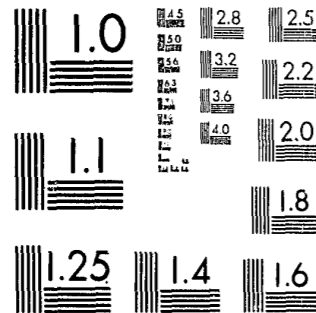


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**National Institute of Law Enforcement and Criminal Justice
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Technical Assistance for Law-Enforcement Communications Grant Summary

Norman B. Reilly
James A. Mustain

August 15, 1979

Prepared for
U.S. Department of Justice
Law Enforcement Assistance Administration
by
Jet Propulsion Laboratory
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ABSTRACT

Activities of the Jet Propulsion Laboratory in conducting a Technical Assistance for Law-Enforcement Communications project under a grant from the U.S. Department of Justice, Law Enforcement Assistance Administration, are described in this final grant management report. It identifies the grant's goals and objectives and discusses the approach to attaining them. Publicity measures taken to announce the project, criteria for selecting agencies for participation, seminars held to broaden dissemination of information developed, and the publication of representative case studies are discussed.

Section IV, Results, summarizes a characterization of the technical assistance delivered by the project, offers an analysis of feedback from the seminars and discusses results obtained from a project questionnaire filled out by participants. Significant findings of the project in such areas as radio channel loading, dispatch system design, training and technology transfer are discussed.

The report concludes with recommendations for future technical assistance efforts to aid law-enforcement command and control operations.

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SECTION I

INTRODUCTION

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The Technical Assistance Project for Law Enforcement Communications was initiated by the Law Enforcement Assistance Administration to meet a need for technical assistance in the analysis and design of dispatching operations, radio system planning, and in digital communications to support law-enforcement operations. Technological advances serve to make law-enforcement operations more efficient, but they have created problems for the agencies, which usually do not have the necessary technical personnel or procurement experience to plan for, assess alternatives to, and purchase and install (when appropriate), relatively sophisticated computer communications systems. Many agencies encounter difficulties in the following areas:

- Measuring the performance of the existing system
- Assessing manual vs computer system alternatives
- Effectively integrating computer data files and computer-aided dispatch systems
- Designing efficient computer-aided dispatch systems
- Selecting mobile digital terminals and next-generation portable radios; designing supporting digital communications networks; efficiently interfacing with existing communications systems
- Radio system evaluation and planning
- Developing and implementing multiple-agency or regional communications, dispatch and computer information systems; using portable software; using available systems and equipment without costly modification.

This document provides a summary overview of project activities and results. The goals and objectives are reviewed in Section II; a description of the approaches used to attain them is in Section III. Section IV includes a brief analysis of the results of the efforts expended in the project, including information on the number of requests for assistance received, the number of agencies actually receiving assistance, etc. Some attention is also given to the feedback received from the seminars conducted as part of the project, and results from a questionnaire about the project are included. Section IV also contains a discussion of the salient findings of the project. Several specific problem areas are identified and evaluated. Section V provides specific recommendations for future technical assistance efforts. Section VI provides an inventory of technical-assistance reports generated throughout the project.

SECTION II
GOALS AND OBJECTIVES

The general goal of this project was to provide technical assistance to state, regional and local law-enforcement planners and managers to improve the effectiveness of their communications systems and services. It was also a goal of the project to develop and test means of supplying these services to the agencies through a formal delivery system.

Specific objectives included:

- (1) Providing direct technical consultation and assistance to agencies in analysis, design and planning for command and control operations and radio systems.
- (2) Bringing technological innovations such as computer-aided dispatch systems and digital radio techniques to the attention of planners and managers and assisting them in integrating these technologies with their master plans.
- (3) Disseminating the results of individual technical assistance tasks to the community of planners and managers.
- (4) Developing, and making available to planners and managers, analytic techniques and system performance standards.
- (5) Identifying key technical problems that should be addressed by supporting technology R&D programs and future technical assistance programs.
- (6) Developing and testing technical assistance delivery system concepts and techniques.

SECTION III

APPROACH

A. PUBLICITY

Announcements about the grant and the project were given wide publicity in the LEAA Newsletter, Crime Control Digest and Criminal Justice Newsletter. Announcement was also made in the National Criminal Justice Reference Service's "Selective Notification of Information." A copy of the announcement was sent to each of the 50 state planning agencies with a cover letter requesting widest possible dissemination. The Associated Public Safety Communications Officers (APCO), Inc., informally disseminated information about the project.

Response was mixed. Many requests resulted from the announcements in the criminal-justice publications and "Selective Notification of Information." Response to the announcement through the state planning agencies was varied. On two occasions many requests were received from one state within a short period of time, apparently soon after that state had disseminated the information. Overall, however, only a small fraction of the requests received resulted from the information sent by the state planning agencies. That does not appear to be the best way to disseminate such information.

The announcements, in their various forms, were to be publicized at different times to keep the news of the project current. Many requests were received within a short period; it was apparent that only a small fraction could be honored within the scope of the grant. Publicity was then discontinued to minimize the number of requests that must be turned down. Formal efforts at publicizing the project lasted for about four months early in 1978.

B. AGENCY SELECTION

Four primary criteria were used in selecting the agencies to receive technical assistance:

- (1) The problems must be similar to problems experienced by other agencies. Since an objective of the project was to provide technology transfer whenever possible, agencies with unique problems were generally not selected.
- (2) The agency's problems should fall within significant areas. Some problems, such as radio system upgrading, are so common that grant resources could easily have been spent in that single area. Thus, in agency selection, problem balance was given strong consideration so that experience could be gained in the development of analytic tools and in technology transfer over a broad spectrum of problems.

- (3) The agency should be willing to commit its own resources to assist, as team members, in the studies, for two reasons: solutions developed through active participation by agency personnel were considered to be more likely to be accepted and implemented, and permanent transfer of the analytic techniques developed by cooperative effort would increase the agency's ability to deal with such problems in the future.
- (4) Multi-community efforts were sought. Concern for economy in government, characterized by California's Proposition 13, has increased interest in saving money through setting up multi-community public-safety agencies. This was not a rigid requirement, but agencies that used or advocated some form of multi-community cooperation received strong consideration.

C. SEMINARS

Analytic techniques developed by the project for the analysis and design of dispatch and radio system operations were incorporated in a seminar structure to achieve wider dissemination of results. Three-day seminars were organized to provide approximately equal time to radio and dispatch operations. Three evening sessions included a visit to a CAD installation, a dispatch workshop and a radio workshop. The workshops stressed discussions of specific agency problems and outlined ways of solving them with techniques presented in the daytime sessions.

