratch paper and pen or percil. The large wall map is divided into police districts to duplicate the wall map used in the Command/Control Center. The map book is provided to locate specific areas on the large map for a more detailed inspection. The remaining materials are those utilized by the Complaint Officer in his daily activities.





1 Game Examiner's Position
2 Examiner's Assistants' Positions
3 3-one Line Telephones
4 Power Supply For Phone System
5 2-way Mirror
6 Phone Cable
7 Examinee's Position
8 Scratch Paper & Pen
9 6-button Phone (3 Active Lines Only)
10 Map Book Of Orlando
11 Duty Roster Of Field Units Assignment
12 602-03 Forms
13 602-09 Forms
14 Large Scale Map Of Orlando
15 Training Rooms Location In Relation To The Police Wing of Municipal Justice Building
16 Police Wing
17 Municipal Justice Building Of Orlando

Figure 19 Shown Above Is The Physical Layout And The Equipment Used In The Command/Control Complaint Officer Training Game

APPLICATION OF THE MODEL

Application of the Command/Control training model, utilizing the selected facilities and equipment, was performed to test the validity and applicability of the game.

Initial plans for testing the training game model involved subjecting all Complaint Desk personnel (officer and civilian) to the three situations in Appendix E . At the time the testing phase of the research began there were eleven personnel, covering three work shifts, assigned to the Complaint Desk but only five were subjected to the game. The reasons for the small sample were: two were involved with devising the situation, one was on vacation, one was in the hospital, and two were on the First Shift, 11:30 p.m. to 7:30 a.m., when the assistants to the instructor were unavailable. Eventhough all Complaint Desk personnel were not evaluated by the game, the results obtained from the five examinees were of significant importance.

The resulting scores from subjecting the five examinees to the game are listed in Table 29 . Their individual situation evaluation sheets are included for reference in Appendix E . The first significant finding after applying the game model was that the ordering, or ranking, of examinees with respect to their operational proficiencies, determined by the game, was almost identical to the ordering of the examinees by personal evaluation from the Supervisor of the Command/Control Center. A comparison of the two orderings, game rated and subjectively rated, are made in Table 30 . In making the subjective rating the Supervisor did not have prior knowledge of each examinee's average score before being asked to render the subjective evaluation of each in the order of their proficiency.

Additional significant results from application of the game were discovered by an analysis of the scores of each examinee. The analysis revealed that certain items in the game caused point deductions for the majority, and in some cases all, of the examinees. These common problem areas included: 1) three out of five, or sixty percent of the sample, failed to enter their initials on the form #602-09 in Situation 1; two of the three indicated that they are not required to initial that particular form and the third examinee stated that verbal directives are "no initials required" on the 602-09 but that he had forgotten trying to work too fast in the game. 2) All five examinees, one-hundred percent of the sample, failed to detect that Situation 3 should be classified as an In-Progress robbery even though the complainant told each examinee that the robbers had just left the store and were presently fleeing; according to the Command/Control Supervisor there is no documented definition of an In-Progress crime, instead a verbal one is given in the Police Academy's courses. The examinees stated in the Post-Game Analysis this situation could possible by classified as one. 3) All five examinees failed to question the complainant on any possible injuries or shots fired resulting from the armed robbery.

From these results of applying the training game in the testing phase of the research, there are significant conclusions which can be drawn. These conclusions, along with recommendations, are discussed in a later section.

TABLE 29

SCORES FROM THE INITIAL APPLICATION

OF THE TRAINING GAME

		1	2	3	Examinee Average	
Examinee	1	95	97.5	90.8	94.4	
	2	95	87.0	72.8	84.9	
	3	95	100	95.6	96.9	
	4	95	89.5	78.4	87.6	
	5	65	90	75.6	76.9	
Situation Average		89	94.6	82.6	88.1	Average Of All Examinees

TABLE 30

SUBJECTIVE PROFICIENCY RATINGS

VS

TRAINING GAME RATINGS

		Ratings	
		Game	Subjective
Rating Order	1	#3*	#1, #3 equal
	2	#1	
	3	#4	#4
	4	#2	#2
	5	#5	#5

* By Examinee Number

COMPUTER AUGMENTED APPLICATIONS

The normal training game can become a more effective and flexible training tool by introducing a computer to handle the accounting functions and drive the force status display.

There are numerous training devices in use today that utilize computers. These include training in tasks related to the operation of aircraft, spacecraft, air traffic control and others where it is important to dynamically control all aspects of a complex operation in a real time simulation. Computer Assisted Training (CAT) techniques and computer equipment can be applied to the Complaint Desk Officer Training Model.

The computer augmented version is directed toward the use of the instructional techniques of the manual game model under computer control to further meet the increasing training demands imposed by the dynamic nature of law enforcement and the growing need for more qualified personnel in Command/Control. The goals of the computerized version are summarized in Table 31.

The computer will increase standardization of grading the examinee performance. Timing of the examinee Information extraction and Decision Response phases can be recorded more accurately through programming the computer's internal clock for this purpose. This would eliminate the stopwatch timing technique required in the mannual version. There are measurement criteria which still must be made subjectively by the instructor, but his evaluations will still be required when the final performance ratings are determined. This instructor must also review the results with the examinee because in typewritten and personnel evaluation which the computer cannot provide are needed.

Although CAT systems today are used primarily in military training applications, technological advancements have reduced computer costs such that commercial applications are becoming more numerous. One such system is the Computer Assisted Training Project[1] of the Los Angeles Police Department. This system is being designed for the LAPD to train and evaluate recruits in their police academy. The system will provide individualized programmed learning, situation simulation, trainee examination and evaluation and trainee record management. Simulation training provides a method to train effectively, safely and at less cost when compared to on the job training.

Training effectiveness is increased because the computer can accomplish more, with greater accuracy, in a fraction of the time it would take a human. The computer would not, though, take away the importance of the instructor's role in administering game situations, instead it

1 Los Angeles Police Department, Los Angeles Police Department and Computers (Los Angeles, California: Advanced Systems Development Section, Advance Planning Division. 1972), pp. 20-23

would increase his effectiveness by allowing him more personalized instruction time with the trainee. It is important to note that in all cases the computer acts as an assistant to the instructor and does not take over his responsibility.

CAT also offers increased flexibility. If changes in the basic training game model becomes necessary, the computer system software can be easily altered to accommodate the change. Flexibility is also enhanced by the ability of the computer to maintain on-line records of examinees past performances. Therefore the computer system can be both a training and information retrieval system.

Reliability in computer systems over manual systems is superior. It is true that in the recent past highly complex electronic equipment has significant failure rates, but through technological achievements, such as solid logic technology, failure rates have become insignificant when compared to production abilities.

In conclusion, the case for CAT applications has been appropriately stated in a Naval Training and Device Center publication "Automated training techniques can be applied in any training situation that requires objective performance measurement , flexibility of criteria for evaluation, and the capability to apply new techniques to an existing system."[2]

TABLE 31

GOALS OF COMPUTER AUGMENTED VERSION OF

COMPLAINT OFFICE TRAINING MODEL

- MAKE A GOOD TRAINING MODEL EVEN MORE EFFECTIVE
- PROVIDE FLEXIBILITY TO SENSE AND TO RAPIDLY RESPOND TO CHANGING REQUIREMENTS
- MAINTAIN STANDARDIZATION OF EVALUATION AND EXAMINEE RECORDS
- ELIMINATE AS MUCH OF THE MANUAL PARTS OF THE ORIGINAL MODEL AS POSSIBLE

2 D. E. Trundle, "Computer-Assisted Instruction", Technical Report NAVTRADEVCEN IH-206, (Orlando, Florida: Naval Training Device Center) February 1972, p. 186.

COMPUTER AUGMENTED TRAINING MODEL LOGIC

The Computer Augmented Training Model requires computer program logic which will implement a step-by-step control of the game and integrate the input/output interface of the Instructor, Examinee, and Computers.

The Computer Augmented Training Model can be viewed as a system of three distinct entities: Instructor, Examinee, and Computer, interacting on a realtime basis. Figure 20 shows the game logic flow occuring between these three entities under computer program control. Interaction between the instructor and the computer, and between the examinee and the computer will be through keyboard data terminals, or teletypewriters, over communication lines to the computer. Interaction between the instructor and examinee will be via telephone.

The interaction between the examinee and the computer via the teletypewriter is a high fidelity simulation of a proposed future mode of Complaint Desk input. Under the computerized (proposed) Command/Control input mode of incident receipt and processing, all incoming incident reports will be received by the Complaint Officer and keyed on the teletypewriter for computer input. The incident data will then be processed and translated for display on a Tactical Force Status Board and simultaneously printed out on the teletypewriter at the dispatcher's console. Further refinement of the proposed automated Command/Control System will be automatic digital assignment of units utilizing computer control.

The computerized game logic flow begins with the manual selection, by the instructor, of a situation from a prepared list of situations stored in the computer's on-line files. The instructor's selection will be based on whether the examinee is receiving procedural incident training or performance evaluation. In either case, the instructor makes his selection and then procedes to key-in on his teletypewriter the appropriate instructions to select and begin execution of the situation. These instructions are immediately transmitted via communication lines to the computer. At this point the computer takes control and begins execution of the game.

Upon receipt of the situation selection instructions the computer, under program control, will retrieve from its on-line files the situation scenario data. The situation environment portion of the scenario is automatically transmitted to the examinee's terminal, and the incident and caller description portions to the instructor's terminal. Now the computer places itself in a "wait-state" until a "start" command is issued by the instructor to the computer for starting the computer's timing process signifying that the examinee is receiving the incident data. From this step in the logic flow the computer will evaluate the examinee's information accuracy, information extraction time, and decision capability automatically in a realtime manner as the examinee is carrying out the handling procedure for that particular situation. The computer's evaluation is based on the Performance Standards for that situation which is a part of the scenario stored on-line. Through the Tactfulness grade input by the instructor and computer's quantitative scoring, performance evaluation of the examinee is completed by the computer and transmitted to the instructor for the Post-Game Analysis part of the game.

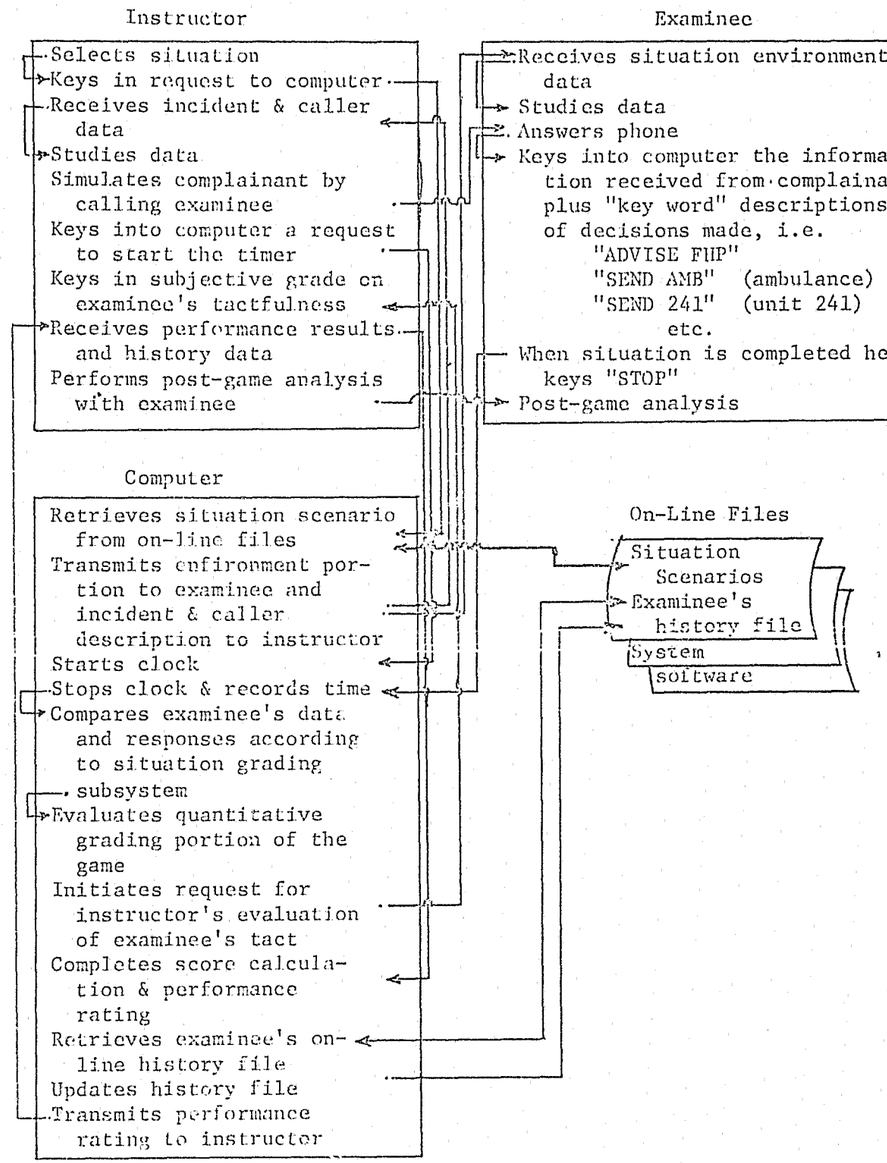


Figure 20 The Figure Above Shows the Logic Flow of the Computer Augmented Game Model

OBSERVATIONS, CONCLUSIONS, AND RECOMMENDATIONS

Observations made during the Training Model research indicate a definite need for standardized personnel selection criteria, improved personnel evaluation procedures, and a training program to improve employee turn-over and the overall Command/Control Center effectiveness.

The current training technique of new Complaint Desk personnel, both civilian and officer, involves on-the-job training without defined procedures. On-the-job (O-J-T) training can be an effective method if it is supported by classroom instruction. A major drawback with O-J-T in the Command/Control Center is that it requires the proficient personnel to devote a portion of their time and attention away from their job which tends to decrease the overall efficiency and effectiveness of the Center.

The selection of civilian personnel is made under recommendations of the Command/Control Supervisor and the officer in command of the Records and Communication Section on the basis of personal interview and background investigation. Selection of uniformed officers for the Complaint Desk is based on assignment by the Uniformed Bureau for a tour of duty of six months. According to the leading uniformed officer in the Command/Control Center the average length of time for an officer to become proficient at the Complaint Desk function is three months, civilians four to six months. The difference can be attributed to the officer's academy training and field experience. A search of civilian personnel records covering the previous two-year period (August 1970 to August 1972) revealed that 1) within Command/Control Center the average term of employment for a civilian at the Complaint Desk was 3.7 months; 2) the overall average term for civilians with the Center (Complaint Desk, Teletype, and Radio) was 6.6 months; 3) of the twenty civilians hired in the past two years in the Center, only eight remain which means that sixty percent of the total hired have terminated. This data is included for reference in Appendix E The implications of the above facts are that every 6.6 months a civilian terminates his employment and another must be hired and retrained, and also that, with an average of four to six months to become proficient, a civilian hired in the last two years has not, on the average, become proficient because he was only employed for an average of 3.7 months.

Additional analysis of the employment histroy data revealed that twenty-five percent of all civilians hired in the past two years have been asked to resign for various reasons. This, plus the previous findings, imply that the current employee selection and training techniques are inadequate and must be improved in order to correct the employee turn-over problem.

A final but major observation was that there is an evident lack of documented operating procedures for the Complaint Officer in handling the various incident types. This conclusion is based on an analysis of examinees during the testing phase of the training game. The indicators pointing to this problem were outlined in the section APPLICATION OF THE MODEL where it was shown that most items missed in the game were due to procedural inconsistencies. A subsequent investigation revealed there is only one documented incident handling procedure for Complaint Officers, OPD Memorandum #72-1 dated June 29, 1972. This procedure covers the handling of Emergency Complaints (10 - 33 Traffic). All other handling procedures are verbally directed by the administrative personnel.

There are certain recommendations to be made herein which are requisite corrective actions to ensure a more efficient and effective Command/Control operation. Firstly, it is recommended that standardization and documentation of incident types and their classification, and of Complaint Desk Operating procedures. Through standardizing and documenting these items, the training game will provide a more valid testing mechanism since there will be referenced procedures for the trainee to follow in handling incidents against which he can be tested.

It is recommended that the Qualification Profile, outlined in an earlier section, be utilized in selecting civilians and officers for the Complaint Desk. After selecting a prospective candidate for the job, he (she) should be screened by subjection to a set of situations, (not necessarily procedural problems) through use of the training game, which would be designed to test the individual's ability to handle pressure situations. Thorough selection and screening should reduce the twenty-five percent figure of those being asked to resign because they cannot handle the job. Also, this would provide for selection of better qualified uniformed officers.

The next recommendation is to adopt proficiency levels which should be attained by Complaint Desk personnel. The current method of subjective proficiency ratings by the Supervisor along with the game ratings will provide a better personnel performance evaluation. For this reason it is necessary to define the various proficiency levels to map the progress of training for each trainee.

A major recommendation is selection and assignment of a Command/Control Training Committee to include the Supervisor and a highly proficient uniformed Complaint Desk Officer. These individuals, along with anyone they may designate, should be assigned the duties of continued utilization of the game model by devising necessary game situations for new personnel selection, present personnel training and proficiency evaluation, and academy training programs.

