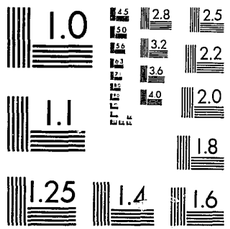

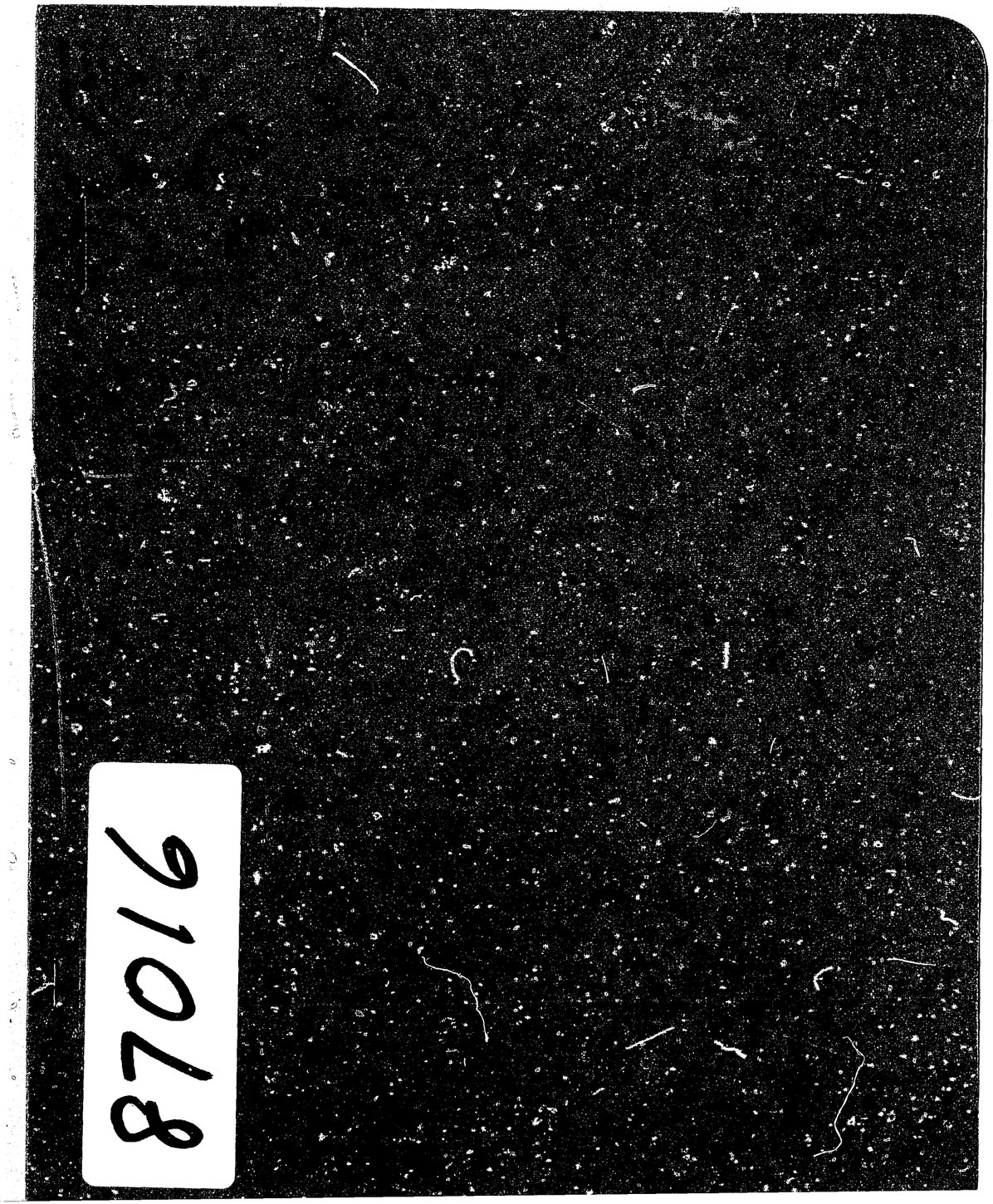

BRISTOL, CONNECTICUT
POLICE DEPARTMENT
800 MHZ RADIO
COMMUNICATIONS SYSTEM

APCO PROJECT 17
TASK NO. 7904901

PREPARED BY

PHILIP Y. BYRD

16 JULY 1979

INTRODUCTION

Mayor Michael L. Werner, by letter of June 25, 1979, requested technical assistance from Project 17 in determing issues concerning poor operation and acceptance of the city's new 800 MHz radio system.