Three seminars were presented: in Oakland CA (Feb. 26-March 1, 1979); Boston MA (March 12-15, 1979), and Dallas TX (March 26-29, 1979). Attendance was limited to 40 participants to ensure an informal setting and to enhance interaction. Valuable insight and assistance was provided by a few vendors and consultants who attended.

Response to all seminars was enthusiastic and many requests to attend had to be denied. It was evident from the response to the first seminar that an additional seminar should be held, and a fourth was presented in Costa Mesa CA (May 7-10, 1979).

D. PUBLICATION

One of the final steps in the project was to distribute a publication, describing the results of representative technical assistance tasks, to the community of law-enforcement planners and managers. Instead of the usual newsletter format, publication took the form of two volumes of case studies dealing with examples of the kinds of assistance rendered by the program. These case studies were sent to the state planning agencies for distribution within their jurisdictions. Additional copies will be available through the National Criminal Justice Reference Service's inter-library loan program. The publications are Technical Assistance for Law Enforcement Communications, Case Study Reports 1 and 2, Norman B. Reilly and James A. Mustain, JPL Publications 79-71 and 79-78.

SECTION IV

RESULTS

A. TECHNICAL ASSISTANCE

During the course of the project 140 formal requests for assistance were received, of which 37 were initially accepted (six were subsequently dropped before a significant amount of work was done). At least that many informal requests were received (by telephone, personal requests at seminars, etc.), but were declined because of resource limitations or inadequate conformance with selection criteria. The total number of requests for assistance would undoubtedly have been much higher had an aggressive publicity effort been in effect throughout the duration of the program.

The nature of the assistance was:

<u>Type of Assistance</u>	<u>Number of Agencies*</u>
Radio system analysis	15
Dispatch systems analysis	16
State message switcher	4
Computer-aided dispatch	3
Multi-agency consolidation	2

Clearly the major effort of the project was devoted to dispatch systems analysis and radio system evaluation.

Of further interest is the fact that of the 31 agencies receiving assistance, 21 provided law-enforcement services to more than one community; i.e., on a county or state level. Six of the agencies provided complete public-safety dispatching, i.e., police, fire and emergency medical services. Technical assistance for seven of the agencies was provided in whole or in part by consultants.

Table 1 provides a list of the agencies that have received assistance from the program. Section VI discusses reports generated.

*The total exceeds the number of agencies served by the project because the assistance given to eight agencies fell into more than one category.

Table 4-1. Agencies Receiving Assistance During the Project

State of Nevada Department of Law Enforcement Assistance	State switcher
Texas Department of Public Safety.....	State switcher
Nassau County Police Department, NY	Computer-aided dispatch (CAD); dispatch center analysis
Bismarck Police Department, ND	Radio specifications
La Grande Police Department, OR.....	Radio
City of Aspen Communications Center, CO	Dispatch analysis
San Diego County Sheriff's Department, CA	Dispatch analysis
Alameda County Sheriff's Department, CA	Dispatch analysis
State of Oregon Law Enforcement Data System ...	Switcher
Snohomish County Police Staff and Auxiliary Service Center, Washington	CAD
La Crosse Police, Sheriff and Fire Departments, WI	Radio/dispatch
State of Connecticut Division of Communications	Multi-agency radio
Walworth County Police, WI.....	Radio/dispatch
Richardson Police Department, TX	Radio
Lincoln County Sheriff, MT	Radio
Raleigh/Wake County Emergency Communications Center, NC	Dispatch analysis
St. Charles County Sheriff's Department, MO ...	Radio/dispatch
Harris County Sheriff's Department, TX	Radio
Savannah Police Department, GA	CAD
State of Missouri, Division of Information Systems	State switcher
Fayetteville Police Department, NC	Radio/dispatch
Greenville County Law Enforcement Center, SC ..	Radio/dispatch
Jefferson County Police Department, KY	Radio
Consolidated City of Jacksonville Sheriff's Department, FL	Dispatch/mobile digital terminal feasibility
St. Mary's County Communication Center, MD	Dispatch analysis
Orange County Criminal Justice Council, CA	Multi-agency consolidation feasibility
Howard County Police Department, MD	Radio/dispatch
Hillsborough Police Department, NH	Dispatch
Lane County Sheriff's Department, OR	Dispatch
State of Wyoming	Radio
Austin Police Department, TX	Radio

B. SEMINAR EVALUATION

Since an important part of the seminars was the feedback from the participants, a comprehensive questionnaire was distributed to each participant at the start of each seminar (see Appendix A for a detailed analysis of the responses and Appendix B for a sample evaluation form. Appendix C contains the seminar schedule). Of the 142 questionnaires distributed, 111 were returned.

Because the seminar presentations are highly detailed, it was believed that participants would have difficulty in responding to queries on specific subjects after a seminar was concluded. In order to get the participants' thoughts while the material was still fresh in their minds, four brief questions were asked at the conclusion of each half-day's work and after each evening session. In addition, 10 general questions were asked about the whole seminar after it was concluded. With the exception of one of the questions asked after each half-day session and one of the 10 overall questions, all were formatted on a 1-through-5 basis, with 5 the most favorable response.

The 10 general queries asked a variety of questions about the seminars; Question No. 3 inquired about the overall value of the seminar to the participants. Question No. 3 specifically asked "Was the seminar useful to you?" The 104 responses were as follows:

Response	5	4	3	2	1	Average
Number of Responses	42	33	19	7	3	4.0

The most favorable response was the most frequent; 72% of the responses were above 3 and only 10% were below 3.

One of the four questions asked at 10 intervals throughout each seminar was, "Was this session helpful to you?" A summary of the 846 responses for 10 sessions is as follows:

Response	5	4	3	2	1	Average
Number of Responses	261	309	165	73	38	3.8

The most frequent response was 4; 67% of the responses were above 3 and 13% were below 3.

A significant observation that is not reflected in the summary arose from the fact that the seminar dealt approximately equally with two major areas--dispatch systems analysis and radio systems analysis. Several participants found the dispatch systems analysis section helpful but were not helped by the radio systems analysis section; the converse was also true. This strongly suggests that each area could be developed into a full seminar on its own. This was a frequent comment by many of the participants.

In summary, the seminars were generally very well received by most participants, several of whom said it was the best they had ever seen in the subject area.

C. PROJECT QUESTIONNAIRE

The principal vehicle for project evaluation, in addition to the seminar questionnaires, is the project questionnaire. This was distributed to each of the agencies that received assistance. Twenty questions were asked covering areas of agency demography, effectiveness of technical assistance, and future needs. A sample questionnaire is provided in Appendix D. Questionnaire responses will be forwarded to the LEAA.