Lastly, it is recommended that continued research be conducted to expand the training game model to meet the dynamic needs of any other OPD training requirements. The basic techniques utilized by the game model could be applied to various phases of cadet training.

One must be careful not to conclude that the sample size in testing the game yielded conclusive results. However, significant evidence has been provided by the game results to indicate that there is a need for effective selection, training, and evaluation programs for Complaint Desk personnel. The training game that was designed and tested herein may well be the answer.

APPENDIX A

OFFENSES REPORTED IN PART I, II, III CATEGORIES

BY ORLANDO POLICE DEPARTMENT

PART I OFFENSES

- Murder
- Non Negligent Manslaughter
- Rape
- Robbery
- Agravated Assault
- Burglary
- Larceny
- Auto Theft

PART II OFFENSES

- Larceny After Trust
- Other Assaults
- Arson
- Forgery & Counterfeiting (Including Bad Checks)
- Fraud
- Embezzlement
- Stolen Property
- Vandalism
- Weapons
- Prostitution
- Sex Offense
- Indecent Exposure
- Homosexual
- Narcotics
- Gambling
- Offense Against Family
- D.W.I.
- Liquor Laws
- Drunk
- Disorderly Conduct
- Vagrancy
- Other Offenses
- Incorrigible
- Cont. to Del. of Minor
- Phone Calls
- Prowlers
- Obscene Literature
- Wanted - Local
- Suspicion

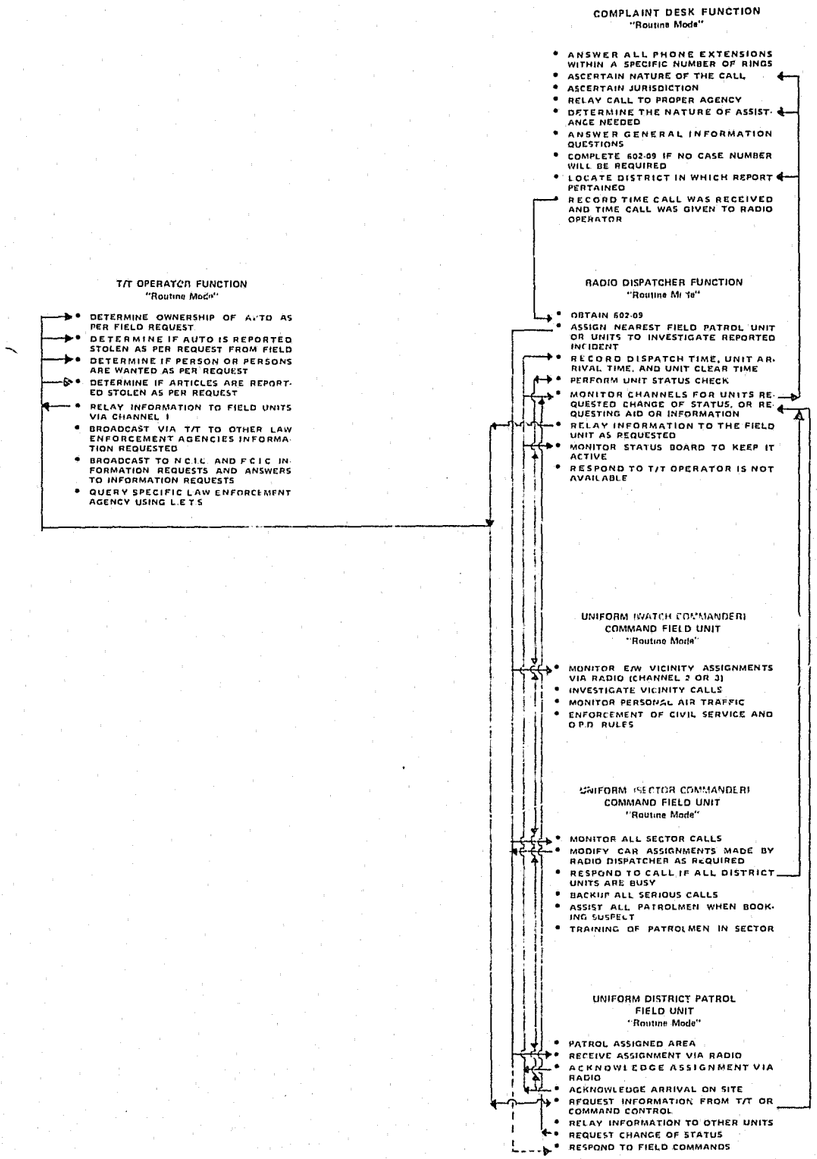
PART III OFFENSES

- Truant
- Curfew & Loitering
- Missing Persons
- Runaways
- Attempt to Locate
- Wanted - Other
- Abandoned Vehicles

- Traffic - Other
- Lost
- Found
- Lost or Stolen
- Animal Bites
- C.R.I.D.
- Drowning
- Mental
- Miscellaneous
- Information
- Stolen Elswhere - Rec. OPD
- Larceny After Trust
- Abandoned Bicycles

APPENDIX B

FUNCTIONAL BLOCK FLOW CHART
ROUTINE MODE



FUNCTIONAL BLOCK FLOW CHART
INCIDENT MODE

T/T OPERATOR FUNCTION
"Incident Mode"

- DETERMINE OWNERSHIP OF AUTO AS PER FIELD REQUEST
- DETERMINE IF AUTO IS REPORTED STOLEN AS PER REQUEST FROM FIELD
- DETERMINE IF PERSON OR PERSONS ARE WANTED AS PER REQUEST
- DETERMINE IF ARTICLES ARE REPORTED STOLEN AS PER REQUEST
- RELAY INFORMATION OT FIELD UNITS VIA CHANNEL 1
- RECORD "MESSAGE" FROM T/T OR PHONE
- SEND "MESSAGE" TO COMPLAINT DESK
- BROADCAST VIA T/T TO OTHER LAW ENFORCEMENT AGENCIES INFORMATION
- BROADCAST TO N.C.I.C. AND F.C.I.C. INFORMATION REQUESTS AND ANSWERS TO INFORMATION REQUESTS

COMPLAINT DESK FUNCTION
"Incident Mode"

- MONITOR AND ANSWER ALL PHONE EXTENSIONS WITHIN A SPECIFIC NUMBER OF RINGS
- ASCERTAIN NATURE OF CALL
- ASCERTAIN JURISDICTION
- DETERMINE THE NATURE OF ASSISTANCE REQUIRED
- COMPLETE 602-03
- LOCATE DISTRICT IN WHICH REPORT PERTAINED
- RECORD TIME RECEIVED AND TIME GIVEN TO RADIO OPERATOR
- COMPLETE 602-03 FOR FIELD REQUEST
- CONTACT RESPONSIBLE PERSONS OF BURGLAR ALARMS OR REPORTED B&E'S AT THEIR PLACE OF BUSINESS
- NOTIFY LAW ENFORCEMENT AGENCIES OF SERIOUS CRIMES
- COMPLETE "LOCAL LOOK OUT" FORM FROM T/T OR PHONE INFORMATION
- SIGN T/T "MESSAGE" FORMS FOR BROADCAST
- CONTACT LOCAL NEWS MEDIA OF INFORMATION FOR BROADCAST TO PUBLIC TO ASSIST POLICE

RADIO DISPTACHER FUNCTION
"Incident Mode"

- OBTAIN 602-03
- ASSIGN NEAREST FIELD PATROL UNIT OR UNITS TO INVESTIGATE REPORTED INCIDENT
- RECORD DISPATCH TIME, UNIT ARRIVAL TIME, AND UNIT CLEAR TIME
- PERFORM UNIT STATUS CHECK
- MONITOR CHANNELS FOR UNITS REQUESTED
- CHANGE OF STATUS, OR REQUESTING AID OR INFORMATION
- RELAY INFORMATION TO THE FIELD UNIT AS REQUESTED
- MONITOR STATUS BOARD TO KEEP IT ACTIVE
- COMPLETE 602-03 PER UNIT REQUEST FROM FIELD FROM CASE NUMBER
- MONITOR "INTERCITY" RADIO FREQUENCY AND COMPLETE "LOCAL LOOK OUT" FORM
- BROADCAST INFORMATION FROM "LOCAL LOOK OUT"
- SEND "LOCAL LOOK OUT" FORM TO COMPLAINT DESK
- BROADCAST INFORMATION FROM "MESSAGES" TO ALL CHANNELS FOR ALL UNITS
- RELAY BY PHONE IF FIELD UNIT REQUESTS SPECIAL UNITS (NON O.P.D.)

UNIFORM (WATCH COMMANDER) COMMAND FIELD UNIT
"Incident Mode"

- MONITOR E/W VICINITY ASSIGNMENTS VIA RADIO (CHANNEL 2 OR 3)
- INVESTIGATE VICINITY CALLS
- INSTRUCT FIELD UNIT THROUGH SGT. FRO MORE/LESS UNITS
- SUPERVISE SPECIAL CASES I.E. UNNATURAL AND/OR TYPE 1 INCIDENTS AGAIN THROUGH THE SGT.
- ASSIST IN SPECIAL PROBLEMS IN BOOKING SUSPECTS

UNIFORM (SECTOR COMMANDER) COMMAND FIELD UNIT
"Incident Mode"

- MONITOR ALL SECTOR CALLS
- MODIFY CAR ASSIGNMENTS MADE BY RADIO DISPATCHER AS REQUIRED
- BACKUP ALL SERIOUS CALLS
- NOTIFY WATCH COMMANDER OF ANY UNUSUAL PROBLEMS AND/OR CALLS IN HIS SECTOR
- TRAINING OF PATROLMEN IN SECTOR

UNIFORM DISTRICT PATROL FIELD UNIT
"Incident Mode"

- PATROL ASSIGNED AREA
- OBSERVE INCIDENT ON PATROL
- NOTIFY COMMAND CONTROL OF INCIDENT
- REQUEST CHANGE OF STATUS
- RECEIVE ASSIGNMENT VIA RADIO AND/OR INFORMATION
- ACKNOWLEDGE ASSIGNMENT VIA RADIO
- ACKNOWLEDGE ARRIVAL ON SITE
- REQUEST INFORMATION FROM T/T OR COMMAND CONTROL
- RELAY INFORMATION TO OTHER UNITS
- RESPOND TO FIELD COMMANDS
- BOOK SUSPECTS
- REQUEST SPECIAL UNITS (NON O.P.D.)
- RECEIVE INFORMATION FROM T/T

FUNCTIONAL BLOCK FLOW CHART
EMERGENCY MODE

COMPLAINT DESK FUNCTION
"Emergency Mode"

- MONITOR AND ANSWER ALL PHONE EXTENSIONS WITHIN A SPECIFIC NUMBER OF RINGS
- ASCERTAIN NATURE OF CALL
- INDICATE EMERGENCY BY TURNING ON RED LIGHT AT DISPATCHER CONSOLE
- COMPLETE 602-03
- LOCATE DISTRICT IN WHICH REPORT PERTAINED
- RECORD TIME
- NOTIFY WATCH COMMANDER OF ENERGENCY AND/OR INJURED O.P.D. PERSONNEL
- RELAY REQUESTS FOR SPECIAL UNITS
- COORDINATE DISPERSION OF INFORMATION TO FIELD UNIT, FROM OTHER O.P.D. DEPARTMENTS AND/OR OTHER AGENCIES
- ANSWER QUESTIONS REGARDING INJURED O.P.D. PERSONNEL
- CONTACT LOCAL NEWS MEDIA OF INFORMATION FOR BROADCAST TO PUBLIC TO ASSIST POLICE

RADIO DISPATCHER FUNCTION
"Emergency Mode"

- RESPOND TO EMERGENCY LIGHT BY LISTENING ON PHONE FOR IMMEDIATE UNIT DISPATCH
- ASSIGN NEAREST FIELD PATROL UNIT OR UNIT, TO INVESTIGATE REPORTED INCIDENT
- OBTAIN 602-03
- RECORD DISPATCH TIME, UNIT ARRIVAL TIME, AND UNIT CLEAR TIME
- PERFORM UNIT STATUS CHECK
- MONITOR CHANNELS FOR UNITS REQUESTED CHANGE OF STATUS, OR REQUESTING AID OR INFORMATION
- RELAY INFORMATION TO THE FIELD UNIT AS REQUESTED
- MONITOR STATUS BOARD TO KEEP IT ACTIVE
- RELAY BY PHONE IF FIELD UNIT REQUESTS SPECIAL UNITS (NON O.P.D.)
- INFORM COMPLAINT DESK OF O.P.D. PERSONNEL INJURED

UNIFORM (WATCH COMMANDER) COMMAND FIELD UNIT
"Emergency Mode"

- MONITOR E/W VICINITY ASSIGNMENTS VIA RADIO (CHANNEL 2 OR 3)
- INVESTIGATE VICINITY CALLS
- INSTRUCT FIELD UNIT FOR MORE/LESS UNITS
- SUPERVISE SPECIAL CASES I.E. UNNATURAL AND/OR TYPE 1 AGAIN THROUGH THE SECTOR COMMANDER
- ASSIST IN SPECIAL PROBLEMS IN BOOKING SUSPECTS

UNIFORM (SECTOR COMMANDER) COMMAND FIELD UNIT
"Emergency Mode"

- MONITOR ALL SECTOR CALLS
- MODIFY CAR ASSIGNMENTS MADE BY RADIO DISPATCHER AS REQUIRED
- BACKUP ALL SERIOUS CALLS
- NOTIFY WATCH COMMANDER OF ANY UNUSUAL PROBLEMS AND/OR CALLS IN HIS SECTOR

UNIFORM DISTRICT PATROL FIELD UNIT
"Emergency Mode"

- PATROL ASSIGNED AREA
- OBSERVE INCIDENT ON PATROL
- NOTIFY COMMAND CONTROL OF INCIDENT
- REQUEST CHANGE OF STATUS
- RECEIVE ASSIGNMENT VIA RADIO
- ACKNOWLEDGE ASSIGNMENT VIA RADIO
- ACKNOWLEDGE ARRIVAL VIA RADIO
- REQUEST ADDITIONAL UNITS AND/OR SPECIAL UNITS (NON O.P.D.)
- RELAY INFORMATION TO UNITS
- RESPOND FIELD COMMANDS
- BOOK SUSPECTS

FUNCTIONAL BLOCK FLOW CHART
INTERNAL MODE

.COMPLAINT DESK FUNCTION
"Internal Mode"

- MONITOR CIVIL DEFENSE NETWORK PHONE
- BLOW NOON CIVIL DEFENSE WHISTLE ON EVERY MONDAY
- RELEIVE RADIO AND/OR T/T OPERATOR WHEN NECESSARY
- COLLIATE AND FILE 602-03 AND 602-09

RADIO DISPATCHER FUNCTION
"Internal Mode"

- RECORD ACTION TAKEN AND TIME ON BACK OF 602-03 OR 602-09
- ASK FOR FORM 602-03 FROM COMPLAINT DESK
- OBTAIN 602-03.

