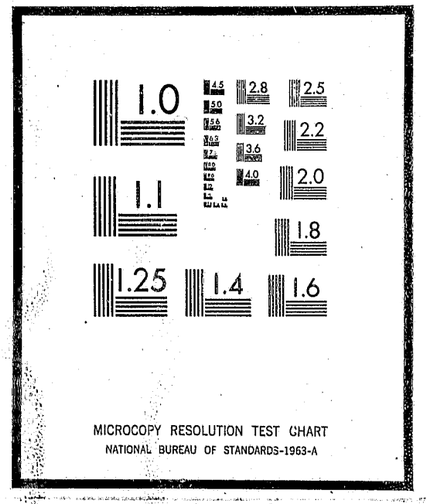

LAW ENFORCEMENT ASSISTANCE ADMINISTRATION (LEAA)

POLICE TECHNICAL ASSISTANCE REPORT

SUBJECT	Communications: Automated Command Control System Acceptance Tests
REPORT NUMBER	75-108-026
FOR	Las Vegas Metropolitan Police Department
	Population: 273,288
	Police Strength (Sworn): 725
	Square Mile Area: 7,874

CONTRACTOR	Public Administration Service 1776 Massachusetts Avenue Northwest Washington, D.C. 20036
CONSULTANT	Walter J. Wiseman
CONTRACT NUMBER	J-LEAA-002-76
DATE	January 30, 1976

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II. Command Benchmark Data

FOREWARD

Technical Assistance was provided to the Las Vegas Metropolitan Police Department (LVMPD) during the acceptance testing of an Automated Command Control System (ACCS). The ACCS consists of a computer, complaint and dispatch console equipments, mobile digital terminals, and interconnections to a local data base computer, and NCIC. Assistance consisted of direction, observation, and conclusions regarding the acceptance tests, and the conducting of other timing tests to validate specified results.

I. INTRODUCTION

Las Vegas Metropolitan Police Department has been engaged in the development and implementation of an Automated Command Control System. This effort is nearing completion. The prime contractor of equipment and services, according to the contract, submitted test criteria for the acceptance testing of the system. LVMPD approved these criteria, scheduled the testing for December 1, 1975 through December 11, 1975 inclusive, and requested technical assistance from Public Administration Service/Law Enforcement Assistance Administration during the conduct of these tests.

The Automated Command Control System consists of two major portions:

1) Communications Center Portion
This portion is a computer-assisted dispatching system consisting of a mini-computer, complaint consoles, dispatch consoles, and interfaces to the public (telephone) and to data base (local and national).

2) Field Portion
This portion consists of mobile digital terminals in the LVMPD vehicles which provide the capability to send and receive dispatches and messages, and to retrieve information from data bases (local and national).

Technical Assistance required a knowledge of, and experience with, similar systems, the test criteria, LVMPD dispatch and field operations, the system specifications, prime contract, and familiarity with the specific equipments and services provided by the contractor.

Persons interviewed and/or contacted during the assignment include:

Assistant Sheriff Bart Jacka
Deputy Chief Ray Gubser
Deputy Chief Wm. Witte
Commander L. Katzenberger
Lieutenant Willis
Sergeant Robert Thimsen

Officers: Geo. Kincer
Wally Johnson
Dan Davis
Bernard Elvin
Brenda Parker

Communications Specialist, Mary Jean Schaub
Kustom Data Communications, Inc., Dana Brown

II. UNDERSTANDING OF THE PROBLEM

The overall objectives of the acceptance testing was to verify that the prime contractor had provided the equipments and services required by the contract, and that the completed system operated in the manner specified by the contract and the approved test criteria. The acceptance testing was to be conducted during normal automated operations, and in a manner which minimized conflict with, or disruption of, normal operations in the communications center and the field.

The test criteria specified that the acceptance testing would commence on December 1, 1975 at 9:00 A.M. PST, and complete on December 11, 1975 at 8:00 A.M. PST (ten 24-hour days of continuous operation). These criteria were divided into inventorying (equipments, programs, etc.) and operating (commands, timings, etc.) requirements to be verified during the test period.