The task (No. 7904901) was assigned and resulted in meetings with Mr. James Blesso of the Connecticut State Planning Agency on July 12 and with Mayor Michael Werner and other Bristol officials and employees on July 13. (Mr. Joseph D. Vandermark of Motorola Communications and Electronics was present during part of the discussions on July 13.) An on-site survey of the Bristol area was conducted during the morning of July 13 to determine the kind of terrain and other environmental factors that would bear on police operations.

This report delineates the findings and pertinent issues resulting from the meetings, the survey, and the judgment of the writer.

BACKGROUND

The Bristol Police Department had for a number of years operated a simplex (single frequency) VHF low band radio system. The system contained both portable (foot) and mobile (car) radios. Its simple, direct, car-to-car, portable-to-portable and car-to-portable common capability and its relatively easy maintenance was its advantages, which were understood and enjoyed by all. However, the equipment was getting old, becoming unreliable, and had undesirable interference from other stations (a common occurence in VHF low band). Additionally, in certain parts of town communications were poor or unreliable (dead spots).

About two years ago the decision was made to do something about the poor communications. The then police chief obtained budget support (approximately $180,000) and made plans to procure a new 800 MHz radio system. This decision was greeted with enthusiasm

by all concerned, particularly the police officers.

Meanwhile, the State Planning Agency (SPA), located in Hartford, had made a survey of the Bristol Police Department and also concluded that a new communication system was required. The State Communications Plan resulting from that study shows an enhanced low band system using two closely spaced low band frequencies in a mobile relay type configuration. The mobile relay operation was apparently intended to increase portable-to-portable range. However, skip type interference would still be present. In addition, the close frequency spacing would have introduced additional technical problems. These two factors may have been the motivating reasons two years ago for not following the State Plan. For whatever reason, the 800 MHz procurement was pursued and about six months ago the long-awaited new system was installed.

CURRENT SITUATION

To procure the 800 MHz system, a consultant was hired. Procurement planning and specifications preparation were apparently left to his discretion. Two responses were received from the bid invitations, one from General Electric which stated portables could not be delivered, and the other from Motorola Communications and Electronics, Inc. (Motorola) which promised the required portables five months later. After securing a performance bond, the city awarded the contract to Motorola. About one month ago Motorola delivered and installed, on a free loan basis until 800 MHz portables were available, the PAC-RT (a VHF high band vehicular repeater system). These would do the same thing as the portables, was the promise. The City went along with the vehicular repeaters on the basis of this promise, since there seemed no other practical alternative.

The resulting system operates quite different from the old, low band system. A repeater and the voting satellite receiver sites comprise the fixed equipment

(4 satellite receivers were specified) with a MODAT digital automatic identification system. The mobiles are 800 MHz units equipped with VHF high band vehicular repeaters. The portables used with the vehicle repeater are VHF high band low power units. The foot patrolmen still use the old low band portables; hence, they cannot talk to the cars or to a car officer when he is out of the vehicle using the high band portable. The digital burst from the MODAT is annoying to both the dispatchers and the partrolmen (car). It takes several seconds for the digital message to be completed prior to voice transmission. This can be an annoying and, in critical situations, a dangerous delay. An in-car monitor and control option (approximately $700) was prepared by Motorola to provide in-vehicle communications, when the vehicle is operating in the vehicular repeat mode.

In addition to the frequency operational difficulties, a number of equipment failures have occurred which has further compounded the operational problems. Failures have occurred in the base repeater causing loss of the total system. Presently, there is no back-up power capability. A back-up repeater is on order and is to be installed in the near future. This should solve the repeater reliability problem. Most of the failures are being repaired in a timely fashion by Motorola. However, there have been some intermittent type problems which are proving difficult to fix. For example, a mobile's audio "faded out" July 12. The maintenance man could not repair the problem. The same problem occurred with the same unit July 13.

The police union has filed suit against the city citing a number of problems concerning the system, its procurement and its operation. The Court proceedings are scheduled for July 23.

FINDINGS, ISSUES and RECOMMENDATIONS

1. (a) Finding

The city's plans to replace their old low band simplex radio system with

a new 800 MHz system was good planning because of the availability of clear, interference-free radio channels. The only drawback to this decision was the unavailability of existing portable units at that time and the need to rely on a vendor's assertion that such portables would be available within five months.