UNIFORM
COMMAND FIELD UNIT
"Internal Mode"

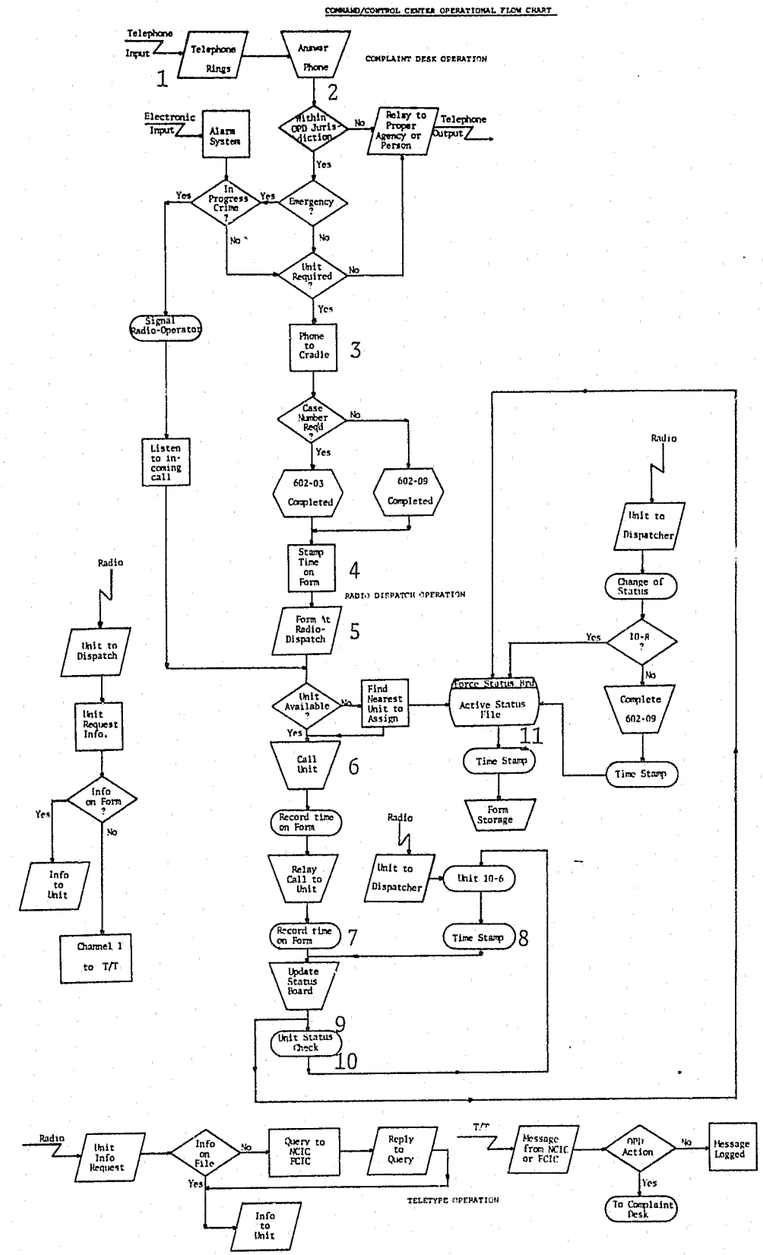
- REVIEW AND RECOMMEND DISCIPLINARY ACTION
- REVIEW MANPOWER DISTRIBUTION WITH THE SGTS.
- REVIEW CRIME STATISTICS BY TYPE AND LOCATION WITH SGTS.
- LISTEN TO PERSONAL PROBLEMS OF MEN THAT THE SGTS. COULD NOT HANDLE
- ENFORCEMENT OF CIVIL SERVICE AND O.P.D. RULES
- REVIEW VACATION SCHEDULE

UNIFORM (SECTOR COMMANDER)
COMMAND FIELD UNIT
"Internal Mode"

- INVESTIGATE MISCONDUCT AND REPORT TO COMMANDER VIA WRITTEN REPORT
- REVIEW CRIME STATISTICS AND MANPOWER DISTRIBUTION WITH LT.
- PREPARE VACATION SCHEDULE
- LISTEN TO PERSONAL PROBLEMS OF THE MEN
- CONDUCT 15 MINUTE A.M. INSPECTION

UNIFORM DISTRICT PATROL
FIELD UNIT
"Internal Mode"

- TESTIFY AS REQUIRED
- ATTEND WATCH MEETING
- OBSERVE ALL CIVIL SERVICE AND O.P.D. RULES AND REGULATIONS
- SEEK ADVICE ON PERSONAL PROBLEMS FROM SUPERVISORS



FORM 602-09.

ORLANDO, FLA.

01 ☐ STOPPING VEH.	16 ☐ GARAGE	UNIT NO.	OFFICER NO.	DIST.	DISPATCHER
02 ☐ STOPPING PERSON	17 ☐ FLAT TIRE				
03 ☐ HOUSE CHECK 61	18 ☐ VEH BROKE DOWN	YEAR	STATE	TAG NUMBER	
04 ☒ BUSINESS CHECK	19 ☐ RADIO REPAIR				
05 ☐ SERVING WRMT.	20 ☐ CITY COURT	10-6	10-8		
06 ☐ SERVING SUBP	21 ☐ CRIM COURT				
07 ☐ FOLLOW UP INV.	22 ☐ J P COURT				
08 ☐ STATION ASGMT	23 ☐ JUV. COURT				
09 ☐ REPORT WRITING	24 ☐ SOL. OFFICE	REMARKS			
10 ☐ TRANSP. PRISONER	25 ☐ ESCORT				
11 ☒ BOOKING PRISONER	26 ☐ LV. CITY LIMITS				
12 ☐ COFFEE BREAK	27 ☐ OTHER				
13 ☐ MEALS	28 ☐ CHECK VEH. REG				
14 ☐ PERS. NECESSITY	29 ☐ CHECK FOR WANT				
15 ☐ MEETING UNIT	30 ☐ 10-7				

602-09 STATUS CARD

LEWIS 52490 OPD

FORM 602-03

ORLANDO, FLORIDA

☐ABANDON AUTO	☐JUVENILE CASE			
☐ACCIDENT AUTO	☐LARCENY		OFFICER	CASE NUMBER 79529 A
☐ALARM	☐MENTAL CASE			
☐AMBULANCE REQ.	☐MISSING PERSON	TYPE OF COMPLAINT		
☐ANIMAL CALL	☐OPEN DOOR-WINDOW	☐EMERGENCY	☐NON EMERGENCY	☐IN PROGRESS
☐ASSAULT	☐PROPERTY CASE	☐SEMI-EMERGENCY	☐SERVICE	☐ATTEMPT
TYPE WEAPON		TIME	TIME	
		10-6	10-8	
☐BAD CHECK	☐PROWLER	LOCATION OF EVENT		DISTRICT
☐BREAK & ENTER	☐ROBBERY			
☐DEATH REPORT	☐SEE COMPL	DATE OF EVENT	TIME OF EVENT	RECEIVED BY
☐DISORDERLY	☐SERVICE			
☐DRUNK	☐SEX OFFENSE	REPORTED BY		PHONE NO
☐ESCORT	☐STOLEN AUTO			
☐FAMILY TRBL	☐SUSPICIOUS	ADDRESS		
☐FIGHT	☐TOW IN			
☐FIRE ALARM	☐TRAFFIC			
☐FIREARM VIO	☐VANDALISM		☐TELEPHONE ☐PERSON MAIL	
☐HOUSE CHECK	☐WARRANT		☐TELETYPE ☐RADIO ☐OTHER	
☐OTHER				

602-03 COMPLAINT IN-871333 OPD

Figure 22 The 602-09 (Top) And The 602-03 (Bottom) Completed By The Complaint Desk And Radio-Dispatch Personnel.

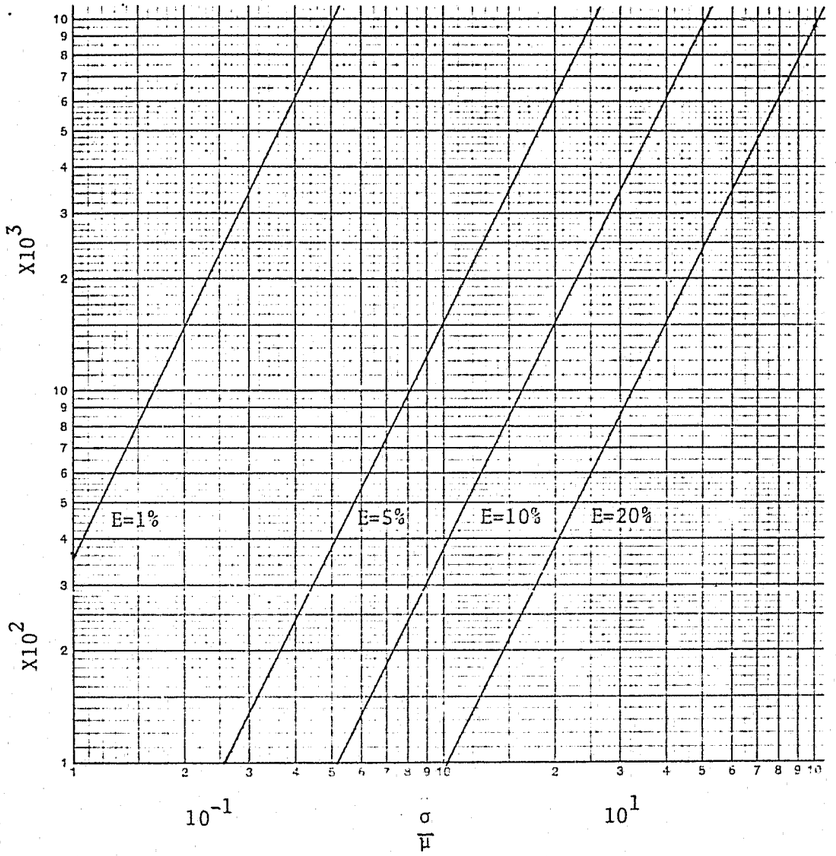


FIGURE 23 90% Confidence Level of Sample Size for Population Ratios $\frac{\sigma}{\mu}$

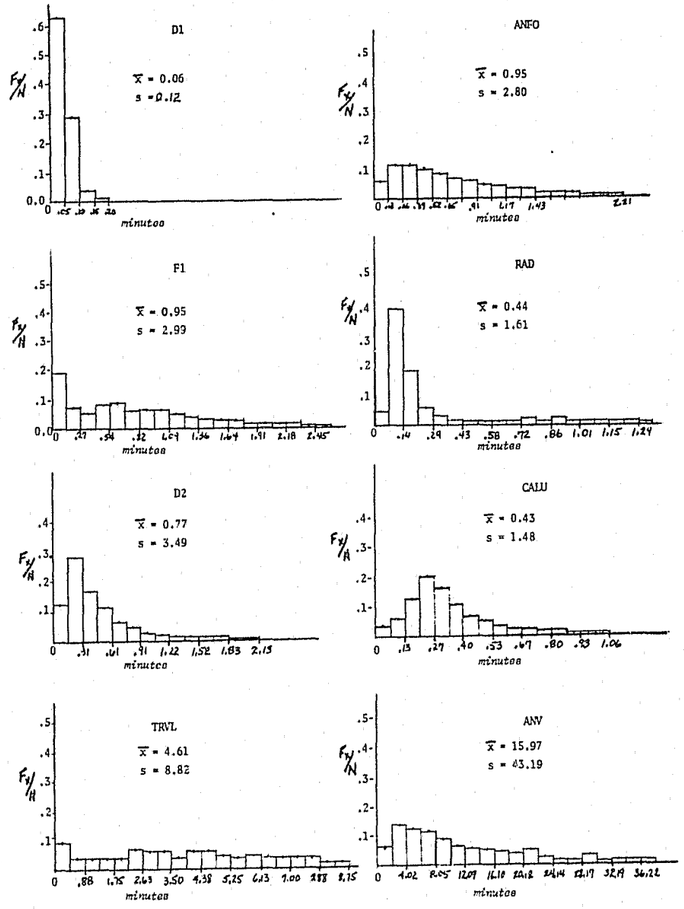


Figure 24 Distribution Histogram For Each Simulation Parameter With The Independent Variable Time Measured In Minutes On The Horizontal Axis And The Normalized Frequency Within Each Time Interval Denoted F_X/N On The Vertical Axis.

TABLE 32

TELEPHONE FREQUENCY COUNT STUDY

DATA SUMMARY

CUMMULATIVE DAILY TOTALS

Day	Total Calls	Total 602-03	Total 602-09	% Of Grand Total	% Of 602-03	% Of 602-09
MON	10049	2293	1030	13.9%	22.8%	10.2%
TUES	10656	2297	1010	14.7	21.6	9.5
WED	10983	2219	1169	15.5	20.2	10.6
THUR	10484	2245	1047	14.5	21.4	10.0
FRI	11618	2701	1228	16.0	23.2	10.6
SAT	11163	2646	883	15.3	23.7	7.9
SUN	7380	1815	543	10.1	24.8	7.4
TOTAL	74137	16212	6910			
AVG	757	165	71	14.3%	22.5%	9.5%

CUMMULATIVE SHIFT TOTALS

Shift	Total Calls	Total 602-03	Total 602-09	% Of Grand Total	% Of 602-03	% Of 602-09
1st	16067	3080	1411	21.7%	19.2%	8.8%
2nd	26067	5664	2505	35.2	21.7	9.6
3rd	32003	7472	2994	43.1	23.3	9.4
TOTAL	74137	16216	6910			

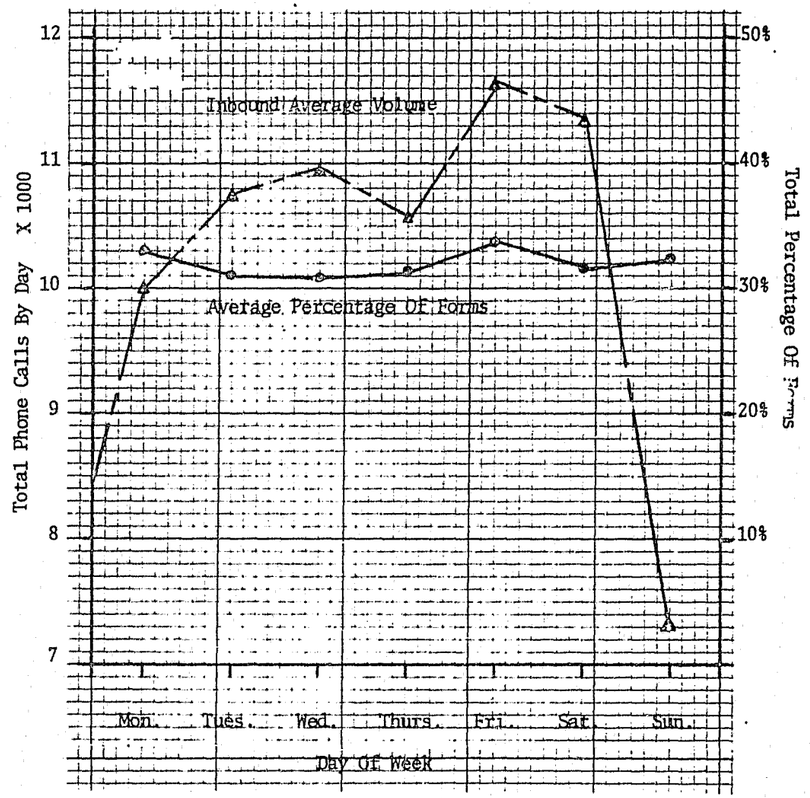
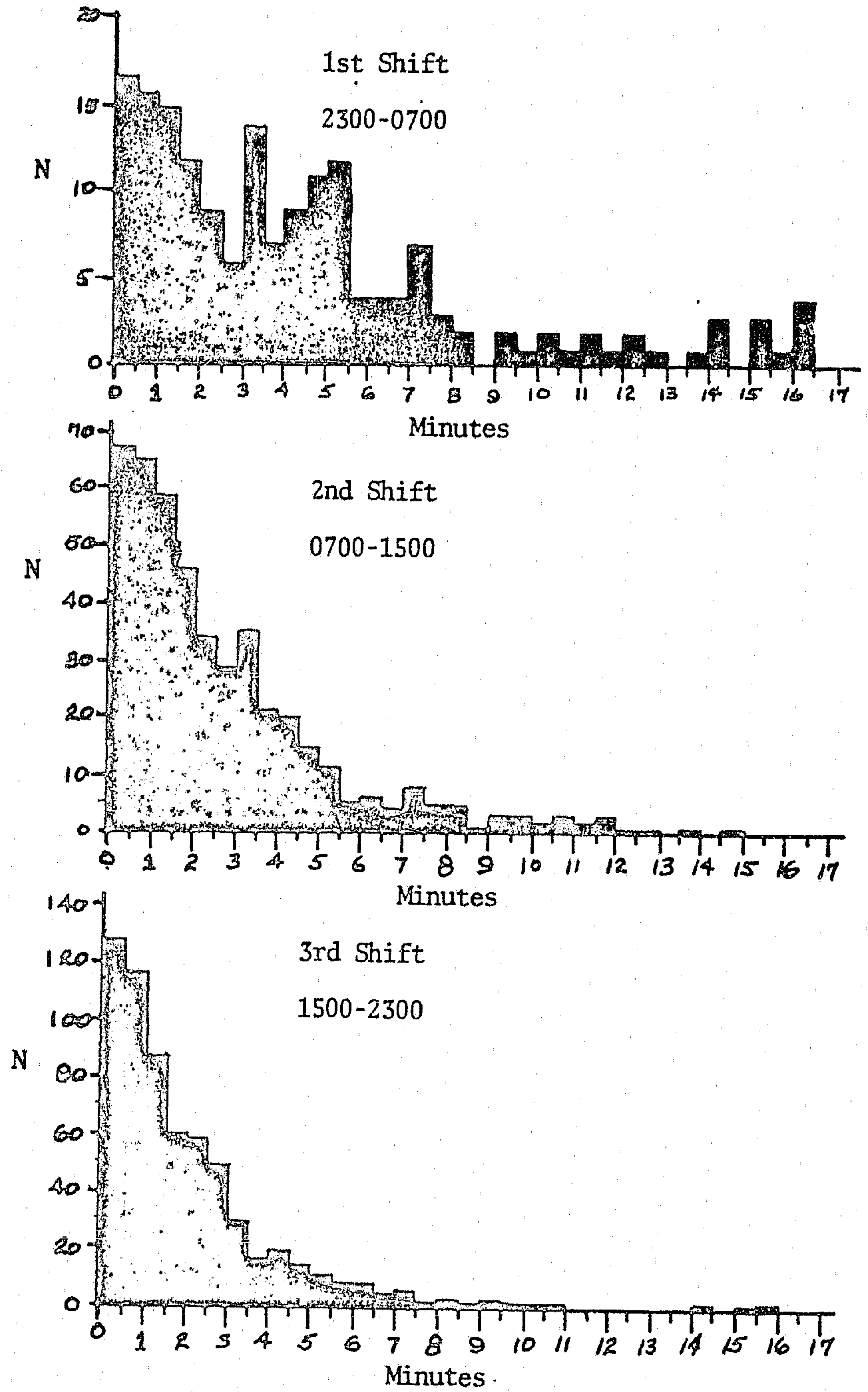