Of particular interest in this evaluation is the assessment by the agencies of the effectiveness of the program. Responses to three key questions are given below. Percentages are based on responses received at the time of this writing.

			<u>YES</u>	<u>NO</u>
Did Technical Assistance Address Your Problems?			92%	8%
	<u>ALL</u>	<u>MOST</u>	<u>SOME</u>	<u>NONE</u>
Did You Implement Recommendations?	31%	31%	8%	30%
			<u>YES</u>	<u>NO</u>
Was Technology Effectively Transferred?			85%	15%

In more than 90% of the cases the technical assistance offered by this project was perceived to be directed at key agency problems. In a small number of cases agencies thought, in retrospect, that the issues addressed were not directed at their key problems.

In almost a third of the cases political factors outside of the cope of the project influenced the actual implementation of engineering and system recommendations provided through this project.

In many cases (85%) the team-effort approach designed to involve agency personnel in tasks at a level that would enhance future independence of consultants, that is, to achieve technology transfer, was reported as being successful.

Judgments with regard to future needs for technical assistance to law enforcement agencies were fairly evenly divided between radio operations, dispatch operations and training. Comments associated with training were directed at needs for personnel training as well as for a wider dissemination of training in the use of the analytic techniques developed during the program period. A lesser number of agencies thought that guidance in multi-community integration represented a significant future need on the part of law enforcement agencies. These are discussed below in greater detail.

D. RESULTS

This section discusses salient findings and insights into the state of criminal-justice agency command and control operations based on the experience gathered throughout the execution of the JPL-LEAA technical assistance program.

It will be of particular interest to local, state, and federal agencies whose charters include the optimal use of resources in the rendering of technical assistance. Observations highlighted in the following brief paragraphs address specific needs perceived at the day-to-day operational command and control level. Some of these needs have been effectively addressed through the JPL-LEAA project. Others, outside the scope of the project, nonetheless represent serious problem areas in the field and are presented here in the interest of completeness.

1. Radio Channel Loading

With few exceptions, radio channel loading in law enforcement agencies is excessive. In many cases the excessive channel wait times experienced at the field unit level during peak-load times result in a serious impairment of normal police functions as well as a degradation of officer support during high-priority incidents.

There are two principal factors contributing to this situation:

- Existing FCC criteria for the allocation of radio channels.
- A lack of understanding on the part of radio-system planning personnel that average utilizations greater than 0.5 of capacity can result in excessive waiting times at peak loads, and that ideal average channel loading is at 0.3 of capacity.

With regard to the first of these matters, the FCC current standard for radio channel allocation to law enforcement agencies stipulates assignments at 50 patrol units per radio channel. This standard can easily result in overloading of channels. A starting point for developing a better standard would consider the average channel waiting time experienced by field units that is tolerable to a law-enforcement agency from an operational standpoint (approximately 8-12 seconds is recommended). Average service times on law-enforcement radio channels where good discipline is in effect varies from 12 to 18 seconds. These criteria suggest that 10 to 15 patrol units per radio channel represent a realistic standard, and that certainly 20 per channel is an upper limit. In short, FCC standards should be reevaluated.

With regard to the second item above, there is a general lack of awareness in law-enforcement agencies of the waiting-time consequence of allowing channel utilization to rise above 0.3. The JPL-LEAA project has made a significant contribution to the understanding of this fact and to the development of analytic methods to support the contention. It has also made these important design guidelines available to many agencies through direct in-depth assistance and through seminar presentations.

Channel loading, however, remains a significant and widespread problem.

2. Dispatch Systems Design

In general, command and control center facilities involved in the servicing of calls from the public and with the dispatching of field units are empirically designed. Total systems analysis techniques leading to an understanding of personnel and equipment tradeoffs and their impacts on basic system performance goals are not well understood and are seldom employed in dispatch system design. As a consequence, it is not unusual for dispatch systems to be overdesigned or underdesigned with respect to numbers of stations and personnel assigned around the clock.

As a direct result of this project a set of analytic procedures applicable to total system design has been developed for the first time. These procedures provide a means of determining requirements for manning, for incoming trunk lines and for numbers of radio channels to meet specified system response-time goals with a substantially greater degree of accuracy. Further, they allow the identification in advance of impending system bottlenecks, and as such they provide a valuable management planning tool. These procedures have been tested, refined, and applied with a high degree of success in agencies receiving on-site technical assistance through this program.

A substantial need, however, remains for the direct on-site application of these techniques to law-enforcement agencies throughout the country.

3. Training

While the issue of training was not within the scope of the JPL-LEAA Technical Assistance Grant, it was perceived throughout our field work as a critical problem area. It is recognized that this is not a new finding. There are two primary needs with regard to training; personnel testing and/or screening, and the training program.

It is a typical practice to bring candidates into a department and initiate a training program that utilizes on-the-job training as its principal component. As the candidate slowly gains confidence, he

spends more and more time at the console under the supervision of the trainer and eventually becomes operational. It is not uncommon for an agency to experience heavy personnel turnover as a result of this scenario. Candidates typically have considerable difficulty in adjusting to the routine stress to which they are subjected in the course of their duties. Generally, turnover occurs in less than a year and the expensive process of rehiring must be repeated. Dispatchers who last more than one year are likely to survive as valuable personnel, although they may change agencies.

A number of excellent testing and training programs have been developed in the country to address this problem and some are successfully in place. An effort should now be made to study these diverse efforts and to generalize model programs from these experiences. Training system conceptual designs should be developed and least-cost alternatives studied, as should financing modes. Finally, exportable cost-effective solutions should be implemented to eliminate what are now certainly terribly costly procedures.

Of all the pressing problems confronting law-enforcement agencies, there is widespread agreement that training is No. 1.

4. Technology Transfer

The exportability of the analysis and design techniques developed by the LEAA-JPL project have been tested through three mechanisms; direct on-site assistance by JPL team members, on-site assistance through consulting resources local to the agencies receiving assistance, and through a series of seminars presented to law-enforcement planning and management personnel.

Direct assistance through JPL team personnel has been highly successful, particularly in larger agencies (state and county levels) that are more likely to have staff members with analytic backgrounds. In these cases, agencies can naturally become more involved in the details and progress of their study. In general, smaller agencies (rural counties and small PDs), while providing good support in data gathering, have difficulty applying the analysis techniques and even show a tendency to accept recommendations with little questioning. In either case, direct aid is unquestionably the most effective means of providing technical assistance, i.e., assuring that realistic solutions are actually implemented. Its principal disadvantage lies in greater manpower and time requirements.