Review of those criteria established for the execution times (Average Mean Times and Standard Deviations) did not provide for operational environment results. Therefore, a series of timing tests similar to actual operations in the communications center and the field were constructed, and conducted during the test period. In addition, normalizing data was collected at intervals so as to detect any bias caused by or affecting these timing tests. The timing tests also provided a more significant sample with which to verify the command execution times than was provided for in the acceptance criteria.

A copy of the Timing Tests explanation and Data Collection sheets is appended hereto.

III. ANALYSIS OF THE PROBLEM

The acceptance testing proceeded successfully throughout the ten 24-hour days of operation, and the timing tests were conducted periodically during four 8-hour shifts to closely approximate day, night, and midnight shift operations during heavy and light usage. The data core collected in a manner constructed to minimize conflict with or disruption of normal operations. The actual timing tests were conducted by two persons acting as a team; an operator who would enter commands, data, etc., at a complaint console, dispatch console, or a mobile digital terminal, and a data collection form. The normalizing data was collected in a similar manner interspersed with the timing tests.

The timing tests were performed on equipment (consoles and mobile digital terminals) which were not involved in the actual operations of the center or field units. This procedure was adopted so that testing and data collection could not interfere with actual operations, but would still experience the usage factor of actual operations. Similarly, the normalizing data were collected by operating equipments not used in actual operating in free-form scenario fashion.

On occasions interruptions in system operation, data base interface, communications medium, etc., caused obvious "no-sample" conditions, but these occasions were rare. In each case, however, the interruption or condition was noted on the data collection sheets so that analysis could account for these anomolies.

The bias detected by the normalizing data is not directly related to each and every command included in the timing tests because the "free-form scenario" did not include each and every command, or because a command did not appear enough times to represent a fair sample to demonstrate bias.

Finally, the Timing Tests commands structure emulated actual operations at a complaint console, dispatch console, and mobile digital terminal. While the structure

attempted to simulate actual operations (commands, sequences, etc.) it must be remembered that actual operations proceed at a much faster pace, are more complex, and represent a more stringent usage or loading of the system. The normalizing data, which could be conducted and collected in a manner more nearly approximating actual operating complexity and speed, shows this factor. In spite of the fact that timing tests represented additional usage, above and beyond the concurrent normal operations, the system appeared to perform better, faster than predicted. The normalizing data counteracts this by adding positive bias to those figures.

IV. FINDINGS AND CONCLUSIONS

The inventory of equipment, software routines, and functions performed during the test period verified that these items had been supplied by the prime contractor. In addition, an inventory of commands utilized at the complaint consoles, dispatch consoles, and mobile digital terminals verified that these command existed, were operable, and performed the functions specified. The inventory of commands did not attempt to verify the average mean time or standard deviation associated with each command.

The level of effectiveness criteria of 95 per cent for the communications center portion of the system was met. There was some difficulty in determining whether or not the level of effectiveness of 80 per cent for the mobile digital communications portion was met. The difficulty arose because of an insufficient number of field personnel trained in the use of the terminals, and therefore, a number of terminals in use which was less than specified in the test criteria. Extra measures were taken to assure that usage of the mobile communications portion of the system was a fair test of their capabilities.

The level of effectiveness results were computed and recorded at 8:00 A.M. PST each day of the testing for the previous 24-hour periods. Both portions of the Automated Command Control System met these criteria as absolute value measurements of periodic (daily) and cumulative (10 days) performance. Despite these results, the system exhibited a major performance problem. The computer experienced stoppages or halts on the average 10-12 times during each 24-hour period during the 10 day tests. Each time this condition happened, the communications center operations revert to manual, the computer is re-started, and automated operations resumed. While these computer stoppages, or outages, were small time increments (i.e., two to three minutes each) and were insignificant in the computation of level of effectiveness figures, their disruptive effect in

the communications center (i.e., reverting to manual operation) is intolerable in the long run.