Figure 25 Graphical Representation Of The Total Volume Of Inbound Calls And Percentage Of All Forms Completed By Day Of Week

INBOUND TELEPHONE FREQUENCY DISTRIBUTION

TIME INTERVAL Minutes	FIRST SHIFT	SECOND SHIFT	THIRD SHIFT
0 - 0.5	17	67	128
0.5 - 1.0	16	65	116
1.0 - 1.5	15	59	87
1.5 - 2.0	12	46	60
2.0 - 2.5	9	34	59
2.5 - 3.0	6	29	49
3.0 - 3.5	14	35	29
3.5 - 4.0	7	21	16
4.0 - 4.5	9	20	19
4.5 - 5.0	11	15	14
5.0 - 5.5	12	12	13
5.5 - 6.0	4	5	11
6.0 - 6.5	4	6	8
6.5 - 7.0	4	4	8
7.0 - 7.5	7	8	5
7.5 - 8.0	3	5	6
8.0 - 8.5	2	5	2
8.5 - 9.0	0	1	3
9.0 - 9.5	2	3	2
9.5 - 10.0	1	3	3
10.0 - 10.5	2	2	2
10.5 - 11.0	1	3	2
11.0 - 11.5	2	2	2
11.5 - 12.0	1	3	0
12.0 - 12.5	2	1	0
12.0 - 13.0	1	0	0
13.0 - 13.5	0	1	0
13.5 - 14.0	1	3	2
14.0 - 14.5	3	0	1
14.5 - 15.0	0	3	2
15.0 - 15.5	3	1	0
15.5 - 16.0	1	4	0
16.0 - 16.5	4	0	0
16.5 - 17.0	0		

INBOUND TELEPHONE FREQUENCY HISTOGRAM



JMORMAN

DATE 5/20/72
SHIFT 1 (2) 3

COMMAND/CONTROL TELEPHONE FREQUENCY COUNT

FROM PUBLIC			O.P.D. DEPT. CALLS			CALLS FROM OTHER AGENCIES			CALLS TO OTHER AGENCIES		
TOTAL	602-03	602-09	TOTAL	602-03	602-09	TOTAL	602-03	602-09	TOTAL	602-03	602-09
卌 卌 卌 卌 卌 卌 卌 卌 卌卌 卌 卌 卌 卌 ////	卌 卌 卌 卌 卌 /	//	卌 卌 卌 卌 卌 卌 卌 卌 卌 卌 卌 卌	卌 /	卌 ////	卌 卌 卌 卌	卌	////	//		

COMMAND/CONTROL TIME STUDY SHEET

Name: Tom
DATE 6/27/72
SHIFT 1 (2) 3

TIME OF DAY 1st RING	PHONE TO EAR	PHONE TO CRADLE	LAST TIME STAMP	CARD AT RADIO-OPERATOR	CALL UNIT	PUNCH 10-?1	PUNCH 10-6	CALL UNIT	UNIT REPLY	PUNCH 10-8	OFFENSE	FORMS NONE	FORMS 602-09	FORMS 602-03	CENSUS TRACT	COMMENTS
0915	.03	.40	.44	1.77	3.21	3.46	7.40	9.03	9.15	15.27	TRAFFIC			✓		
0924	.03	.42	.55	.66	4.06	4.13	4.31	—	—	5.02	10-45		✓			
0931	.04	.57	.71	1.46	1.62	1.71	1.82	—	—	3.08	10-45		✓			
0935	.06	1.78										✓				INFO
0937	.04	1.19	1.24									✓				C/D CHANGED MIND NO CARD SENT
0942	.06	.28										✓				TRANSFERED TO O.C.S.D.
0945	.04	.87	2.62	2.82	3.07	3.50	6.83			(8.00)				✓		79507
0955	.05	.18										✓				INFO
1000	.04	.28										✓				INFO
1001	.04	.28	.31	1.00	1.14	1.25	3.02			(19.00)	Sus 390			✓		79533

```
      REAL MEAN(8 )
      INTEGER DAY,SHIFT,FORM,C,CT(8 ,51),TIME
      DIMENSION IT(51),IC(51)
      DIMENSION R(8 ),Q(8 ),SIGMA(8 ),T(10,51)
      DIMENSION V(8 ),S(8 ,7,3,3),SQ(8 ,7,3,3),CI(8 ,7,3,3)
      DIMENSION SDV(8 ,7),SQDV(8 ,7),CDV(8 ,7),SFV(8 ,3),SQF-
                                                V(8 ,3),CFV(
     18 ,3),SSV(8 ,3),SQSV(8 ,3),CSV(8 ,3),SD8(7),SQD8(7),CD-
                                                8(7),SF8(3),
     2SQF8(3),CF8(3),SS8(3),SQS8(3),CS8(3),SD6(7),SQD6(7),CD-
                                                6(7),SF6(3),
     3SQF6(3),CF6(3),SS6(3),SQS6(3),CS6(3)
      DIMENSION VMD(8 ,7),VSGD(8 ,7),VMD8(7),VSGD8(7),VMD6(7-
                                                ),VSGD6(7),
     1VMF(8 ,3),VSGF(8 ,3),VMF8(3),VSGF8(3),VMF6(3),VSGF6(3)-
                                                ,VMS(8 ,3),
     2VSGS(8 ,3),VMS8(3),VSGS8(3),VSGS6(3),VMS6(3)
   52 FORMAT(/////,35X,'DATA REDUCTION FOR THE COMMAND/CONTR-
                                                OL SIMULATIO
     1N',/,44X,'OF THE ORLANDO POLICE DEPARTMENT',/,50X,'BY -
                                                GERALD LCC
     2ASALE',/////)
  100 FORMAT(2I1,5X,8F6.2,14X, I1)
  200 FORMAT(1H1,/////,43X,'MEAN AND STANDARD DEVIATION BY D-
                                                AY',//)
  300 FORMAT(28X,8F8.3)
  301 FORMAT(28X,8F8.0)
  400 FORMAT(1H1,///,31X,'MEAN AND STANDARD DEVIATION FOR A -
                                                UNIT TO CLEA
     1R THAT CALL',/,54X,'TIME TO 10-8',//)
  500 FORMAT(40X,F10.3, 5X,F10.3, 5X,F10.3)
  600 FORMAT(///    ,30X,'MEAN AND STANDARD DEVIATION OF TIM-
                                                E FOR UNIT T
     1O GET TO SCENE' ,//)
  700 FORMAT(28X,8F8.3)
  701 FORMAT(28X,8F8.0)
  900 FORMAT(46X,F8.3,2X,F8.3,2X,F8.0,/)
 1000 FORMAT(// ,38X,'MEAN AND STANDARD DEVIATION BY TYPE OF-
                                                FORM',/,54X
     1,'TIME TO 10-8',//)
 1001 FORMAT(// ,38X,'MEAN AND STANDARD DEVIATION BY TYPE OF-
                                                FORM',/,54X
```



```
     1,'TIME TO 10-6',//)
 1100 FORMAT(1H1,33X,'MEAN AND STANDARD DEVIATION OF EACH VA-
                                                RIABLE BY SH
     1IFT',//)
 1101 FORMAT(//,42X,'MEAN AND STANDARD DEVIATION BY SHIFT',/-
                                                ,54X,'TIME T
     1O 10-8',/)
 1102 FORMAT(//,42X,'MEAN AND STANDARD DEVIATION BY SHIFT',/-
                                                ,54X,'TIME T
     1O 10-6',/)
 1103 FORMAT(30X,'VARIABLE D1',' = ' ,'THIS VARIABLE IS THE -
                                                TOTAL TIME T
     1O ANSWER THE',/,35X,'TELEPHONE',/)
 1104 FORMAT(30X,'VARIABLE  ANFO',' = ' ,'THIS VARIABLE IS T-
                                                HE TOTAL TIM
     1E TO GATHER',/,35X,'ALL THE INFORMATION FROM THE TELEP-
                                                HAONE CALL',
     2/)
 1105 FORMAT(30X,'VARIABLE  F1',' = ' ,'THIS VARIABLE IS THE-
                                                TOTAL TIME
     1TO CHOOSE ',/,35X,'AND THEN COMPLETE THE APPROPRIATE F-
                                                ORM',/)
 1106 FORMAT(30X,'VARIABLE  RAD',' = ','THIS VARIABLE IS  TH-
                                                E TOTAL TIME
     1 FOR THAT FORM',/,35X,'TO GET TO THE RADIO-OPERATOR',/-
                                                )
 1107 FORMAT(30X,'VARIABLE  D2',' = ','THIS VARIABLE IS THE -
                                                TOTAL TIME F
     1OR THE ',/,35X,'RADIO-OPERATOR TO READ AND ASSIGN A UN-
                                                IT',/)
 1108 FORMAT(30X,'VARIABLE  CALU',' = ' ,'THIS VARIABLE IS T-
                                                HE TOTAL TIM
     1E FOR THE',/,35X,'RADIO-OPERATOR TO GIVE THE INFORMATI-
                                                ON TO THE UN
     2IT',/)
 1109 FORMAT(30X,'VARIABLE TRVL',' = ' ,'THIS VARIABLE IS TH-
                                                E TOTAL TIME
     1 FOR THE',/,35X,'UNIT TO GET TO THE ASSIGNED LOCATION'-
                                                ,/)
 1110 FORMAT(30X,'VARIABLE  ANV1',' = ' ,'THIS VARIABLE IS T-
                                                OTAL INVESTI
     1GATION TIME',/,35X,'FOR THAT CALL',/)
 1113 FORMAT(45X,'THE TOTAL NUMBER PER CATEGORY',/)
 1114 FORMAT(42X,'THE MEAN FOR EACH ELEMENT IS AS FOLLOWS',/-
                                                )
 1115 FORMAT(41X,'THE STANDARD DEVIATION OF EACH ELEMENT IS'-
                                                ,/)
 1200 FORMAT(3X,I4,8F6.2)
 1201 FORMAT(1H1,51X,'INBOUND FREQUENCY',///,48(54X,2I6,/))
 1300 FORMAT(51(28X, 4(F7.3,1X,I5,3X),/),//)
```

```
 1400 FORMAT(1H1,//,51X,'FREQUENCY POLYGON',///,28X,4(F8.3,8X-
                                              ),/,28X, 4(F
     18.3,8X),/)
 1600 FORMAT(1H1,25X,'MEAN AND STANDARD DEVIATION OF EACH VA-
                                             RIABLE BY TY
     1PE OF FORM COMPLETED',//)
C
C
      REWIND 1
      NN=1
      IN=6
      DO 24 J=1,8
      DO 24 K=1,7
      DO 24 L=1,3
      DO 24 M=1,3
      S(J,K,L,M)=0.
      SQ(J,K,L,M)=0.
      CI(J,K,L,M)=0.
      SDV(J,K)=0.
      SQDV(J,K)=0.
      CDV(J,K)=0.
      SFV(J,L)=0.
      SQFV(J,L)=0.
      CFV(J,L)=0.
      SSV(J,M)=0.
      SQSV(J,M)=0.
      CSV(J,M)=0.
      SD8(K)=0.
      SQD8(K)=0.
      CD8(K)=0.
      SF8(L)=0.
      CD8(K)=0.
      SQF8(L)=0.
      CF8(L)=0.
      SS8(M)=0.
      SQS8(M)=0.
      V(J)=0.
      SIGMA(J)=0.
      MEAN(J)=0.
      Q(J)=0.
      R(J)=0.
      SD6(K)=0.
      SQD6(K)=0.
      CD6(K)=0.
      SF6(L)=0.
      SQF6(L)=0.
      CF6(L)=0.
      SS6(M)=0.
      SQS6(M)=0.
      CS6(M)=0.
```



```
      CS8(M)=0.
      VMD6(K)=0.
      VMD8(K)=0.
      VMF8(L)=0.
      VMF6(L)=0.
      VMS8(M)=0.
      VMS6(M)=0.
   24 CONTINUE
      DO 25 I=1,10
      DO 25 J=1,51
      IT(J)=0.
      IC(J)=0.
      T(I,J)=0.
      CT(I,J)=0.
   25 CONTINUE
    1 READ(NN,100) DAY,SHIFT,(V(J),J=1, 8),FORM
      K=DAY
      L=FORM
      M=SHIFT
      CD8(K)=CD8(K)+1.
      CF8(L)=CF8(L)+1.
      CS6(M)=CS6(M)+1.
      CS8(M)=CS8(M)+1.
      CD6(K)=CD6(K)+1.
      CF6(L)=CF6(L)+1.
      DO 2 J=1,8
   47 IF(V(J).EQ.0.) GO TO 2
      S(J,K,L,M)=S(J,K,L,M)+V(J)
      SQ(J,K,L,M)=SQ(J,K,L,M)+V(J)**2.
      CI(J,K,L,M)=CI(J,K,L,M)+1.
    2 CONTINUE
      IF(DAY.NE.0) GO TO 1
      DO 3 J=1,8
      DO 3 K=1,7
      DO 3 L=1,3
      DO 3 M=1,3
      SDV(J,K)=SDV(J,K)+S(J,K,L,M)
      SQDV(J,K)=SQDV(J,K)+SQ(J,K,L,M)
      CDV(J,K)=CDV(J,K)+CI(J,K,L,M)
      SFV(J,L)=SFV(J,L)+S(J,K,L,M)
      SQFV(J,L)=SQFV(J,L)+SQ(J,K,L,M)
      CFV(J,L)=CFV(J,L)+CI(J,K,L,M)
      SSV(J,M)=SSV(J,M)+S(J,K,L,M)
      SQSV(J,M)=SQSV(J,M)+SQ(J,K,L,M)
      CSV(J,M)=CSV(J,M)+CI(J,K,L,M)
      SD8(K)=SD8(K)+S(J,K,L,M)
      SF8(L)=SF8(L)+S(J,K,L,M)
      SS8(M)=SS8(M)+S(J,K,L,M)
      IF(J.GT.7) GO TO 3
      SD6(K)=SD6(K)+S(J,K,L,M)
```

```
      SF6(L)=SF6(L)+S(J,K,L,M)
      SS6(M)=SS6(M)+S(J,K,L,M)
    3 CONTINUE
      DO 5 J=1,8
      DO 5 K=1,7
      IF(CDV(J,K).LE.1.) GO TO 28
      VMD(J,K)=SDV(J,K)/CDV(J,K)
      VSGD(J,K)=SQRT((SQDV(J,K)-(SDV(J,K)**2./CDV(J,K)))/(CD-
                                              V(J,K)-1.))
    8 VMD8(K)=VMD8(K)+VMD(J,K)
      SQD8(K)=SQD8(K)+(VSGD(J,K)**2)
      IF(J.GT.7) GO TO 5
      VMD6(K)=VMD6(K)+VMD(J,K)
      SQD6(K)=SQD6(K)+(VSGD(J,K)**2)
      GO TO 5
   28 VMD(J,K)=0.
      VSGD(J,K)=0.
      GO TO 8
    5 CONTINUE
      DO 6 J=1,8
      DO 6 L=1,3
      IF(CFV(J,L).LE.1.) GO TO 26
      VMF(J,L)=SFV(J,L)/CFV(J,L)
      VSGF(J,L)=SQRT((SQFV(J,L)-(SFV(J,L)**2./CFV(J,L)))/(CF-
                                              V(J,L)-1.))
   10 IF(CF8(L).EQ.0.) GO TO 34
      SQF8(L)=SQF8(L)+(VSGF(J,L)**2)
      VMF8(L)=VMF8(L)+VMF(J,L)
      IF(J.GT.7) GO TO 6
      IF(CF6(L).EQ.0.) GO TO 35
      VMF6(L)=VMF6(L)+VMF(J,L)
      SQF6(L)=SQF6(L)+(VSGF(J,L)**2)
      GO TO 6
   26 VMF(J,L)=0.
      VSGF(J,L)=0.
      GO TO 10
   34 VMF8(L)=0.
   35 VMF6(L)=0.
    6 CONTINUE
      DO 7 J=1,8
      DO 7 M=1,3
      IF(CSV(J,M).LE.1.) GO TO 27
      VMS(J,M)=SSV(J,M)/CSV(J,M)
      VSGS(J,M)=SQRT((SQSV(J,M)-(SSV(J,M)**2./CSV(J,M)))/(CS-
                                              V(J,M)-1.))
   12 IF(CS8(M).EQ.0.) GO TO 38
      VMS8(M)=VMS8(M)+VMS(J,M)
      SQS8(M)=SQS8(M)+(VSGS (J,M)**2)
      IF(CS6(M).EQ.0.) GO TO 39
      IF(J.GT.7) GO TO 7
```



```
      VMS6(M)=VMS6(M)+VMS(J,M)
      SQS6(M)=SQS6(M)+(VSGS (J,M)**2)
      GO TO 7
   27 VMS(J,M)=0.
      VSGS(J,M)=0.
      GO TO 12
   38 VMS8(M)=0.
   39 VMS6(M)=0.
    7 CONTINUE
      DO 31 K=1,7
      VSGD8(K)=SQRT(SQD8(K))
   31 VSGD6(K)=SQRT(SQD6(K))
      DO 32 L=1,3
      IF(CF8(L).EQ.0.) GO TO 40
      VSGF8(L)=SQRT(SQF8(L))
      VSGF6(L)=SQRT(SQF6(L))
      GO TO 32
   40 VSGF8(L)=0.
      VSGF6(L)=0.
   32 CONTINUE
      DO 33 M=1,3
      IF(CS8(M).EQ.0.) GO TO 41
      VSGS8(M)=SQRT(SQS8(M))
      VSGS6(M)=SQRT(SQS6(M))
      GO TO 33
   41 VSGS8(M)=0.
      VSGS6(M)=0.
   33 CONTINUE
      DO 15 I=1,8
      DO 14 J=1,7
      Q(I)=Q(I)+VMD(I,J)
      R(I)=R(I)+VSGD(I,J)**2.
   14 CONTINUE
      MEAN(I)=Q(I)/7.
      SIGMA(I)= SQRT(R(I))
   15 CONTINUE
      DO 42 I=3,49,2
   42 IT(I)=((I-1)/2)*100
      DO 43 I=2,48,2
      N=I-1
   43 IT(I)=IT(N)+30
C
      REWIND 1
C
   23 READ(NN,100) DAY,SHIFT,(V(J),J=1, 8),FORM
      DO 20 I=1,8
      DO 22 J=1,51
      IF(V(I).EQ.0.) GO TO 20
      IF(J.EQ.51) GO TO 21
   49 T(I,J)=((MEAN(I)+1.96*SIGMA(I))/50.)*(J-1)
```

```
      K=J+1
      T(I,K)=((MEAN(I)+1.96*SIGMA(I))/50.)*J
      IF(V(I).GT.T(I,J).AND.V(I).LE.T(I,K)) GO TO 21
      GO TO 22
   21 CT(I,J)=CT(I,J)+1
   22 CONTINUE
   20 CONTINUE
      DO 44 I=1,48
      IF(I.EQ.48) GO TO 45
      N=I+1
      IF(TIME.GE.IT(I).AND.TIME.LT.IT(N))GO TO 45
      GO TO 44
   45 IC(I)=IC(I)+1
      GO TO 46
   44 CONTINUE
   46 IF(DAY.NE.0) GO TO 23
C
C
      WRITE(IN,52)
      WRITE(IN,1103)
      WRITE(IN,1104)
      WRITE(IN,1105)
      WRITE(IN,1106)
      WRITE(IN,1107)
      WRITE(IN,1108)
      WRITE(IN,1109)
      WRITE(IN,1110)
      WRITE(IN, 200)
      WRITE(IN,1113)
      WRITE(IN, 301)((CDV(I,J),I=1,8 ),J=1,7)
      WRITE(IN,1114)
      WRITE(IN, 300)((VMD(I,J),I=1,8 ),J=1,7)
      WRITE(IN,1115)
      WRITE(IN, 300)((VSGD(I,J),I=1,8 ),J=1,7)
      WRITE(IN, 400)
      WRITE(IN, 500)(VMD8(I),VSGD8(I),CD8(I),I=1,7)
      WRITE(IN, 600)
      WRITE(IN, 500)(VMD6(I),VSGD6(I),CD6(I),I=1,7)
      WRITE(IN,1600)
      WRITE(IN,1113)
      WRITE(IN, 701)((CFV(I,J),I=1,8 ),J=2,3)
      WRITE(IN,1114)
      WRITE(IN, 700)((VMF(I,J),I=1,8 ),J=2,3)
      WRITE(IN,1115)
      WRITE(IN, 700)((VSGF(I,J),I=1,8 ),J=2,3)
      WRITE(IN,1000)
      WRITE(IN, 900)(VMF8(I),VSGF8(I),CF8(I),I=2,3)
      WRITE(IN,1001)
      WRITE(IN, 900)(VMF6(I),VSGF6(I),CF6(I),I=2,3)
      WRITE(IN,1100)
```



```
      WRITE(IN,1113)
      WRITE(IN, 701)((CSV(I,J),I=1,8 ),J=1,3)
      WRITE(IN,1114)
      WRITE(IN, 700)((VMS(I,J),I=1,8 ),J=1,3)
      WRITE(IN,1115)
      WRITE(IN, 700)((VSGS(I,J),I=1,8 ),J=1,3)
      WRITE(IN,1101)
      WRITE(IN, 900)(VMS8(I),VSGS8(I),CS8(I),I=1,3)
      WRITE(IN,1102)
      WRITE(IN, 900)(VMS6(I),VSGS6(I),CS6(I),I=1,3)
      WRITE(IN,1400)(MEAN(I),I=1,4),(SIGMA(I),I=1,4)
      WRITE(IN,1300)((T(I,J),CT(I,J),I=1,4),J=1,51)
      WRITE(IN,1400)(MEAN(I),I=5,8),(SIGMA(I),I=5,8)
      WRITE(IN,1300)((T(I,J),CT(I,J),I=5,8 ),J=1,51)
      WRITE(IN,1201)(IT(I),IC(I),I=1,48)
      STOP
      END
```