The use of outside local consultants has also, in general, been successful. However, as in any discipline, there is in reality a mix of competence to be found in consultants. In addition, many of the design guidelines that have resulted from the development of analysis techniques by this project are not widely understood yet within the consultant community. In short, while there are excellent consulting resources available in the country, there is a risk factor in an agency taking on a consultant solely on the basis of propinquity.

The problem for typical agencies is compounded by the fact that they are not always able to assess accurately the competence of a consultant in advance. Therefore, any program devised to make wide-scale use of consultants should include close monitoring and coordination through a single resource of established practical competence in the delivery of technical assistance to law-enforcement agencies.

The seminar approach has been highly acclaimed by its participants. In retrospect, it can be said that the most important product of the seminars has been their great enhancement of the awareness of sound analysis and design principles on the part of communications, supervisory and management personnel. Some attendees have been successful in returning to their agencies and implementing effective system studies on their own.

The seminars were organized to present material in two major areas: dispatch-system design and radio-system design. Our experience suggests that people with interests in these areas tended to divide into two distinct groups, perhaps reflecting their own responsibilities at home. Future seminars should probably concentrate on these areas separately. This would permit expansion in each of the areas and provide a greater opportunity to use the workshop approach--a valuable tool in the technology transfer area.

The major advantage of the seminar approach is that a wider dissemination of proper analysis and design perspective can be accomplished for a given expenditure. A disadvantage with respect to direct technical assistance is that the responsibility for the ultimate use of techniques presented is largely up to the participant.

Finally, with regard to the seminars, we learned that there is a considerable need for guidance in project-management aspects of system procurement. What began as a two-hour segment in the first seminar was constantly expanded throughout the next three. Detailed experience in such matters of RFP generation, system specification generation, management of bidders' conferences, bid-evaluation procedures, system test and acceptance procedures, and manpower and support requirements were all strongly sought. Future seminars should give proper weight to the coverage of these fundamentals.

SECTION V RECOMMENDATIONS

This section summarizes specific recommended program concentration areas for technical-assistance efforts directed toward law-enforcement command and control operations.

- The LEAA should take an active role in conjunction with the FCC, APCO, and other communications experts in a study to formulate new standards for patrol-unit allocation limits to radio channels. New standards should be based on field unit operational requirements.
- There is a need for a set of manuals providing step-by-step procedures, richly augmented with examples, for law-enforcement communications system planners, analysts and designers in the following areas:
 - a. Command and control dispatch system design
 - b. Multi-community dispatch system integration
 - c. Project planning for system implementation.
- As a means of alleviating high channel utilizations, a program should be initiated to carry development of Voice Data Entry systems for command and control use from their present breadboard status to a technically feasible finished prototype suitable for turnover to industry.
- There is a continuing need to support in-depth, on-site technical assistance in addition to programs designed for larger audiences. This is particularly true in a number of the nation's larger cities and counties where there remains an outstanding need for the direct application of system analysis techniques developed by this project. The pressing nature of this need for a balance between direct on-site assistance and more general programs cannot be overemphasized.
- There is a substantial need for the development of standards and practices for personnel screening, testing and training, for application to dispatch-system operations.
- The highly successful seminar series developed by this project should be continued.

SECTION VI

TASK REPORT INVENTORY

Of the 37 task descriptions originally prepared for travel approval, six were deleted because of travel requirements outside the continental United States, or because of requests for assistance that fell outside of the scope of the project. In seven of the remaining cases the assistance given consisted principally of consultations and instructions in the use of analytic procedures. In each of these cases formal reports were not generated for one of two reasons:

1. Consultation resulted in the successful use of analytic techniques on the part of the agency without further JPL-agency team effort, or
2. In a few cases agencies were unable to meet the program's schedule for data gathering and analysis.

The remaining work with 24 agencies resulted in the production of formal reports based on JPL-agency team collaboration. These 24 reports are listed in Table 6-1.

Table 6-1. Formal Report Inventory

TASK NO.	TITLE
2.	On-line Queueing Analysis Study, Texas Dept. of Public Safety
5.	Dispatch System Analysis, Nassau County Police Department, NY
7.	Analysis of Radio System RFP/Bids, Bismarck Police Dept., ND
9.	Analysis of Plans for Communications System Upgrade, City of La Grande and Counties of Union, Wallowa and Baker, OR
11.	Analysis of Dispatch Operations, Aspen Police Department, CO
12.	CAD Planning and Consultant RFP, San Diego County, CA
13.	Analysis of Dispatch Operations, Alameda County, CA
17.	Radio System Evaluation and Upgrade, La Crosse PD, WI
18.	Evaluation and Comparison of Bids Received for Eastern Connecticut Police Emergency Communications Network, East Lyme, CT
19.	Communications Planning, Walworth County, WI
20.	Communications System Upgrade Planning, Richardson PD, TX
22.	Analysis of Radio System, Lincoln County, MT
24.	Analysis of Dispatch Operations, Raleigh PD, NC
25.	1. Analysis of Dispatch Workload, St. Charles County, MO 2. Radio System Planning Assistance, St. Charles County, MO
26.	Communications System Upgrade Planning, Harris County, TX
27.	Communications System Planning Assistance, Savannah PD, GA
28.	MULES System Queueing Model, Missouri Highway Patrol
29.	Communication System Planning Assistance, Fayetteville PD, NC
30.	Communication System Planning Assistance, Greenville PD, SC
31.	Communications System Analysis, Jefferson County, KY
33.	Mobile Digital Terminals, Jacksonville PD, FL
34.	Dispatch System Analysis, St. Mary's County, MD
35.	Multi-Community Command and Control Assessment, Orange County, CA
37.	Communications Planning, Howard County, MD

APPENDIX A

SEMINAR EVALUATION

A summary of the evaluations received from seminars on Law Enforcement Communications and Dispatch Systems follows. The seminars were conducted by the Jet Propulsion Laboratory as part of the Technical Assistance for Law-Enforcement Communications project funded by a grant from the Law Enforcement Assistance Administration of the federal Department of Justice. Seminar sites were in Oakland CA (February 26-March 1, 1979); Boston MA (March 12-15, 1979); Dallas TX (March 26-29, 1979), and Costa Mesa CA (May 7-10, 1979).

Since a large amount of material was to be covered in the seminars, it was believed that it would be difficult for the participants to provide accurate feedback on specific subjects if there were delays in eliciting it. Therefore, for each major session of the seminars (approximately half a day, with evening sessions counted separately), participants were asked to answer four brief questions (Appendix B) about the session that had just ended. It was thought that this approach would yield more useful feedback since the material would be fresh in the participants' minds. In addition to the questions about each half-day's material, 10 general questions about the seminar were asked at the conclusion. With the exception of Question No. 4 for each half-day session and Question No. 8 on the overall seminar, all questions were formatted for answers on a 1-to-5 scale, with 5 representing the strongest approval.