(b) Issue

The planning issue, i.e., failure to assure the availability of portables, could have reasonably been resolved during bid evaluation; hence, this issue is of minor consequence as it affects this problem.

(c) Recommendation

The city should increase its police planning capability. Obtaining a planning manual like the APCO Project 13 is recommended. (A second edition of this document is now being printed by the Law Enforcement Assistance Administration.)

2. (a) Finding

The city's action in obtaining the services of a consulting engineer for system design and specifications preparation was the proper course, hence, is commendable.

(b) Issue

Issues which might arise would relate to the completeness and correctness of the specifications in satisfying the needs of the city. Such issues were not discussed.

(c) Recommendation

None.

3. (a) Finding

Prior to executing the purchase agreement with Motorola, the city secured a performance bond, motivated in part by the uncertainty concerning portable deliveries.

(b) Issue

Whether or not the city should attempt to have the bond forfeited.

(c) Recommendation

The city should negotiate with Motorola for equitable solutions to the communications problems that still exist. The PAC-RT is a reasonable interim solution to the promised portables and should give satisfactory service when debugging is complete and when the foot patrolmen communications problem is solved. All foot patrolmen must be able to communicate with the dispatcher via an activated vehicular repeater. They may communicate with each other direct or via the vehicular repeater.

4. (a) Finding

The MODAT "status/message data communication system" serves no viable and practical purpose in the present police operations, yet introduces objectionable noise and voice message delays.

(b) Issue

How to disposition the MODAT system.

(c) Recommendation

Review present and future possible uses of the MODAT. If no uses can be found, negotiate with Motorola a return credit for the MODAT.

5. (a) Finding

The equipment is having a high failure rate including system level failures.

(b) Issue

Is the equipment basically unreliable or are the present failures "normal" debugging problems?

(c) Recommendation

The 800 MHz Motorola equipment has been in operation in various parts of the country for a number of months and reportedly has a record of good to excellent reliability (see APCO's Project 16A, Task II Report). The PAC-RT also has a fairly large number of months of service history. From the design viewpoint, the equipment is all solid state with modern integrated circuits. If therefore should be highly reliable and have a long service life.

It is recommended that the equipment remain in service and that accurate and complete failure logs be made, noting malfunctions, down time, and required repair actions (actual). From this information, a determination be made of the system reliability.

6. (a) Finding

RF coverage of the city is adequate with three satellite repeaters (no 800 MHz portables).

(b) Issue

This is a happy issue and should be the basis for satisfactory system performance.

(c) Recommendation

None.

7. (a) Finding

The system has several basic deficiencies:

(1) no base repeater back-up;

(2) inadequate emergency power;

(3) foot patrolmen still assigned low band portables; and

(4) when the vehicle is in the repeat mode, there is no in-car communications capability.

(b) Issue

What corrective actions are warranted?

(c) Recommendation

Item (1) is presently being corrected (base station on order). Item (2) will be partially corrected by Item (1) because it is on an alternative site, control equipment of police headquarters will have building emergency power, and telephone circuits have redundant routing.
Re Item (3), all foot patrolmen should be assigned VHF high band portables. The in-vehicle monitor SP option discussed ($700) or another method of having in-car communications when the assigned portable is out of the car should be implemented. Another method would be to assign another VHF portable to the car. This second portable could be used for in-car communication via the PAC-RT. The portable idea may be less expensive than $700.

8. (a) Finding

The police union representatives, the police department administration and the city officials all seem respectful of one another's position and seem genuinely interested and motivated in obtaining a good, reliable communication system for the police department.

(b) Issue

How best, in light of the present situation, to obtain the desired system.

(c) Recommendation

The police union and the city settle their differences, join forces in encouraging and aiding Motorola in rapidly providing a reliable and complete communication system.

9. (a) Finding

Inadequate operational system level training, including multi-car operation.

(b) Issue

Officer acceptance and proficiency with the new system.

(c) Recommendation

Training be undertaken immediately, both in equipment operation and system level performance, particularly the multiple on-scene car situation.

CONCLUSION

There are no system level reasons why the interim system (800 MHz plus VHF high band PAC-RT) should not provide satisfactory communications. However, a number of deficiencies do exist (note in the Findings) which should be corrected. The question of biological hazards using the VHF portables is clearly laid to rest under the present National Standards. If the National Standards are changed, the question should be revisited and appropriate action taken.

END