APPENDIX C

GPSS/360 PROGRAM CODE SEGMENTS

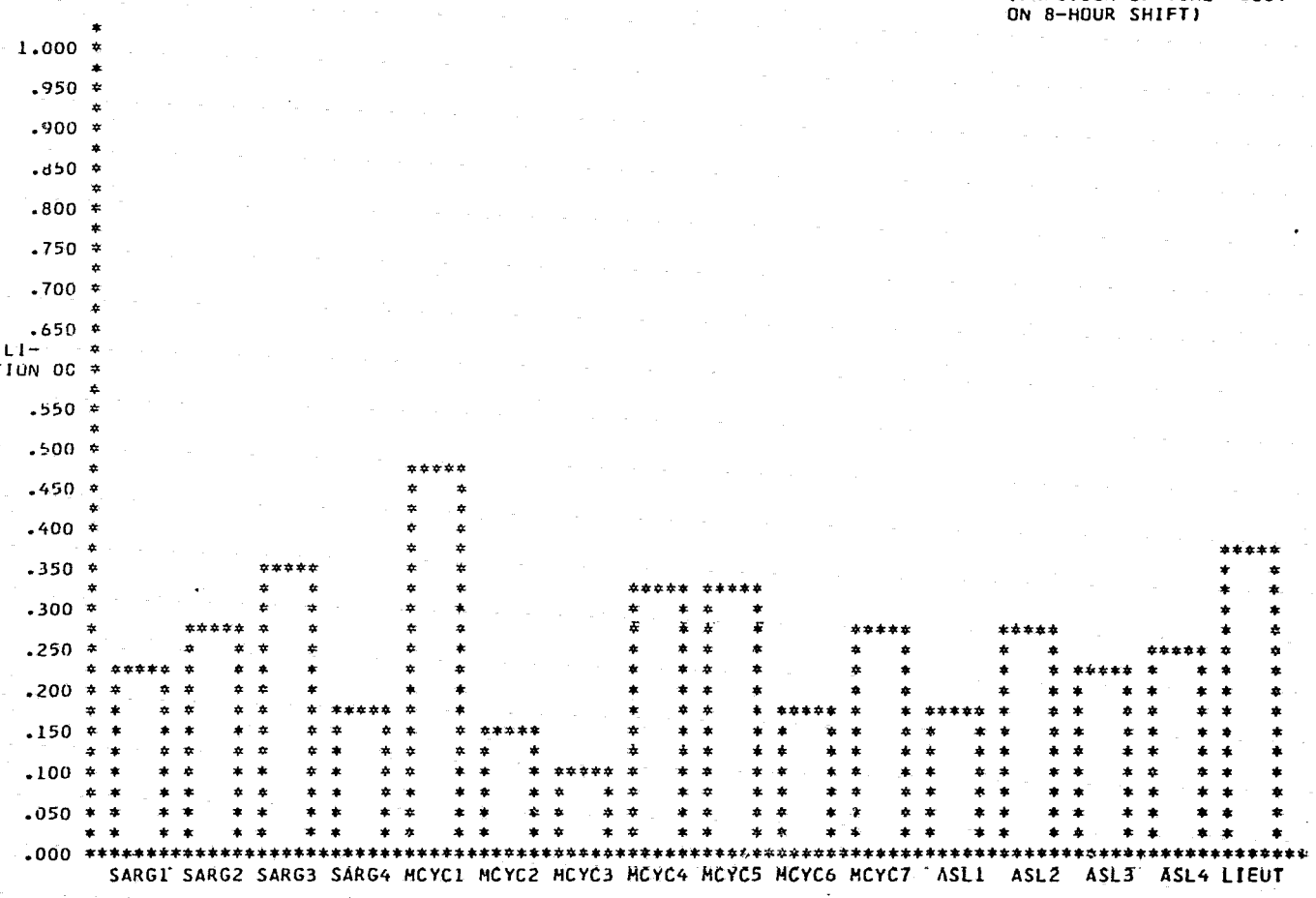
FOR COMPLAINT DESK CLERK AND

FIELD UNIT MODEL SEGMENTS

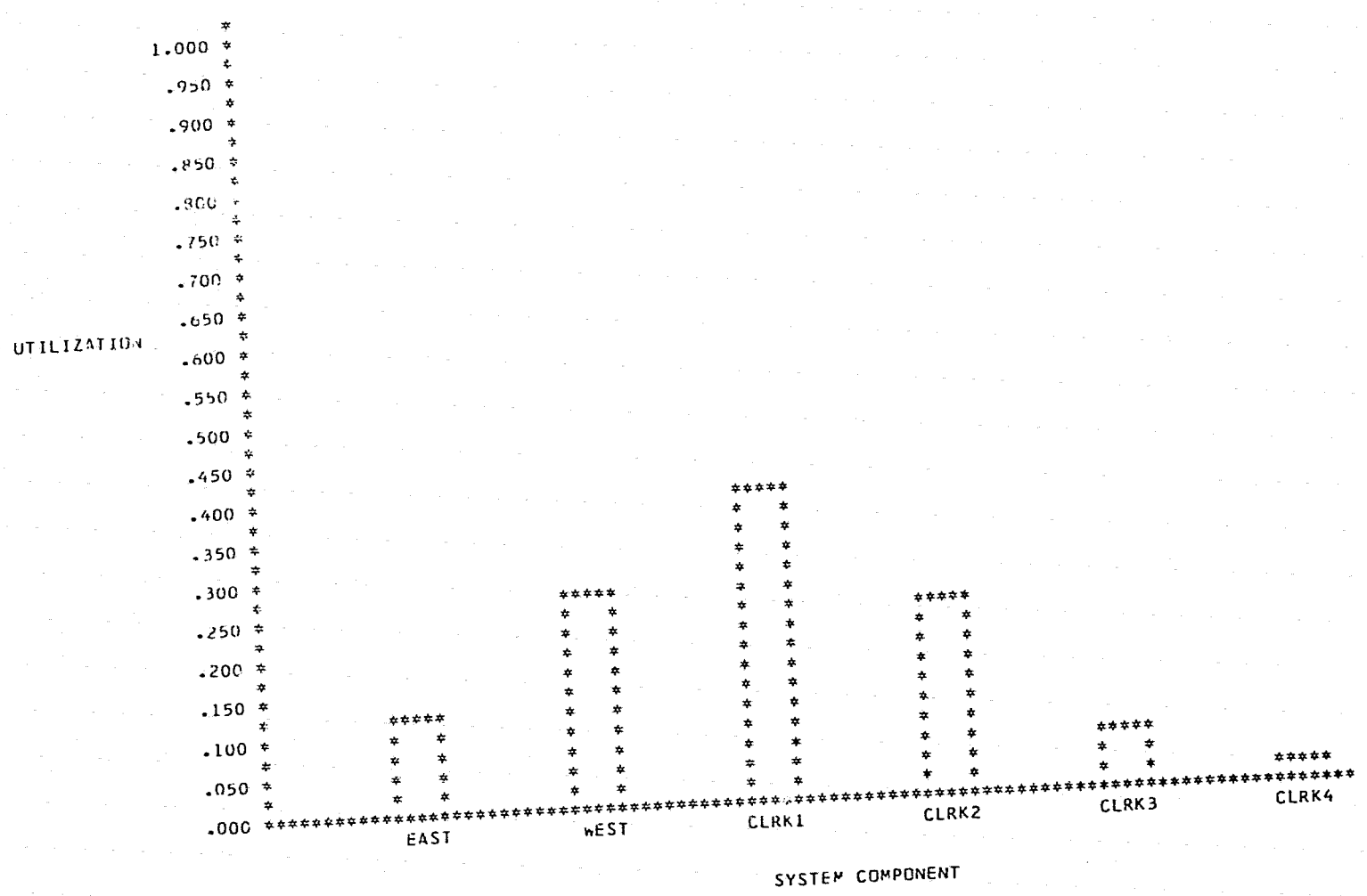
```
        CLERK MACRO ARGUMENTS
          A = CLERK UNIT BLOCK GROUP NAME
          B = FACILITY NAME FOR CLERK
          C = 'NOGOX', X = ASCENDING UNIT NUMBER
CLERK   STARTMACRO
$A      SEIZE       $B              IDLE CLERK FOUND ... NOW ANSWER PHONE
        DEPART      INPUT           LEAVE INPUT CALL QUEUE
        ADVANCE     FN$TTYM         RESPONSE TIME TO ANSWER PHONE
        ADVANCE     FN$INFO         GATHER INFORMATION
        TEST LE     P2,K2,$C        DIVERT NON-SERVICE CALLS
        ADVANCE     FN$FORM         FORM COMPLETION
        RELEASE     $B              HANG UP PHONE
        TRANSFER    ,CNVYR          SEND TO RADIO OPERATOR
$C      RELEASE     $B              HANG UP PHONE
        TRANSFER    ,NOACT          GATHER STATISTICS ON NO-ACTION CALLS
        ENDMACRO
```

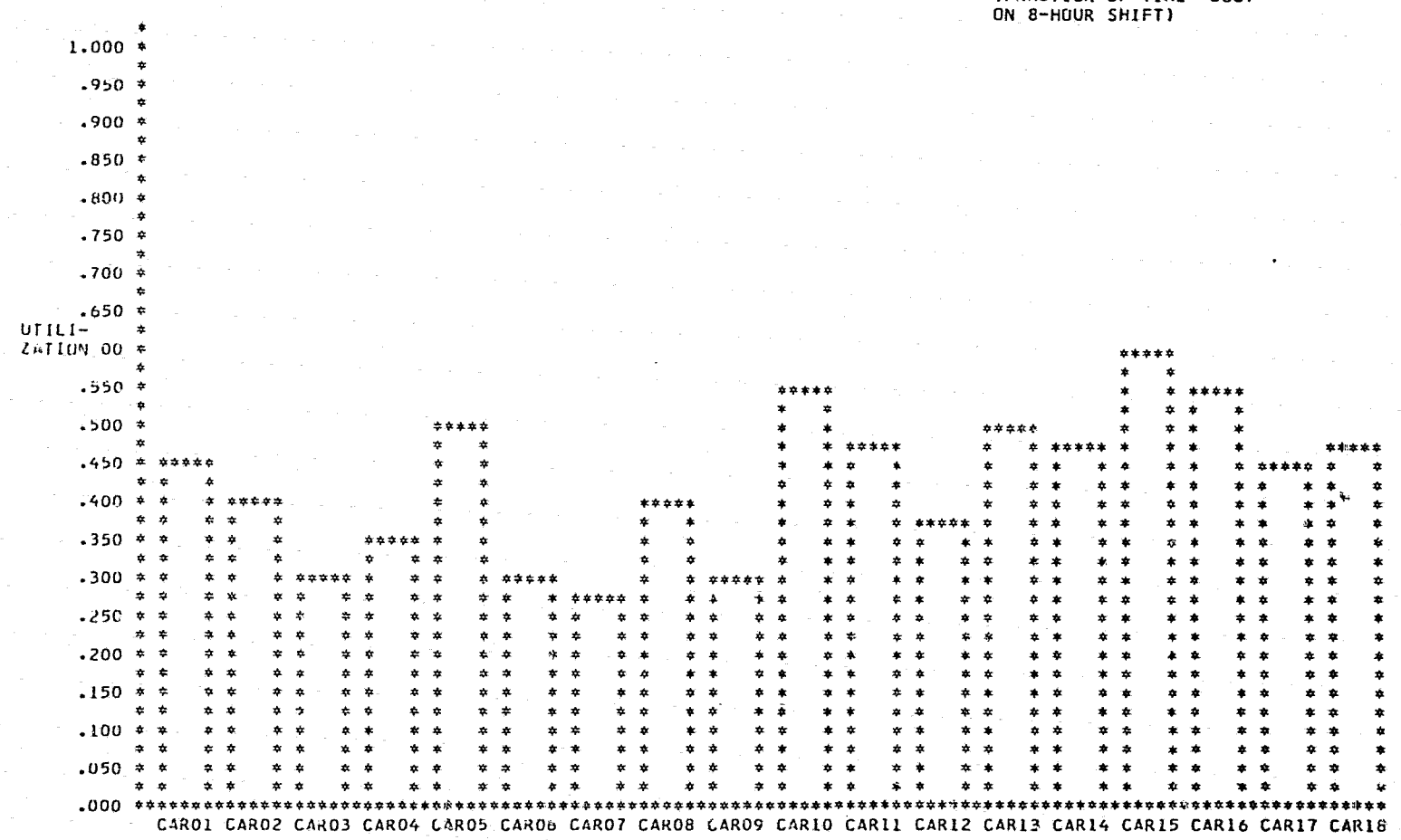
```
        FUNIT MACRO ARGUMENTS
          A = FIELD UNIT BLOCK NAME GROUP
          B = ALTERNATE BRANCH POINT FOR CURRENT XACT
          C = FACILITY FOR FIELD UNIT (CAR,MOTOR,SARGE,LT)
          D = OUTX, LASTX = ASCENDING EXIT NUMBER
          E = XTRX, LASTX = ASCENDING EXIT NUMBER
          F = RADIO (EAST OR WEST)
FUNIT   STARTMACRO
$A      GATE NU     $C,$B           TEST IF UNIT CAN ACCEPT CALL
        SEIZE       $C              FIELD UNIT NOW PROCESSING CALL
        ADVANCE     P5              TRAVEL TIME
        TABULATE    TEN6            UNIT NOW AT SCENE OF COMPLAINT
        ADVANCE     P6              INVESTIGATION TIME DELAY
        TRANSFER    .050,$D,$E
$E      PREEMPT     $F              INTERACT WITH RADIO OPERATOR
        ADVANCE     17,1            STATUS CHECK (DONE 5 PER-CENT OF TIME)
        RETURN      $F              FREE RADIO OPERATOR
$D      RELEASE     $C              FIELD UNIT NOW FREE
        TRANSFER    ,FINSH
        ENDMACRO
```