The total number of responses to each question is found in parentheses after the question or in the total column in the tables.

The final section is a summary of demographic data from the participants.

EVALUATION RESULTS

Question No. 3 on the overall seminar asked "Was the seminar useful to you?" (N=104.)* The responses were as follows:

Response	5	4	3	2	1	TOTAL	AVERAGE
No. of responses	42	33	19	7	3	104	4.0

Of the 104 responses to this question, 72% (75 responses) were above 3, and 10% (10 responses) were below 3. The most frequent response was 5 (42 responses).

The same question was asked after each half-day session** with the following results:

Table A-1. Responses to Question on Seminar Usefulness

	RESPONSE					TOTAL	AVERAGE
	5	4	3	2	1		
MONDAY p.m.	36	43	19	5	1	104	4.0
CAD TOUR	24	26	11	5	0	66	4.0
TUESDAY a.m.	32	48	19	4	3	106	4.0
TUESDAY p.m.	38	37	22	8	2	107	3.9
TUESDAY WORKSHOP	11	24	8	6	2	51	3.7
WEDNESDAY a.m.	29	32	23	13	6	103	3.6
WEDNESDAY p.m.	18	28	27	15	10	98	3.3
WEDNESDAY WORKSHOP	11	16	9	2	4	42	3.7
THURSDAY a.m.	28	36	20	10	8	102	3.6
THURSDAY p.m.	34	19	7	5	2	67	4.2
TOTAL	261	309	165	73	38	846	

A summary of the 10 general questions is provided in Table A-2 and in Figures 1-10. A summary of the other three questions asked after the half-day sessions is provided in Table A-3.

*Total of responses to the question; this format is used throughout.

**See Appendix C for subject matter covered in each session.

Table A-2 Numbers of Responses to Questions About Major Segments of the Seminar

S E S S I O N	QUESTION #1 Were the objectives for the session clear?							QUESTION #2 Were the objectives for this session met?							QUESTION #4 Was enough time allowed to cover the material effectively?			
	RESPONSE					T O T A L	AVG	RESPONSE					T O T A L	AVG	RESPONSE			T O T A L
	5	4	3	2	1			5	4	3	2	1			YES	NO	TOO MUCH	
MONDAY p.m.	30	47	19	7	1	104	3.9	17	55	28	4	0	104	3.8	74	27	2	103
CAD TOUR	26	28	6	4	1	65	4.1	20	32	6	8	0	66	4.0	59	6	1	66
TUESDAY a.m.	34	44	21	8	0	107	4.0	27	52	22	5	1	107	3.9	82	14	7	103
TUESDAY p.m.	48	41	15	3	0	107	4.3	43	46	14	5	0	108	4.2	90	6	7	103
TUESDAY WORKSHOP	13	18	12	7	0	50	3.7	11	21	15	2	1	50	3.8	43	4	1	48
WEDNESDAY a.m.	40	37	18	7	1	103	4.0	23	48	20	12	0	103	3.8	74	19	6	99
WEDNESDAY p.m.	31	33	25	6	2	97	3.9	18	38	23	11	6	96	3.5	63	16	11	90
WEDNESDAY WORKSHOP	9	18	11	3	0	41	3.8	6	20	13	1	1	41	3.7	34	2	4	40
THURSDAY a. m.	37	44	13	5	2	101	4.1	26	51	14	6	4	101	3.9	75	9	9	93
THURSDAY p.m.	35	23	6	2	1	67	4.3	31	25	6	1	4	67	4.2	58	6	2	66
TOTALS	303	333	146	52	8	842		222	388	161	55	17	843		652	109	50	811

NOTES:

1. For Questions 1 and 2 combined, 74% (1,246 responses) were above 3, 8% (132 responses) were below 3. To both questions the most frequent response was 4 (721 responses).
2. 80% (652 responses) indicated that the right amount of time was allowed for the material; 13% (109 responses) indicated that not enough time was allowed, and 6% (50 responses) indicated that too much time was allowed.

Table A-3. Numbers of Responses to General Questions Regarding the Seminar

QUESTION	RESPONSE					TOTAL	AVG
	5	4	3	2	1		
1. Were the objectives of the seminar clear?	38	43	16	5	1	103	4.1
2. Were the objectives of the seminar met?	26	53	18	2	3	102	4.0
3. Was the seminar useful to you?	42	33	19	7	3	104	4.0
4. How was the seminar material organized?	58	39	5	2	1	105	4.4
5. How were the questions answered?	44	50	7	3	1	105	4.3
6. How well did the speakers maintain your interest?	29	55	16	1	3	104	4.0
7. How effectively were visual aids used?	52	31	17	4	1	105	4.2
8. How complex was the overall material?	Too complex 37		About right 64	Too simple 2		103	---
9. How would you rate the speakers overall?	36	54	11	1	0	102	4.2
10. How would you rate the seminar overall?	38	48	14	3	2	105	4.1
TOTAL (except No. 8)	363	406	123	28	15	935	

NOTE: For all questions except No. 8,

1. 82% (769 responses) were above 3.
2. 5% (43 responses) were below 3.
3. Most frequent response was 4 (406 responses).

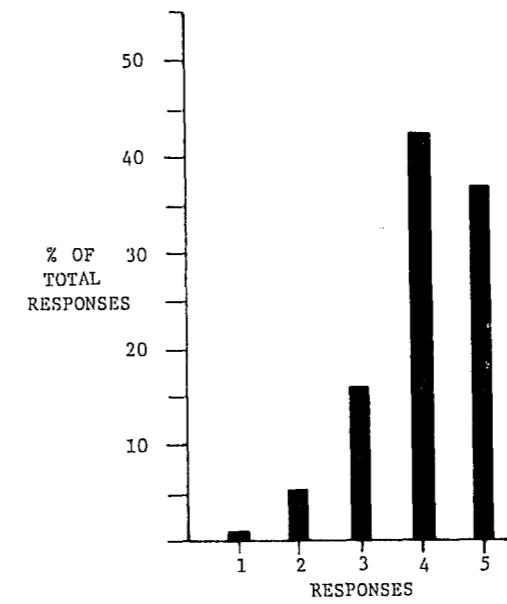


Fig. 1. Were the objectives for the seminar clear? (N=103)