The results of the timing tests served to verify that the execution times specified (i.e., mean average and standard deviation times) for both the communications center and mobile communications portions of the system were met. In summary, the acceptance testing was conducted in a professional manner, and the results show that the LVMPD Automated Command Control System meets or exceeds specifications and the approved test criteria with some exceptions.

It appears that the system operates in a superior manner particularly when compared with other law enforcement computer-assisted dispatch systems. This observation is particularly important when considering that the LVMPD system combines both communications center, and mobile digital communications in a single system.

V. RECOMMENDATIONS

The acceptance tests demonstrated that the LVMPD Automated Command Control System meets or exceeds specified criteria with some exception. Acceptance can proceed on a conditional basis. The effective date of acceptance can be that of testing completion (i.e., December 11, 1975) if the prime contractor satisfies all conditions according to an acceptable schedule. Acceptance would not, however, be complete until the remedial work is completed to the satisfaction of LVMPD.

It is recommended that conditions to acceptance include:

1) Reduce frequency of system stoppages and restarts to a maximum of two per 24-hour period by January30,1976.

2) Eliminate console keyboard lockout recovery problem by January 30, 1976.

3) Rectify cause of "INVALID COMMAND" conditions by February 15, 1976.

4) Eliminate malfunction when many units are assigned to the same event by January 15, 1976.

5) Correct inoperable "CLOSED EVENT" command by January 15, 1976.

6) Correct the "ON-VIEW" command to log unit status to the primary line printer by January 15, 1976.

7) Correct the "EVENT UPDATE" command to log updated events to the primary line printer by January 15, 1976

8) Reduce failure rate of mobile digital terminals and digital radios to an MTBF comparable to standard available mobile radio equipment by January 15, 1976.

The overall and long-term reliability of the system is compromised by the fact that several elements which can cause total failure are not redundant or have appropriate backup. For example, failure of the mini-computer, disc controller, etc., will cause a total system failure which will require substantial time (e.g., days, weeks, etc.) to repair.

Similarly, the lack of an uninterruptable power supply can cause substantial outages (e.g., minutes, hours, etc.) when primary power fails. The communications center and computer equipment rooms are equipped with overhead automatic water sprinklers for fire suppression. In the event these sprinklers were triggered, the electronic equipment would suffer substantial, if not irreparable damage, and create an extremely hazardous condition to personnel from electrical shock. A fire protection and suppression system for these areas employing halleogen is highly recommended.

It is recognized that redundant equipment, uninterruptable power, and electronic equipment fire protection systems are expensive, and were not within the financial scope of the Automated Command Control System development budget. No precise estimate of cost for these improvements, or the availabilities of funds was available, therefore, no schedule of improvements can be described.

APPENDIX I

TIMING TESTS

TIMING TESTS
LAS VEGAS METROPOLITAN POLICE DEPARTMENT
COMPUTER COMMAND AND CONTROL SYSTEM
AUTOMATED MODE

INTRODUCTION

The objective of this study is to evaluate the Las Vegas Metropolitan Police Department Computer Command and Control System Automated Mode (A-Mode) with respect to response times. The tests are being conducted during the acceptance test for the system.

Testing the system while it is in operational use presents conflicting requirements. On one hand the test must not impair operational conditions, that is, artificial loading must be kept to a minimum. On the other hand virtually all commands must be tested and the quantity of observations must be statistically significant.

To deal with these conflicting requirements the following two part approach was chosen. PART I consists of a periodic test of responses to a predetermined series of commands. PART II involves random observation and sampling of response times.

PART I: FORMAL TEST OF RESPONSES

The purpose of these tests are to generate a set of statistically significant observations. To accomplish this a command benchmark will be entered into the system every two hours during test periods. The command benchmark is given in Attachment I. The commands are grouped in order, first by medium of entry (i.e. CRT device versus mobile terminal), then by function to be performed (i.e. dispatch, inquiry).

The test procedure is as follows:

1. Four - eight (8) hour periods are to be selected in the following categories:
   a. A morning with expected light transaction volumes,
   b. A night with expected light transaction volumes,
   c. A morning with expected heavy transaction volumes,
   d. A night with expected heavy transaction volumes,

   The mornings and nights do not necessarily have to occur during the same calendar day.
2. For every other hour of each of the eight hour periods the command benchmark must be entered at the appropriate type terminal and the response time should be recorded on the form in Attachment I.
3. When the results from the four - eight hour periods are assembled, statistics will be computed from the observations generated.