UTILIZATION OF OTHER FIELD UNITS
BY ASCENDING UNIT NUMBER
(FRACTION OF TIME 'BUSY'
ON 8-HOUR SHIFT)



UTILIZATION OF
COMPLAINT DESK OFFICERS
AND RADIO OPERATORS
(FRACTION OF TIME 'BUSY'
ON 8-HOUR SHIFT)





QUEUE	MAXIMUM CONTENTS	AVERAGE CONTENTS	TOTAL ENTRIES	ZERO ENTRIES	PERCENT ZEROS	AVERAGE TIME/TRANS	$AVERAGE TIME/TRANS	TABLE NUMBER	CURRENT CONTENTS
INPUT	1	.002	326	323	99.0	.328	35.666		
ERQ	2	.021	68	57	83.8	15.294	94.545		
WRQ	3	.070	56	32	57.1	60.642	141.500		

$AVERAGE TIME/TRANS = AVERAGE TIME/TRANS EXCLUDING ZERO ENTRIES

TABLE TEN4
ENTRIES IN TABLE 124
MEAN ARGUMENT 318.636
STANDARD DEVIATION 160.000
SUM OF ARGUMENTS 39511.000
NON-WEIGHTED

UPPER LIMIT	OBSERVED FREQUENCY	PER CENT OF TOTAL	CUMULATIVE PERCENTAGE	CUMULATIVE REMAINDER	MULTIPLE OF MEAN	DEVIATION FROM MEAN
0	0	.00	.0	100.0	-.000	-1.991
100	2	1.61	1.6	98.3	.313	-1.366
200	27	21.77	23.3	76.6	.627	-.741
300	39	31.45	54.8	45.1	.941	-.116
400	24	19.35	74.1	25.8	1.255	.508
500	17	13.70	87.9	12.0	1.569	1.133
600	8	6.45	94.3	5.6	1.883	1.758
700	4	3.22	97.5	2.4	2.196	2.383
800	0	.00	97.5	2.4	2.510	3.008
900	2	1.61	99.1	.8	2.824	3.633
1000	0	.00	99.1	.8	3.138	4.258
1100	1	.80	100.0	.0	3.452	4.883

REMAINING FREQUENCIES ARE ALL ZERO

FACILITY	AVERAGE UTILIZATION	NUMBER ENTRIES	AVERAGE TIME/TRAN	SEIZING TRANS. NO.
EAST	.125	70	85.771	
WEST	.295	237	59.902	
CLRK1	.422	180	112.694	
CLRK2	.254	95	128.431	
CLRK3	.089	42	102.476	20
CLRK4	.026	11	114.454	
CAR01	.467	10	2245.399	
CAR02	.409	8	2459.875	
CAR03	.324	7	2225.428	3
CAR04	.356	13	1316.384	
CAR05	.508	10	2441.500	10
CAR06	.320	13	1183.769	
CAR07	.296	9	1578.777	
CAR08	.424	10	2035.699	
CAR09	.314	9	1678.666	13
CAR10	.559	15	1790.466	
CAR11	.491	11	2145.454	
CAR12	.384	11	1677.454	
CAR13	.511	9	2730.111	
CAR14	.499	10	2396.500	
CAR15	.612	12	2449.916	
CAR16	.550	14	1886.428	
CAR17	.450	12	1802.750	27
CAR18	.493	10	2369.500	
SARG1	.249	9	1332.666	
SARG2	.281	9	1504.000	
SARG3	.367	7	2518.142	
SARG4	.193	6	1550.500	
MCYC1	.480	9	2563.666	
MCYC2	.162	9	866.444	21
MCYC3	.116	6	936.000	18
MCYC4	.325	7	2234.714	6
MCYC5	.325	8	1951.125	14
MCYC6	.197	8	1184.250	
MCYC7	.281	5	2698.000	
ASL1	.184	5	1769.000	
ASL2	.297	8	1784.250	
ASL3	.242	6	1936.666	
ASL4	.252	9	1347.111	
LIEUT	.381	8	2286.125	

APPENDIX D

SITUATION SERIES A

SCENARIOS

Series description:
This series consists of three hypothetical situations which all take place on a Friday evening beginning at 2244 hours during which the entire Orlando area is experiencing a thunderstorm with heavy rain and lightning.

Situation 1

Type:
Personal call.
Call description:
Criminal Investigation Bureau wants Sgt. McNamara, signal 10.
Handling Procedure for examinee:
- o Check the duty roster to determine unit number assigned to Sgt. McNamara, if he is on duty and proceed to next procedure. If he is not on duty, tell the CIB caller and then hang up.
- o Fill in form 602-09 with unit number, the Sgt.'s name, a check mark in the block labeled OTHER, SIGNAL 10 written in the remarks section, and examinee's initials.
- o Time stamp the 602-09 on the back.
- o Send 602-09 to the Radio Operator.

Situation 2

Beginning time:
30 seconds after examinee answers the phone on Situation 1.
Type:
Accident.
Location:
Curryford and Griffin Road.
Reported by:
Joe Jones, service station attendent, phone 424-2486.
Description of caller:
Mr. Jones is in mild shock and speaking in an erratic manner, but fairly coherent. His descriptive vocabulary is that of approximately a sixth grader.
Incident description:
A sedan was traveling west on Curryford Road at a high rate of speed, attempted to stop for the traffic signal, because of the rain-slick street the sedan slid through the intersection into a utility pole on the NW corner knocking it down. It then continued sliding, coming to rest against a gas pump at the service station, rupturing a gas line inside the pump. The driver is pinned inside the car, unconscious and bleeding. Gasoline is flowing openly from the pump and the utility lines are down in the street.
Handling procedure for examinee:
Caller states that a bad accident has occured.
- o Examinee requests location from caller.
- o Examinee asks caller if there are injuries.

- o After finding out there are injuries, examinee tells the caller to stay on the line.
- o Put caller on hold.
- o Call ambulance.
- o Via the intercom:
  Advise the Radio Operator that an accident has occured at Conway and Griffin, district 36, and an ambulance has been dispatched.
- o Stamp form 602-03 twice, once for the approximate time received and once for the in-route time for the ambulance and police unit.
- o Return to the caller who is holding.
- o Advise caller that an ambulance and police car have been dispatched.
- o Request additional information from caller.
  NOTE: At this point the caller will volunteer the remaining information about the accident as described in the section above on the incident description.
- o Put caller on hold.
- o Call the O.F.D. and advise then that a rescue unit is needed, giving the location, because a man is pinned in the car, and advise them that a gas leak was observed and utility lines are down.
- o Via intercom advise Radio Operator that the O.F.D. has dispatched fire and rescue units to the scene and advises Radio Operator to dispatch additional police units for traffic and crowd control and to prohibit any smoking in the area.
  NOTE: Since this is taking place at the time of shift change,the examiner (acting as Radio Operator) may advise the examinee that there are insufficient units available placing an additional burden on the examinee to request assistance from the OCSO or FHP or both.
- o Advise Orlando Utilities of the downed lines and the gas leak in addition to emphasizing the seriousness of the accident.
- o Return to the caller who is holding.
- o Request identification of caller and his phone number.
- o Complete the information needed on the 602-03.
- o Send 602-03 to the Radio Operator.

Situation 3

Beginning time:
1 minute, 30 seconds after examinee answers phone on Situation 2.
Type:
Robbery (in progress).
Location:
7-11 convenience store at Princeton and Dade. District 22.
Reported by:
John Smith, manger of the store, phone 849-2444.
Discription of caller:
Mr. Smith speaks in a fast excited manner.
Incident description:
One white man and one black man, both armed with revolvers, held Mr. Smith at gun point while removing approximately $200, in currency only, form the cash register. The black man was about 6 feet tall, 185 pounds, wearing black trousers and a light blue shirt. The white man was short, about 5 feet 6 inches, 130 pounds, with sholder length brown hair, wearing dirty and ragged blue jeans and a gray

T-shirt. After leaving the store, the suspects entered a late model yellow sports car and headed west on Princeton. The only information about the car's tag was that Mr. Smith could see it was a Fla. tag beginning with a 7.

Handling procedure for examinee:

Caller states that he has been robbed by two armed men.

- o Asks caller for location.
- o Asks caller if there were any injuries.
- o Turns on the emergency light to notify the Radio Operator to pick up the receiver and listen to the caller.
- o Examinee repeats (to caller for his verification and also for the benefit of the Radio Operator) location, incicent type, and district number.
- o Time stamp the 602-03.
- o Gets verification from the Radio Operator that she has received the information.
- o Advises caller that the dispatcher is listening and to slowly give a description of the subjects and any other information requested.
- o Upon completion of verification from the Radio Operator, request identification of caller and his phone number.
- o Complete the necessary entries on the 602-03.
- o Send 602-03 to Radio Operator.

PERFORMANCE STANDARDS AND EXAMINEE EVALUATION SHEET

Situation 1		Possible Score	Examinee Score
A. Information Accuracy			
. Used correct form, 602-09		5	
. Necessary data entries (0 points if entry was omitted or entry was incorrect):			
Unit number (435)		5	
District number (88)		5	
Officer's initials		5	
Signal 10 in REMARKS		5	
OTHER block checked		5	
Time stamped on back of card		5	
	Total	= 35	

B. Form Completion Time

Grading Scale: μ = 13.3 sec, σ = 1.9 sec

If:	Score
Examinee's time ≤ 15.2 sec	30
15.3 sec ≤ Examinee's time ≤ 17.1 sec	20
17.2 sec ≤ Examinee's time ≤ 19.0 sec	10
Examinee's time ≥ 19.1 sec	0

Total	30	

C. Decision Capability

Necessary decisions:

(None for this situation)

Total	20	20

D. Tactfulness

Scale:

Subjective Rating	Score
Excellent	15
Good	10
Fair	5
Poor	0

Total	15	

Total possible = 100 Examinee Total =

PERFORMANCE STANDARDS AND EXAMINEE EVALUATION SHEET

Situation 2

	Possible Score	Examinee Score
A. Information Accuracy		
Used correct form, 602-03	2.5	
Necessary data entries (0 points if entry was omitted or incorrect)		
ACCIDENT AUTO block checked	2.5	
Either AMBULANCE RUN block checked or 37 in space named OTHER	2.5	
EMERGENCY blocked checked	2.5	
Location of Event properly filled in	2.5	
District number	2.5	
Officer's initials	2.5	
Complainant's name	2.5	
Complainant's phone number	2.5	
Complainant's address	2.5	
TELEPHONE block checked	2.5	
Time received stamped	2.5	
Time of unit dispatch stamped	2.5	
Any additional information which may be pertinent	2.5	
Total	35	

B. Form Completion Time

Grading Scale: μ = .51 min., σ = .10 min

If:	Score
Examinee's time ≤ .61 min	30
.62 ≤ Examinee's time ≤ .71 min	20
.72 ≤ Examinee's time ≤ .81 min	10
Examinee's time ≥ .82 min.	0
Total	30

C. Decision Capability		
Necessary decisions:		
Dispatch police unit immediately	3	
Call ambulance	5	
Notify OFD	9	
Notify Orlando Utilities	3	
Total	20	

D. Tactfulness

Scale:

Subjective Rating	Score
Excellent	15
Good	10
Fair	5
Poor	0

Total	15	
Total Possible	100	Exam.T1=

PERFORMANCE STANDARDS AND EXAMINEE EVALUATION SHEET

Situation 3

	Possible Score	Examinee Score
A. Information Accuracy		
Used correct form, 602-03	1.4	
Necessary data entries:		
EMERGENCY block checked	2.4	
IN PROGRESS block checked	2.4	
ROBBERY block checked	2.4	
Location of event	2.4	
District number	2.4	
Officer's initials	2.4	
Complainant's name	2.4	
Complainant's phone number	2.4	
Complainant's address	2.4	
TELEPHONE block checked	2.4	
29-0 in OTHER space	2.4	
Time received stamped	2.4	
Time of dispatch stamped	2.4	
Any additional data	2.4	
Total	35	

B. Form Completion Time

Grading Scale: μ = .33 min., σ = .06 min.

If:	Score
Examinee's time ≤ .39 min	30
.40 min ≤ Examinee's time ≤ .45 min	20
.46 min ≤ Examinee's time ≤ .51 min	10
Examinee's time ≥ .52 min	0
Total	30

C. Decision Capability		
Necessary decisions:		
Determine it's an Emergency	8	
To notify Radio operator by turning on Emergency Light	10	
To question complaint on possible injuries	2	
Total	20	

D. Tactfulness

Scale:

Subjective Rating	Score
Excellent	15
Good	10
Fair	5
Poor	0

Total	15	
Total Possible	100	Exam.T1=

ANSWER FORMS

SITUATION 1

Front View

ORLANDO, FLA.

01 ☐ STOPPING VEH.	16 ☐ GARAGE	UNIT NO. 435	OFFICER NO. (optional) McNamara	DIST. 88	DISPATCHER FW
02 ☐ STOPPING PERSON	17 ☐ FLAT TIRE	YEAR	STATE	TAG NUMBER	
03 ☐ HOUSE CHECK 61	18 ☐ VEH. BROKE DOWN	10-6	10-8		
04 ☐ BUSINESS CHECK	19 ☐ RADIO REPAIR				
05 ☐ SERVING WANT.	20 ☐ CITY COURT	REMARKS Sig 10			
06 ☐ SERVING SUBP.	21 ☐ CRIM. COURT				
07 ☐ FOLLOW UP INV.	22 ☐ J.P. COURT				
08 ☐ STATION ASSMT.	23 ☒ JUV. COURT				
09 ☐ REPORT WRITING	24 ☐ SOL. OFFICE				
10 ☐ TRANSP. PRISONER	25 ☐ ESCORT				
11 ☐ BOOKING PRISONER	26 ☐ LV. CITY LIMITS				
12 ☐ COFFEE BREAK	27 ☑ OTHER				
13 ☐ MEALS	28 ☐ CHECK VEH. REG.				
14 ☐ PERS. NECESSITY	29 ☐ CHECK FOR WANT				
15 ☐ MEETING UNIT	30 ☐ 10-7				

602-09 STATUS CARD OPD

Back View

JUL 25 10:09

ANSWER FORMS

SITUATION 2

Front View

ORLANDO, FLORIDA

☐ ABANDON AUTO ☐ JUVENILE CASE
☑ ACCIDENT AUTO ☐ LARCENY
☐ ALARM ☐ MENTAL CASE
☑ AMBULANCE RUN ☐ MISSING PERSON
☐ ANIMAL CASE ☐ OPEN-DOOR/WINDOW
☐ ASSAULT ☐ PROPERTY CASE

UNIT ASSD. | OFFICER | CASE NUMBER 86147A

CODE OF COMPLAINT: ☑ EMERGENCY ☐ SEMI-EMERGENCY ☐ NON-EMERGENCY ☐ SERVICE ☐ IN PROGRESS ☐ ATTEMPT

TIME RECEIVED	10-51	10-6	10-8
JUL 25 10:33	JUL 25 10:33		

☐ BAD CHECK ☐ PROWLER
☐ BREAK & ENTER ☐ ROBBERY
☐ DEATH REPORT ☐ SEE COMPL.
☐ DISORDERLY ☐ SERVICE
☐ DRUNK ☐ SEX OFFENSE
☐ ESCORT ☐ STOLEN AUTO
☐ FAMILY TRBL. ☐ SUSPICIOUS
☐ FIGHT ☐ TOW IN
☐ FIRE ALARM ☐ TRAFFIC
☐ FIREARM VIO. ☐ VANDALISM
☐ HOUSE CHECK ☐ WARRANT
☐ OTHER (optional) : OFD, OUC 10-51