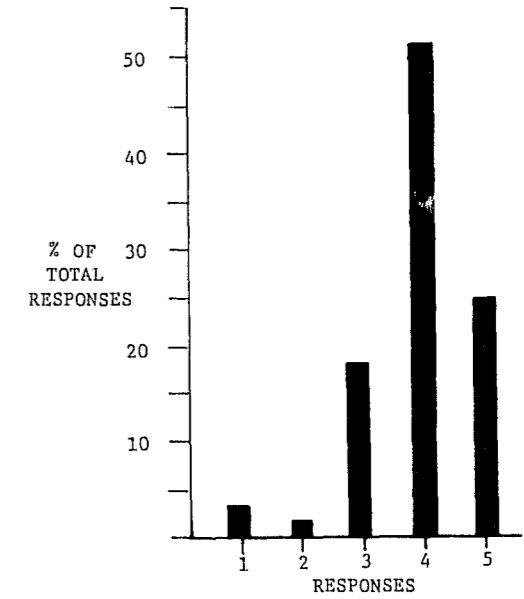


Fig. 2. Were the objectives for the seminar met? (N=102)

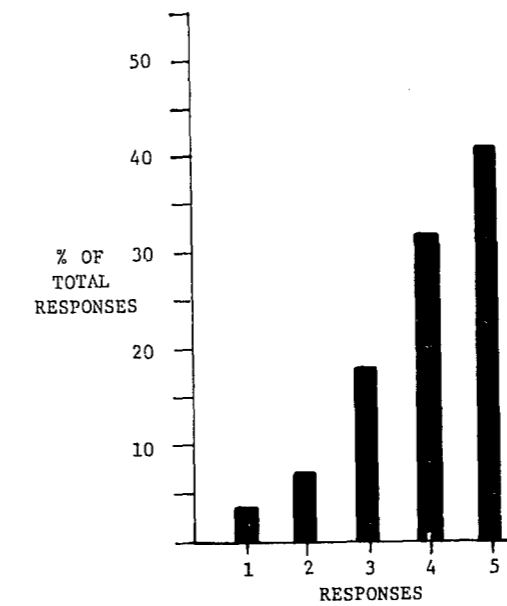


Fig. 3. Was the seminar useful to you? (N=104)

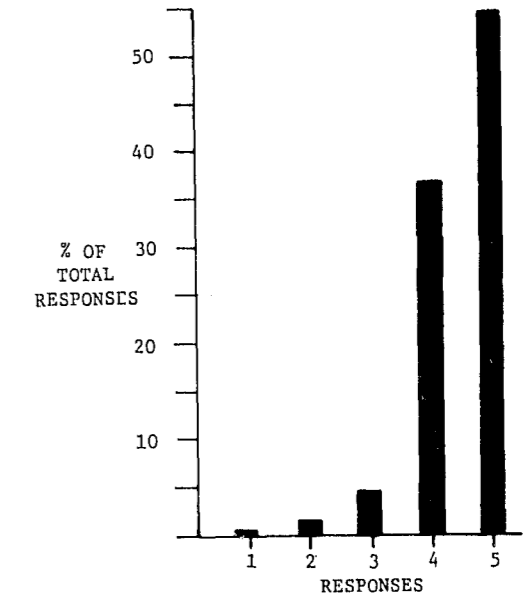


Fig. 4. How was the seminar material organized? (N=105)

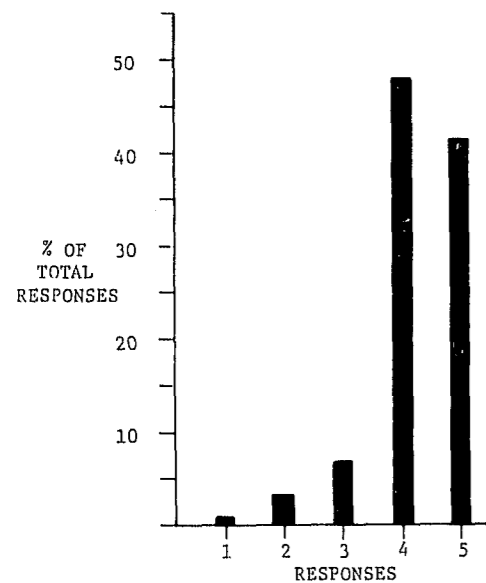


Fig. 5. How were the questions answered? (N=105)

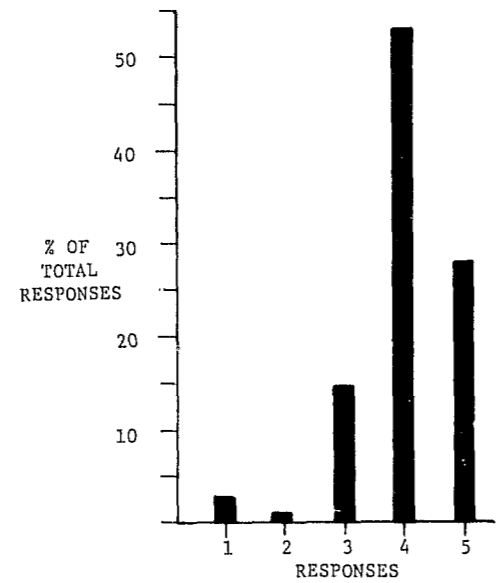


Fig. 6. How well did the speaker maintain your interest? (N=104)

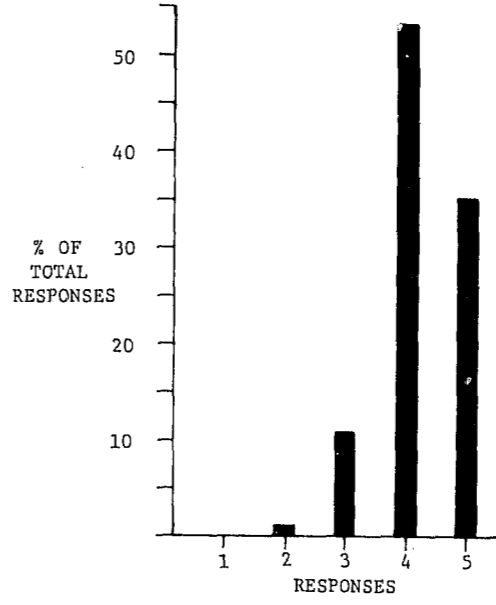


Fig. 9. How would you rate the speakers overall? (N=102)

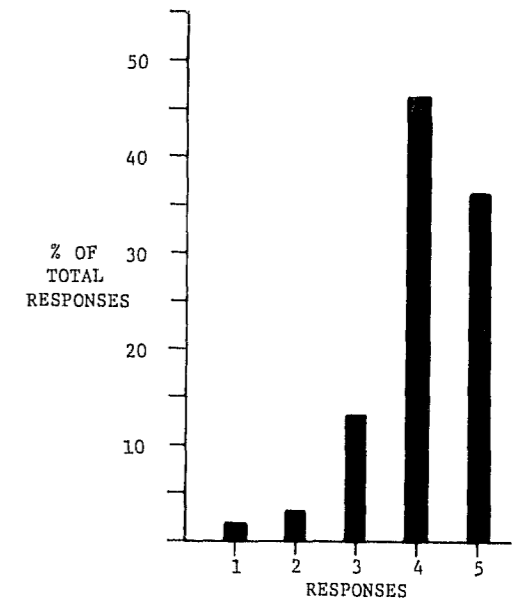


Fig. 10. How would you rate the seminar overall? (N=105)