PART II: RANDOM SAMPLING OF RESPONSES

The purpose of this portion of the tests is to provide a set of normalizing data for the results of Part I, and can be performed at any time during which the experiment in Part I is not being conducted.

The procedure for conducting the sampling is as follows:

1. At any time the system is operational and Part I of this study is not being conducted; the experimenter will sit at a console with a dispatcher or a complaint operator and record his/her activity. The activity is to be recorded on the form given in Appendix II.

2. After statistics are computed from Part I, the results will be compared with those collected in (1) above to determine reasonableness.

APPENDIX II

COMMAND BENCHMARK DATA

COMMAND BENCHMARK
PROCEDURES

COMPLAINT

1) Log on a complaint position

(with areas C1-C9)

e.g. LT.123.C9 (SEND)

2) Bring up blank event form

B1 (SEND)

3) Log on a dispatch console, enable status monitors

e.g.

LT.123.CO (SEND)

SM.M 1.T.E.B (SEND)

SM.M1.B.R (SEND)

4) Fill in an event and route it

Fill in form (include type and make both admin and non admin types)

R. 1 . dispatch area (SEND)

5) UNUEUE ROUTED EVENT AT DISPATCH POSITION

Q (QUEUE)

6) LOG RESOURCES

QR. Dispatch area. Unit 1.,,,.Unit 5 (SEND)

or LR.Unit.Area.Pnl.Pn2.Car#.Comment (SEND)

7) If "QR" used:

UR.Unit.Pnl. etc (SEND)

8) DISPATCH UNIT(s) TO AN EVENT

D..Unit(s) (SEND)

9) ENROUTE UNIT(s)

NR.Unit(s) (SEND)

10) ARRIVE Unit(s)

A. Unit(s) (SEND)

11) FREE UNIT(s)

F. Unit(s) (SEND)

or 12) CLEAR UNIT(s)

admin, non admin, clears of backup and primary unit(s)

C. Unit (SEND)

C. Unit. IDF. Disposition (SEND)

13) ON-VIEW UNITS

Unit.Type.Address.Beat.Remarks (SEND)

14) DISPLAY EVENT

EN.event # (SEND)

AND ER.unit # (SEND)

15) UPDATE EVENT

UP.precedence (SEND)

16) LOG OFF

LO.unit(s) and area(s) (SEND)

MOBILE TERMINAL

1) LOG ON

LR.Unit.Area.Pnl.Pn2.Car#.Comment (F7) (TX)

2) ON VIEW

OV.Type.Address.Timer (F7) (TX)

3) CLEAR

(S3) (TX)

CRT 4) DISPATCHED BY CRT

CRT:

D.Evt no.unit (SEND)

MCT:

IDF.Disposition (S3) (TX)

5) ENROUTE

(S1) (TX)

6) ARRIVE

(S2) (TX)

7) CLEAR

IDF.Disposition (S3) (TX)

8) EVENT RECALL

Blank Screen (F7) (TX)

9) HOT SHEET

e.g.

HR.1.1 (F7) (TX)

10) LOG OFF

LO (F7) (TX)

DATA BASE (CRT)

11) a) SCOPE WVS ZQ.Plate.State

b) NCIC

12) a) SCOPE WVS ZQ...VIN DATA BASE

b) NCIC

13) a) NCIC ZW.Name.SOC/number

b)

DATA BASE (MCT)

14) a) NCIC Plate.state (F1) (TX)

b) Vin (F2) (TX)

15) a) SCOPE Name.Soc/number (F3) (TX)

b)

16) a) SCOPE ONLY Soc.Sec.number/S (F3) (TX)

b)

(a)	(b)
Use both "hits"	"non hits"

known hits:

License Plate:

TESTLIC.XX

Vin:

TESTVIN

MNIF:

123456789/S

END