LOCATION OF EVENT: N/W Corner Conway and Griffin Rd. | DISTRICT 36
DATE OF EVENT | TIME OF EVENT | RECEIVED BY: F. Wilcoxson
REPORTED BY: Joe Jones | PHONE NO 424-2486
ADDRESS: Station Attendent
☑ TELEPHONE ☐ PERSON ☐ MAIL ☐ TELETYPE ☐ RADIO ☐ OTHER
NR - Report
In gas station lines down

602-03 COMPLAINT OPD

Back View

Any additional pertinent information

ANSWER FORMS

SITUATION 3

Front View

ORLANDO, FLORIDA — COMPLAINT — 602-03

☐ABANDON AUTO ☐ACCIDENT AUTO ☐ALARM ☐AMBULANCE RUN ☐ANIMAL CASE ☐ASSAULT ☐JUVENILE CASE ☐LARCENY ☐MENTAL CASE ☐MISSING PERSON ☐OPEN DOOR/WINDOW ☐PROPERTY CASE

UNIT ASSD. | OFFICER | CASE NUMBER 86146A

CODE OF COMPLAINT: ☑EMERGENCY ☐SEMI-EMERGENCY ☐NON-EMERGENCY ☐SERVICE

☑IN PROGRESS ☐ATTEMPT

TIME RECEIVED	10-51	10-6	10-8
JUL 25 10:46	JUL 25 10:46		

☐BAD CHECK ☐BREAK & ENTER ☐DEATH REPORT ☐DISORDERLY ☐DRUNK ☐ESCORT ☐FAMILY TRBL. ☐FIGHT ☐FIRE ALARM ☐FIREARM VIO. ☐HOUSE CHECK ☐OTHER 29-0 (optional)

☐PROWLER ☑ROBBERY ☐SEE COMPL. ☐SERVICE ☐SEX OFFENSE ☐STOLEN AUTO ☐SUSPICIOUS ☐TOW IN ☐TRAFFIC ☐VANDALISM ☐WARRANT

LOCATION OF EVENT: 7-11 at Princeton and Dade | DISTRICT: 22

DATE OF EVENT | TIME OF EVENT | RECEIVED BY: FW

REPORTED BY: John Smith | PHONE NO: 849-2444

ADDRESS: Manager

☑TELEPHONE ☐TELETYPE ☐PERSON ☐RADIO ☐MAIL ☐OTHER

B/M 20's, 6', 180 lbs., Lt blue shirt, Blk pants, 1 w/m 20's, 5'6", 130 lbs. shoulder length brown hair, gray T-shirt, dirty and ragged blue jeans, Heading west on Princeton in late model yellow sport car, 7-unk. Sig. 0 with revolvers.

Back View

REQUISITE CURRICULUM FOR CIVILIANS

The courses listed below are considered necessary requisites in curriculum for civilain Complaint Desk personnel by the Orlando Police Department

Introduction to Law Enforcement

Objectives:

- o Philosophical difference between natural law and human law.
- o Brief history of law enforcement from acient to modern times, with an emphasis on law enforcement development in the U. S.
- o A presentation of the legal limitations on a democratic society, and reflection upon some major enforcement problems.
- o Listing of the major and related agencies of law enforcement.
- o Delineation of the basic processes of justice.
- o Evaluating the current position of law enforcement.

Ethics and Professionalization

Objectives:

- o To introduce the true meaning of Ethical Conduct as it applies to law enforcement
- o To point out the enforcement that accompanies the Law Enforcement Code of Ethics.
- o To cover in detail the Law Enforcement Code of Ethics.

How to Find the Law

Objectives:

- o To explain the various legal reference text and publications to enable the police personnel to locate laws and cases.

Human Relations

Objectives:

- o To define and explain the role of human relations.
- o To relate human relations with the police profession.
- o To explain the attitudes and emotions that effect human relations.
- o To explain the moral aspects of law enforcement.
- o To introduce the student to the various changes taking place in society.

Public Relations

Objectives:

- o To define and explain police public relations.
- o To emphasize the importance of favorable public relations and the importance of maintaining a favorable image.
- o To illustrate the results of both good and poor public relations.

Police and Minority Groups

Objectives:

- o To isolate and identify specific groups, explaining their social background and customs.
- o To explain and justify the positions of minorities.
- o Minorities opinions toward police.
- o To illustrate steps police must take to gain confidence of minorities.

Social Agencies Services

Objectives:

- o To orient police personnel with the various state and local social agencies and their various services
- o To relate these services to the role of the officer.

Domestic Complaints

Objectives:

- o To orient police personnel to the need in answering domestic complaints; reference State Statutes 85.19 and 509.141
- o To equip the officer with the proper procedure and/or recommendations to handle domestic complaints.

Prowler and Distribance Calls

Objectives:

- o To orient police personnel to the need and proper method of answering prowler calls.
- o To introduce the various operational techniques to follow when answering the call.
- o To explain the various search procedures involved with these type calls.

Constitutional Law

Objectives:

- o To familiarize police personnel with the purposes of the state's Constitutional Law.
- o To briefly examine those cases whose results concern police personnel.
- o To establish a foundation for the study of Criminal Law.

Criminal Law

Objectives:

- o To familiarize police personnel with the origins, sources, development, and purposes of the Criminal Law.
- o To cover Florida law relating to criminal acts with emphasis on elements of crimes, parties to crimes, and the specific statutory sections most used by police.
- o To examine constitutional limitations and special problems excountered as a result of significant court decisions and case law.
- o To discuss some legal theory, as well as the practical applications of such theory to enable the student to better appreciate the laws he is sworn to enforce.

Social Agencies Services

Objectives:

- o To orient police personnel with the various state and local social agencies and their various services
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TABLE 33

RESULTS FROM ADMINISTERING THE

MYERS-BRIGGS TYPE INDICATOR

PSYCHOLOGICAL EXAM TO

FIVE PROFICIENT

COMPLAINT OFFICERS

	Profile Type							
Officer	E	I	S	N	T	F	J	P
1	x		x		x			x
2	x		x		x		x	
3	x		x		x		x	
4	x		x		x			x
5	x		x		x		x	
Total	5	0	5	0	5	0	3	2

The preferable profile for the Complaint Desk Officer is E - S - T - P.

Application of Churchman's Procedure 1 for Weighting Objectives to the Quantification of Evaluation Criteria

1. The Supervisor of the Command/Control Center was asked to rank the four evaluation criteria in order of importance. The Supervisor's ranking was:

   0_1 = Information Accuracy

   0_2 = Form Completion Time

   0_3 = Decision Capability

   0_4 = Tactfulness

2. The tentative value of 1.00 was assigned to the most valued outcome 0_1. The Supervisor was asked to assign values that initially seemed to reflect their relative values to the others. These tentative values v_i are considered as first estimates of the true value V_i. The value assignments made was:

   0_1 v_1 = 1.00

   0_2 v_2 = .90

   0_3 v_3 = .80

   0_4 v_4 = .80

3. Now the evaluator was questioned on the following comparisons:

   If you had a choice of using either criteria 0_1 or the combination of 0_2, 0_3, and 0_4 which would you select? i.e. 0_1 vs 0_2, 0_3, 0_4. Evaluator's response was "neither is preferred over the other." Therefore no value adjustments are necessary in the v_i.

4. The evaluator was next asked to compare in the same manner 0_2 vs 0_3 and 0_4. Evaluator's response was "neither is preferred over the other." Again, no adjustments in the v_i were necessary.

5. The evaluator was finally asked to compare 0_3 vs 0_4. Evaluator's response was "0_3 is preferred over 0_4. Now v_3 must be adjusted to conform to the assumption v_3 v_4. Therefore v_3 is assigned the value .85.

6. The evaluations are now completed. The final values of v_i were normalized to obtain the weighting coefficients as follows:

		Normalized
v_1 = 1.00		$V_1 = \frac{1.00}{3.55} = .282$
v_2 = .90		$V_2 = \frac{.90}{3.55} = .254$
v_3 = .85		$V_3 = \frac{.85}{3.55} = .239$
v_4 = .80		$V_4 = \frac{.80}{3.55} = .225$
3.55		1.000

Thus, the final rankings were found to be

Item	Relative Importance (weight)
0_1	.28
0_2	.25
0_3	.24
0_4	.23
	1.00

Application of Nightengale's Method of Making Decisions under Uncertainty to the Quantification of Evaluation Criteria

The OPD has three people who are very proficient, or expert, in the field of Complaint Desk operations. These people were asked to subjectively rank the four effectiveness criteria in the order of their importance to performance evaluation. The results are shown in the table below.

A = Form Completion Time
B = Information Accuracy
C = Tactfulness
D = Decision Capability

		CRITERIA			
		A	B	C	D
Expert	1	2	1	4	3
	2	3	1	2	4
	3	2	1	4	3

MATRIX A

i \ j	A	B	C	D	Row Totals
A	X	0	2	3	5
B	3	X	3	3	9
C	1	0	X	1	2
D	0	0	2	X	2

The cell entries in Matrix A represent the number of times criteria i was judged more important than criteria j.

MATRIX P

i \ j	A	B	C	D	Row Totals
A	X	0	.67	1.00	1.67
B	1.00	X	1.00	1.00	3.00
C	.333	0	X	.333	.67
D	0	0	.67	X	.67

The cell entries in Matrix P represent the percentage of times criteria i was judged more important then criteria j.

MATRIX Z

Sample Calculation: G(Z) - .333, Z= -.43 from Normal Table

	A	B	C	D	Total	Mean($\bar{Z}$)
B	4.3	0	4.3	4.3	12.90	3.20
A	0	0	.44	4.3	4.74	1.18
C	-.43	0	0	-.43	-.86	-.22
D	0	0	.44	0	.44	.11

Matrix Z is used to convert Matrix P into standard measurements of separation in terms of the equal standard deviations of the discriminal dispersion scale. A normal distribution table is used to accomplish this task. In this matrix the rows are arranged in decending order of percentages.

ASSIGNMENT OF PROBABILITIES (WEIGHTS)

	Z	G(Z)
$\bar{Z}_B$	3.20	.9993
$\bar{Z}_A$	1.18	.8800
$\bar{Z}_C$	-.22	.4150
$\bar{Z}_D$	.11	.5430
		2.8373

$$B \quad \frac{.9993}{2.8373} = .35$$

$$A \quad \frac{.8800}{2.8373} = .30$$

$$D \quad \frac{.5430}{2.8373} = .20$$

$$C \quad \frac{.4150}{2.8373} = \frac{.15}{1.00}$$

The order of importance and relative weights have been determined as follows:

Criteria B .35

Criteria A .30

Criteria D .20

Criteria C .15

APPENDIX E

PERFORMANCE EVALUATION SHEETS

PERFORMANCE STANDARDS AND EXAMINEE EVALUATION SHEET

EXAMINEE #1

Situation 1

	Possible Score	Examinee Score
A. Information Accuracy		
. Used correct form, 602-09	5 ✓	
. Necessary data entries (0 points if entry was omitted or entry was incorrect):		
Unit number (435)	5 ✓	
District number (88)	5 ✓	
Officer's initials	5 X	
Signal 10 in REMARKS	5 ✓	
OTHER block checked	5 ✓	
Time stamped on back of card	5 ✓	
Total	=35	30

B. Form Completion Time

Grading Scale: μ = 13.3 sec, σ = 1.9 sec

If:	Score
Examinee's time ≤ 15.2 sec	30 ✓
15.3 sec ≤ Examinee's time ≤17.1 sec	20
17.2 sec ≤ Examinee's time ≤19.0 sec	10
Examinee's time ≥ 19.1 sec	0

12 sec.

Total	30	30

C. Decision Capability

Necessary decisions:
(None for this situation)

Total	20	20

D. Tactfulness

Scale:

Subjective Rating	Score
Excellent	15 ✓
Good	10
Fair	5
Poor	0

Total	15	15

Total possible = 100 Examinee Total = 95

PERFORMANCE STANDARDS AND EXAMINEE EVALUATION SHEET

Situation 2

	Possible Score	Examinee Score
A. Information Accuracy		
Used correct form, 602-03	2.5 ✓	
Necessary data entries (0 points if entry was omitted or incorrect)		
ACCIDENT AUTO block checked	2.5 ✓	
Either AMBULANCE RUN block checked or 37 in space named OTHER	2.5 ✓	
EMERGENCY blocked checked	2.5 ✓	
Location of Event properly filled in	2.5 ✓	
District number	2.5 ✓	
Officer's initials	2.5 ✓	
Complainant's name	2.5 ✓	
Complainant's phone number	2.5 ✓	
Complainant's address	2.5 X	
TELEPHONE block checked	2.5 ✓	
Time received stamped	2.5 ✓	
Time of unit dispatch stamped	2.5 ✓	
Any additional information which may be pertinent	2.5	
Total	35	32.5

B. Form Completion Time

Grading Scale: μ = .51 min., σ = .10 min

If:	Score
Examinee's time ≤ .61 min	30 ✓
.62 ≤ Examinee's time ≤ .71 min	20
.72 ≤ Examinee's time ≤ .81 min	10
Examinee's time ≥ .82 min.	0

.42 min.

Total	30	30

C. Decision Capability

Necessary decisions:

Dispatch police unit immediately	3 ✓	
Call ambulance	5 ✓	
Notify OFD	9 ✓	
Notify Orlando Utilities	3 ✓	
Total	20	20

D. Tactfulness

Scale:

Subjective Rating	Score
Excellent	15 ✓
Good	10
Fair	5
Poor	0

Total	15	15
Total Possible	100	Exam. T1=97.5

PERFORMANCE STANDARDS AND EXAMINEE EVALUATION SHEET

Situation 3

	Possible Score	Examinee Score
A. Information Accuracy		
Used correct form, 602-03	1.4 ✓	
Necessary data entries:		
EMERGENCY block checked	2.4 ✓	
IN PROGRESS block checked	2.4 X	
ROBBERY block checked	2.4 ✓	
Location of event	2.4 ✓	
District number	2.4 ✓	
Officer's initials	2.4 ✓	
Complainant's name	2.4 ✓	
Complainant's phone number	2.4 ✓	
Complainant's address	2.4 ✓	
TELEPHONE block checked	2.4 ✓	
29-0 in OTHER space	2.4 X	
Time received stamped	2.4 ✓	
Time of dispatch stamped	2.4 ✓	
Any additional data	2.4 X	
Total	35	27.8

B. Form Completion Time

Grading Scale: μ = .33 min., σ = .06 min.

If:	Score
Examinee's time ≤ .39 min	30 ✓
.40 min ≤ Examinee's time ≤ .45 min	20
.46 min ≤ Examinee's time ≤ .51 min	10
Examinee's time ≥ .52 min	0

.21 min.

Total	30	30

C. Decision Capability

Necessary decisions:

Determine it's an Emergency	8 ✓	
To notify Radio operator by turning on Emergency Light	10 ✓	
To question complaint on possible injuries	2 X	
Total	20	18

D. Tactfulness

Scale:

Subjective Rating	Score
Excellent	15 ✓
Good	10
Fair	5
Poor	0

Total	15	15
Total Possible	100	Exam. Tl = 90.8

PERFORMANCE STANDARDS AND EXAMINEE EVALUATION SHEET

Situation 1 EXAMINEE #2

	Possible Score	Examinee Score
A. Information Accuracy		
. Used correct form, 602-09	5 ✓	
. Necessary data entries (0 points if entry was omitted or entry was incorrect):		
Unit number (435)	5 ✓	
District number (88)	5 ✓	
Officer's initials	5 X	
Signal 10 in REMARKS	5 ✓	
OTHER block checked	5 ✓	
Time stamped on back of card	5 ✓	
Total	= 35	30

B. Form Completion Time

Grading Scale: μ = 13.3 sec, σ = 1.9 sec

If:	Score
Examinee's time ≤ 15.2 sec	30 ✓
15.3 sec ≤ Examinee's time ≤ 17.1 sec	20
17.2 sec ≤ Examinee's time ≤ 19.0 sec	10
Examinee's time ≥ 19.1 sec	0

14.1 sec.