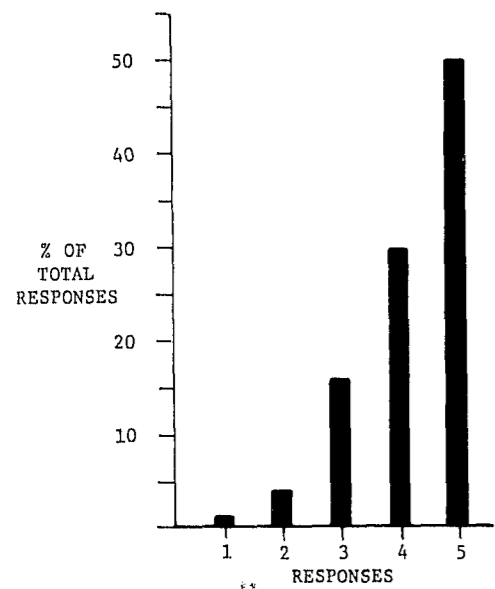


Fig. 7. How effectively were visual aids used? (N=105)

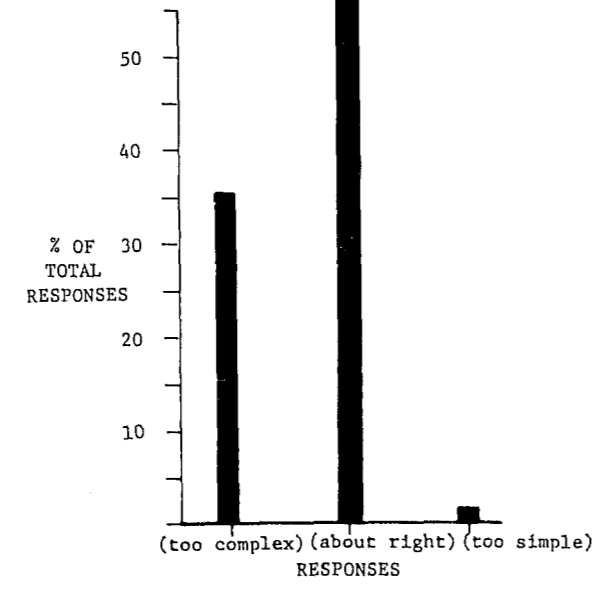


Fig. 8. How complex was the overall material? (N=103)

PARTICIPANTS

The total number of participants for the four seminars was 142. The following five questions were asked of each participant:

1. With what type of agency are you associated? (N = 105)

<u>Number of Responses</u>	
a. City police	55
b. Sheriff/county police	21
c. State police	6
d. Other	23

The category "Other" included criminal-justice planners and representatives from multi-agency systems.

2. Are you a sworn police officer? (N = 104)

<u>Number of Responses</u>	
a. Yes	60
b. No	44

3. At what level are you employed? (N = 95)

<u>Number of Responses</u>	
a. Operational	7
b. Supervisory	46
c. Command	42

4. Does a significant part of your duties involve communications planning? (N = 103)

<u>Number of Responses</u>	
a. Yes	83
b. No	20

5. If you work for a law-enforcement agency, what is the population served by the agency (in thousands)? (N = 94)

<u>Number of Responses</u>	
a. Less than 25	6
b. 25 - 75	24
c. 75 - 150	11
d. 150 - 500	21
e. More than 500	31

APPENDIX B

LAW ENFORCEMENT COMMUNICATIONS

AND

DISPATCH SYSTEMS

Seminar Evaluation Form

The purpose of this form is to give you an opportunity to evaluate the seminar and offer suggestions for its improvement.

At the end of each morning and afternoon session please answer the following questions about the session by circling the response that most nearly reflects your feelings:

1. Were the objectives for this session clear?
2. Were the objectives for this session met?
3. Was this session helpful to you?
4. Was enough time allowed to cover the material effectively?

If you have further comments, please add them to the reverse side of this page (use additional sheets as necessary). Please identify the session (e.g., Mon., p.m.).

MON. P.M.	1. CLEAR (5 4 3 2 1) VAGUE
	2. FULLY (5 4 3 2 1) LITTLE
	3. VERY (5 4 3 2 1) NOT AT ALL
	4. (YES NO TOO MUCH)

CAD TOUR	1. CLEAR (5 4 3 2 1) VAGUE
	2. FULLY (5 4 3 2 1) LITTLE
	3. VERY (5 4 3 2 1) NOT AT ALL
	4. (YES NO TOO MUCH)

TUES. A.M.	1. CLEAR (5 4 3 2 1) VAGUE
	2. FULLY (5 4 3 2 1) LITTLE
	3. VERY (5 4 3 2 1) NOT AT ALL
	4. (YES NO TOO MUCH)

(Continued)

TUES.
P.M.
1. CLEAR (5 4 3 2 1) VAGUE
2. FULLY (5 4 3 2 1) LITTLE
3. VERY (5 4 3 2 1) NOT AT ALL
4. (YES NO TOO MUCH)

TUES.
WORK-
SHOP
1. CLEAR (5 4 3 2 1) VAGUE
2. FULLY (5 4 3 2 1) LITTLE
3. VERY (5 4 3 2 1) NOT AT ALL
4. (YES NO TOO MUCH)

WED.
A.M.
1. CLEAR (5 4 3 2 1) VAGUE
2. FULLY (5 4 3 2 1) LITTLE
3. VERY (5 4 3 2 1) NOT AT ALL
4. (YES NO TOO MUCH)

WED.
P.M.
1. CLEAR (5 4 3 2 1) VAGUE
2. FULLY (5 4 3 2 1) LITTLE
3. VERY (5 4 3 2 1) NOT AT ALL
4. (YES NO TOO MUCH)

WED.
WORK-
SHOP
1. CLEAR (5 4 3 2 1) VAGUE
2. FULLY (5 4 3 2 1) LITTLE
3. VERY (5 4 3 2 1) NOT AT ALL
4. (YES NO TOO MUCH)

THURS.
A.M.
1. CLEAR (5 4 3 2 1) VAGUE
2. FULLY (5 4 3 2 1) LITTLE
3. VERY (5 4 3 2 1) NOT AT ALL
4. (YES NO TOO MUCH)