Total	30	30

C. Decision Capability

Necessary decisions:

(None for this situation)

Total	20	20

D. Tactfulness

Scale:

Subjective Rating	Score
Excellent	15 ✓
Good	10
Fair	5
Poor	0

Total	15	15

Total possible = 100 Examinee Total = 95

PERFORMANCE STANDARDS AND EXAMINEE EVALUATION SHEET

Situation 2

	Possible Score	Examinee Score
A. Information Accuracy		
Used correct form, 602-03	2.5 ✓	
Necessary data entries (0 points if entry was omitted or incorrect)		
ACCIDENT AUTO block checked	2.5 ✓	
Either AMBULANCE RUN block checked or 37 in space named OTHER	2.5 X	
EMERGENCY blocked checked	2.5 X	
Location of Event properly filled in	2.5 ✓	
District number	2.5 ✓	
Officer's initials	2.5 ✓	
Complainant's name	2.5 ✓	
Complainant's phone number	2.5 ✓	
Complainant's address	2.5 X	
TELEPHONE block checked	2.5 ✓	
Time received stamped	2.5 ✓	
Time of unit dispatch stamped	2.5 ✓	
Any additional information which may be pertinent	2.5 X	
Total	35	25

B. Form Completion Time

Grading Scale: μ = .51 min., σ = .10 min

If:	Score	
Examinee's time ≤ .61 min	30 ✓	.53 min.
.62 ≤ Examinee's time ≤ .71 min	20	
.72 ≤ Examinee's time ≤ .81 min	10	
Examinee's time ≥ .82 min.	0	
Total	30	30

C. Decision Capability

Necessary decisions:		
Dispatch police unit immediately	3 ✓	
Call ambulance	5 ✓	
Notify OFD	9 ✓	
Notify Orlando Utilities	3 X	
Total	20	17

D. Tactfulness

Scale:

Subjective Rating	Score	
Excellent	15 ✓	
Good	10	
Fair	5	
Poor	0	
Total	15	15
Total Possible	100	Exam. T1= 87

PERFORMANCE STANDARDS AND EXAMINEE EVALUATION SHEET

Situation 3

	Possible Score	Examinee Score
A. Information Accuracy		
Used correct form, 602-03	1.4 ✓	
Necessary data entries:		
EMERGENCY block checked	2.4 X	
IN PROGRESS block checked	2.4 X	
ROBBERY block checked	2.4 X	
Location of event	2.4 ✓	
District number	2.4 ✓	
Officer's initials	2.4 ✓	
Complainant's name	2.4 ✓	
Complainant's phone number	2.4 ✓	
Complainant's address	2.4 ✓	
TELEPHONE block checked	2.4 ✓	
29-0 in OTHER space	2.4 ✓	
Time received stamped	2.4 ✓	
Time of dispatch stamped	2.4 ✓	
Any additional data	2.4 ✓	
Total	35	27.8

B. Form Completion Time

Grading Scale: μ = .33 min., σ = .06 min.

If:	Score	
Examinee's time ≤ .39 min	30 ✓	.31 min
.40 min ≤ Examinee's time ≤ .45 min	20	
.46 min ≤ Examinee's time ≤ .51 min	10	
Examinee's time ≥ .52 min	0	
Total	30	30

C. Decision Capability

Necessary decisions:		
Determine it's an Emergency	8 X	
To notify Radio operator by turning on Emergency Light	10 X	
To question complaint on possible injuries	2 X	
Total	20	0

D. Tactfulness

Scale:

Subjective Rating	Score	
Excellent	15 ✓	
Good	10	
Fair	5	
Poor	0	
Total	15	15
Total Possible	100	Exam. T1= 77.8

PERFORMANCE STANDARDS AND EXAMINEE EVALUATION SHEET

Situation 1 EXAMINEE #_3

	Possible Score	Examinee Score
A. Information Accuracy		
. Used correct form, 602-09	5 ✓	
. Necessary data entries (0 points if entry was omitted or entry was incorrect):		
Unit number (435)	5 ✓	
District number (88)	5 ✓	
Officer's initials	5 X	
Signal 10 in REMARKS	5 ✓	
OTHER block checked	5 ✓	
Time stamped on back of card	5 ✓	
Total	= 35	30

B. Form Completion Time

Grading Scale: μ = 13.3 sec, σ = 1.9 sec

If:	Score	
Examinee's time ≤ 15.2 sec	30 ✓	15 sec
15.3 sec ≤ Examinee's time ≤ 17.1 sec	20	
17.2 sec ≤ Examinee's time ≤ 19.0 sec	10	
Examinee's time ≥ 19.1 sec	0	
Total	30	30

C. Decision Capability

Necessary decisions:

(None for this situation)

Total	20	20

D. Tactfulness

Scale:

Subjective Rating	Score	
Excellent	15 ✓	
Good	10	
Fair	5	
Poor	0	
Total	15	15

Total possible = 100 Examinee Total = 95

PERFORMANCE STANDARDS AND EXAMINEE EVALUATION SHEET

Situation 2

	Possible Score	Examinee Score
A. Information Accuracy		
Used correct form, 602-03	2.5 ✓	
Necessary data entries (0 points if entry was omitted or incorrect)		
ACCIDENT AUTO block checked	2.5 ✓	
Either AMBULANCE RUN block checked or 37 in space named OTHER	2.5 ✓	
EMERGENCY ↑ locked checked	2.5 ✓	
Location of Event properly filled in	2.5 ✓	
District number	2.5 ✓	
Officer's initials	2.5 ✓	
Complainant's name	2.5 ✓	
Complainant's phone number	2.5 ✓	
Complainant's address	2.5 ✓	
TELEPHONE block checked	2.5 ✓	
Time received stamped	2.5 ✓	
Time of unit dispatch stamped	2.5 ✓	
Any additional information which may be pertinent	2.5 ✓	
Total	35	35

B. Form Completion Time

Grading Scale: μ = .51 min., σ = .10 min

If:	Score	
Examinee's time ≤ .61 min	30 ✓	.59 min.
.62 ≤ Examinee's time ≤ .71 min	20	
.72 ≤ Examinee's time ≤ .81 min	10	
Examinee's time ≥ .82 min.	0	
Total	30	30

C. Decision Capability

Necessary decisions:

Dispatch police unit immediately	3 ✓	
Call ambulance	5 ✓	
Notify OFD	9 ✓	
Notify Orlando Utilities	3 ✓	
Total	20	20

D. Tactfulness

Scale:

Subjective Rating	Score	
Excellent	15 ✓	
Good	10	
Fair	5	
Poor	0	
Total	15	15
Total Possible	100	Exam. Tl= 100

PERFORMANCE STANDARDS AND EXAMINEE EVALUATION SHEET

Situation 3

	Possible Score	Examinee Score
A. Information Accuracy		
Used correct form, 602-03	1.4 ✓	
Necessary data entries:		
EMERGENCY block checked	2.4 ✓	
IN PROGRESS block checked	2.4 X	
ROBBERY block checked	2.4 ✓	
Location of event	2.4 ✓	
District number	2.4 ✓	
Officer's initials	2.4 ✓	
Complainant's name	2.4 ✓	
Complainant's phone number	2.4 ✓	
Complainant's address	2.4 ✓	
TELEPHONE block checked	2.4 ✓	
29-0 in OTHER space	2.4 ✓	
Time received stamped	2.4 ✓	
Time of dispatch stamped	2.4 ✓	
Any additional data	2.4 ✓	
Total	35	32.6

B. Form Completion Time

Grading Scale: μ = .33 min., σ = .06 min.

If:	Score	
Examinee's time ≤ .39 min	30 ✓	.38 MIN.
.40 min ≤ Examinee's time ≤ .45 min	20	
.46 min ≤ Examinee's time ≤ .51 min	10	
Examinee's time ≥ .52 min	0	
Total	30	30

C. Decision Capability

Necessary decisions:

Determine it's an Emergency	8 ✓	
To notify Radio operator by turning on Emergency Light	10 ✓	
To question complaint on possible injuries	2 X	
Total	20	18

D. Tactfulness

Scale:

Subjective Rating	Score	
Excellent	15 ✓	
Good	10	
Fair	5	
Poor	0	
Total	15	15
Total Possible	100	Exam. Tl = 95.6

PERFORMANCE STANDARDS AND EXAMINEE EVALUATION SHEET

Situation 1 EXAMINEE #4

	Possible Score	Examinee Score
A. Information Accuracy		
. Used correct form, 602-09	5 ✓	
. Necessary data entries (0 points if entry was omitted or entry was incorrect):		
Unit number (435)	5 X	
District number (88)	5 ✓	
Officer's initials	5 ✓	
Signal 10 in REMARKS	5 ✓	
OTHER block checked	5 ✓	
Time stamped on back of card	5 ✓	
Total	= 35	30

B. Form Completion Time

Grading Scale: μ = 13.3 sec, σ = 1.9 sec

If:	Score	
Examinee's time ≤ 15.2 sec	30 ✓	12 SEC
15.3 sec ≤ Examinee's time ≤ 17.1 sec	20	
17.2 sec ≤ Examinee's time ≤ 19.0 sec	10	
Examinee's time ≥ 19.1 sec	0	
Total	30	30

C. Decision Capability

Necessary decisions:

(None for this situation)

Total	20	20

D. Tactfulness

Scale:

Subjective Rating	Score	
Excellent	15 ✓	
Good	10	
Fair	5	
Poor	0	
Total	15	15

Total possible = 100 Examinee Total = 95

PERFORMANCE STANDARDS AND EXAMINEE EVALUATION SHEET

Situation 2

	Possible Score	Examinee Score
A. Information Accuracy		
Used correct form, 602-03	2.5	✓
Necessary data entries (0 points if entry was omitted or incorrect)		
ACCIDENT AUTO block checked	2.5	✓
Either AMBULANCE RUN block checked or 37 in space named OTHER	2.5	✓
EMERGENCY blocked checked	2.5	X
Location of Event properly filled in	2.5	✓
District number	2.5	✓
Officer's initials	2.5	X
Complainant's name	2.5	✓
Complainant's phone number	2.5	✓
Complainant's address	2.5	✓
TELEPHONE block checked	2.5	✓
Time received stamped	2.5	✓
Time of unit dispatch stamped	2.5	X
Any additional information which may be pertinent	2.5	X
Total	35	27.5

B. Form Completion Time

Grading Scale: μ = .51 min., σ = .10 min

If:	Score	
Examinee's time ≤ .61 min	30	✓
.62 ≤ Examinee's time ≤ .71 min	20	
.72 ≤ Examinee's time ≤ .81 min	10	
Examinee's time ≥ .82 min.	0	
Total	30	30

.58 min.

C. Decision Capability

Necessary decisions:

Dispatch police unit immediately	3	✓
Call ambulance	5	✓
Notify OFD	9	✓
Notify Orlando Utilities	3	X
Total	20	17

D. Tactfulness

Scale:

Subjective Rating	Score	
Excellent	15	✓
Good	10	
Fair	5	
Poor	0	
Total	15	15
Total Possible	100	Exam. T1=89.5

PERFORMANCE STANDARDS AND EXAMINEE EVALUATION SHEET

Situation 3

	Possible Score	Examinee Score
A. Information Accuracy		
Used correct form, 602-03	1.4	✓
Necessary data entries:		
EMERGENCY block checked	2.4	X
IN PROGRESS block checked	2.4	X
ROBBERY block checked	2.4	✓
Location of event	2.4	✓
District number	2.4	✓
Officer's initials	2.4	X
Complainant's name	2.4	✓
Complainant's phone number	2.4	✓
Complainant's address	2.4	✓
TELEPHONE block checked	2.4	✓
29-0 in OTHER space	2.4	✓
Time received stamped	2.4	✓
Time of dispatch stamped	2.4	X
Any additional data	2.4	✓
Total	35	25.4

B. Form Completion Time

Grading Scale: μ = .33 min., σ = .06 min.

If:	Score	
Examinee's time ≤ .39 min	30	
.40 min ≤ Examinee's time ≤ .45 min	20	✓
.46 min ≤ Examinee's time ≤ .51 min	10	
Examinee's time ≥ .52 min	0	
Total	30	20

.42 min

C. Decision Capability

Necessary decisions:

Determine it's an Emergency	8	✓
To notify Radio operator by turning on Emergency Light	10	✓
To question complaint on possible injuries	2	X
Total	20	18

D. Tactfulness

Scale:

Subjective Rating	Score	
Excellent	15	✓
Good	10	
Fair	5	
Poor	0	
Total	15	15
Total Possible	100	Exam. T1=78.4

PERFORMANCE STANDARDS AND EXAMINEE EVALUATION SHEET

Situation 1 — EXAMINEE #5

	Possible Score	Examinee Score
A. Information Accuracy		
. Used correct form, 602-09	5 ✓	
. Necessary data entries (0 points if entry was omitted or entry was incorrect):		
Unit number (435)	5 X	
District number (88)	5 ✓	
Officer's initials	5 ✓	
Signal 10 in REMARKS	5 ✓	
OTHER block checked	5 ✓	
Time stamped on back of card	5 ✓	
Total	=35	30

B. Form Completion Time

Grading Scale: μ = 13.3 sec, σ = 1.9 sec

If:	Score	
Examinee's time ≤ 15.2 sec	30	
15.3 sec ≤ Examinee's time ≤ 17.1 sec	20	
17.2 sec ≤ Examinee's time ≤ 19.0 sec	10	24 sec
Examinee's time ≥ 19.1 sec	0 ✓	
Total	30	0

C. Decision Capability

Necessary decisions:

(None for this situation)

Total	20	20

D. Tactfulness

Scale:

Subjective Rating	Score	
Excellent	15 ✓	
Good	10	
Fair	5	
Poor	0	
Total	15	15

Total possible = 100 — Examinee Total = 65

PERFORMANCE STANDARDS AND EXAMINEE EVALUATION SHEET

Situation 2

	Possible Score	Examinee Score
A. Information Accuracy		
Used correct form, 602-03	2.5 ✓	
Necessary data entries (0 points if entry was omitted or incorrect)		
ACCIDENT AUTO block checked	2.5 ✓	
Either AMBULANCE RUN block checked or 37 in space named OTHER	2.5 ✓	
EMERGENCY blocked checked	2.5 ✓	
Location of Event properly filled in	2.5 ✓	
District number	2.5 ✓	
Officer's initials	2.5 ✓	
Complainant's name	2.5 ✓	
Complainant's phone number	2.5 ✓	
Complainant's address	2.5 ✓	
TELEPHONE block checked	2.5 ✓	
Time received stamped	2.5 ✓	
Time of unit dispatch stamped	2.5 ✓	
Any additional information which may be pertinent	2.5 ✓	
Total	35	35

B. Form Completion Time

Grading Scale: μ = .51 min., σ = .10 min

If:	Score	
Examinee's time ≤ .61 min	30	
.62 ≤ Examinee's time ≤ .71 min	20 ✓	.62 MIN
.72 ≤ Examinee's time ≤ .81 min	10	
Examinee's time ≥ .82 min.	0	
Total	30	20

C. Decision Capability

Necessary decisions:

Dispatch police unit immediately	3 ✓	
Call ambulance	5 ✓	
Notify OFD	9 ✓	
Notify Orlando Utilities	3 ✓	
Total	20	20

D. Tactfulness

Scale:

Subjective Rating	Score	
Excellent	15 ✓	
Good	10	
Fair	5	
Poor	0	
Total	15	15
Total Possible	100	Exam. Tl = 90

PERFORMANCE STANDARDS AND EXAMINEE EVALUATION SHEET

Situation 3

	Possible Score	Examinee Score
A. Information Accuracy		
Used correct form, 602-03	1.4	1.4 ✓
Necessary data entries:		
EMERGENCY block checked	2.4	2.4 ✓
IN PROGRESS block checked	2.4	2.4 X
ROBBERY block checked	2.4	2.4 ✓
Location of event	2.4	2.4 ✓
District number	2.4	2.4 ✓
Officer's initials	2.4	2.4 ✓
Complainant's name	2.4	2.4 ✓
Complainant's phone number	2.4	2.4 ✓
Complainant's address	2.4	2.4 ✓
TELEPHONE block checked	2.4	2.4 ✓
29-0 in OTHER space	2.4	2.4 ✓
Time received stamped	2.4	2.4 ✓
Time of dispatch stamped	2.4	2.4 ✓
Any additional data	2.4	2.4 ✓
Total	35	37.8

B. Form Completion Time

Grading Scale: μ = .33 min., σ = .06 min.

If:	Score
Examinee's time ≤ .39 min	30
.40 min ≤ Examinee's time ≤ .45 min	20
.46 min ≤ Examinee's time ≤ .51 min	10 ✓
Examinee's time ≥ .52 min	0
Total	30 / 10

.51 min

C. Decision Capability

Necessary decisions:

Determine it's an Emergency	8 ✓
To notify Radio operator by turning on Emergency Light	10 ✓
To question complaint on possible injuries	2 X
Total	20 / 18

D. Tactfulness

Scale:

Subjective Rating	Score
Excellent	15 ✓
Good	10
Fair	5
Poor	0
Total	15 / 15

Total Possible 100 Exam. T1=75.6

EMPLOYMENT HISTORY DATA FOR CIVILIANS

HIRED AND TERMINATED IN OPD

COMMUNICATIONS FROM

8 - 70 TO 8 - 72

Job	No. Hired	No. Terminated	No. Remaining	Average Length Of Employment For Those Terminated	Percent Terminated
Desk	8	5	3	3.7 mo.	62.5%
Teletype	9	5	4	8.3 mo.	55.5%
Radio	3	2	1	9.8 mo.	66.7%
TOTAL	20	12	8	6.6 mo.	60.0%

SUMMARY OF REASONS FOR TERMINATION

Job	Asked To Resign	Personal Problems	Another Job Offer	Transfered Within OPD	Employee Married A Policeman	TOTAL
Desk	1	2	1	1	0	5
Teletype	2	0	2	0	1	5
Radio	0	0	1	0	1	2
TOTAL	3	2	4	1	2	= 12
%	25%	17%	33%	8%	17%	= 100%

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