THURS.
P.M.
1. CLEAR (5 4 3 2 1) VAGUE
2. FULLY (5 4 3 2 1) LITTLE
3. VERY (5 4 3 2 1) NOT AT ALL
4. (YES NO TOO MUCH)

(Continued)

Please answer the following questions for the overall seminar:

1. Were the objectives for the seminar clear?
CLEAR (5 4 3 2 1) VAGUE
2. Were the objectives for the seminar met?
FULLY (5 4 3 2 1) LITTLE
3. Was the seminar useful to you?
VERY (5 4 3 2 1) NOT AT ALL
4. How was the seminar material organized?
VERY WELL (5 4 3 2 1) POORLY, DISORGANIZED
5. How were the questions answered?
VERY WELL (5 4 3 2 1) POORLY
6. How well did the speakers maintain your interest?
VERY WELL (5 4 3 2 1) POORLY
7. How effectively were visual aids used?
VERY EFFECTIVELY (5 4 3 2 1) POORLY
8. How complex was the overall material?
(TOO COMPLEX ABOUT RIGHT TOO SIMPLE)
9. How would you rate the speakers overall?
EXCELLENT (5 4 3 2 1) POOR
10. How would you rate the seminar overall?
EXCELLENT (5 4 3 2 1) POOR
11. COMMENTS:

(Continued)

With what type of agency are you associated?

city police state police
 sheriff/county police other (specify) _____

Are you a sworn police officer? Yes No

At what level are you employed?

Operational (patrolman, dispatcher, etc.)
 Supervisory (dispatch center supervisor, communications supervisor, etc.)
 Command (captain, director, chief, etc.)

Does a significant portion of your duties involve communications planning?

Yes No

If you work for a law enforcement agency, what is the population served by the agency (in thousands)?

less than 25
 25 - 75
 75 - 150
 150 - 500
 more than 500

THANK YOU

APPENDIX C

SEMINAR PROGRAM

Seminar on Law Enforcement Communications and Dispatch Systems

FIRST DAY

Registration 11:00 a.m.

Part I. Introduction

12:00 a.m.

1. Elements of the System
Communications--dispatch--complaint answering, data files, management records.
2. Technology Trends
Computer-aided dispatch--mobile digital communications--access to data files--computerized management reports--multi-agency consolidation--911.
3. Standards and Goals

Part II. Dispatch

1. Dispatch Systems
System elements--system descriptions--system design parameters--subsystem design parameters--standards and goals.
2. Measuring the Existing System
What to measure--measurement techniques--data analysis.
3. Requirements
Telephone and dispatch systems--radio channel utilization--data processing--displays--data files.

Dinner

4. Tour of CAD installation (7-9 p.m.)

SECOND DAY

5. System Design

System elements--software and data files--hardware systems--sizing the system.

6. System Costs

Cost elements--cost estimation.

7. Implementation Plan

Milestones--funding--scheduling.

Lunch

8. System Design Examples

Case I--manual.
Case II--computer-aided dispatch.

Dinner

THIRD DAY

Part III. Communications

1. Communications Systems

System elements--system descriptions--system design parameters--FC regulations--subsystem design parameters.

2. Requirements

Overall system-subsystem--dispatch support--data file access--emergency operations--interties--example.

3. Basic Link Design Equation

Free space loss-antenna gain--frequency signal-to-noise ratios--power margin--example.

Lunch

4. Subsystem Design Elements

Frequency characteristics--effective radiated power--propagation losses--receiver characteristics--interference.

5. Propagation Models

Bullington--Egli--terrain effects--buildings--atmospheric conditions.

Dinner

6. System Design Workshop (7-9 p.m.)

FOURTH DAY

7. System Design Procedures

Design tables--dispatch interface

8. System Design Examples

Case I.
Case II.

Lunch

Part IV. Management

1. Management of Technical Projects

Project phases--developing a plan--use of consultants and vendors--preparing specs--preparing RFPs--bid evaluation--monitoring the contract.

Dinner

2. Workshop (7-9 p.m.) (if desired)

APPENDIX D

LAW ENFORCEMENT ASSISTANCE ADMINISTRATION
COMMUNICATIONS TECHNICAL ASSISTANCE QUESTIONNAIRE

BACKGROUND INFORMATION

1. Agency (Optional) _____

2. Which of the following most closely describes your agency:
 - a. Municipal Police Department
 - b. Sheriff/County Police Department
 - c. State Police Agency
 - d. Other (describe) _____

3. What is the approximate population served by your agency?
 - a. Less than 50,000 _____
 - b. 50,001 - 250,000 _____
 - c. 250,001 - 500,000 _____
 - d. 500,001 - 1,000,000 _____
 - e. More than 1,000,000 _____

4. How many people are employed by your agency?
Sworn _____ Non-sworn _____

5. Please describe briefly the technical assistance your agency received.

GENERAL

1. How did you learn of the availability of this technical assistance?
 - a. Publication (name) _____
 - b. Other _____

2. Did the technical assistance you received address your problem?
YES _____ NO _____

3. Did you implement the recommendations that resulted from the technical assistance?
 - a. All _____
 - b. Most _____
 - c. Some _____
 - d. None _____

- 3A. If you did not implement most or all of the recommendations, why not?
 - a. Too expensive
 - b. Not Practical
 - c. Other _____

4. In addition to providing technical assistance one of the goals of the project was to involve agency personnel so that the expertise within the agency would be enhanced. Did someone in your agency gain expertise so that he might be able to handle similar problems in the future with less technical assistance?
YES _____ NO _____

- 4A. Approximately how many man-hours were spent on the project by personnel in your agency?

5. Would your agency have used the assistance if the cost had to be met from your budget?
YES _____ NO _____

- 5A. What would you consider to be a reasonable charge for the assistance your agency received?

6. What other sources of funds are available for technical assistance?

7. Has the assistance you received resulted in any financial savings for your agency (through reduction in personnel, equipment, etc.)?

8. Has the assistance your agency received resulted in any improved performance for your agency (such as reduction in response time, improvement in radio coverage, etc.)?

9. Will your agency need technical assistance in the future?
YES _____ NO _____

- 9A. If yes, will your agency seek technical assistance even if LEAA funding is not available?
YES _____ NO _____

FUTURE NEEDS

1. In what ways could the Law Enforcement Assistance Administration make it easier for you to obtain needed technical assistance in the future?

2. In what areas do you feel that there is the greatest need for continued technical assistance?

a. Radio planning _____

b. Dispatch center planning and analysis _____

c. Training _____

d. Other _____

Return To:

James A. Mustain 510-250
Jet Propulsion Laboratory
4800 Oak Grove Drive
Pasadena, CA 91103

END