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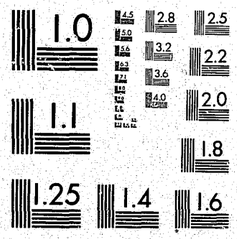

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CENTER FOR THE INTERDISCIPLINARY STUDY OF SCIENCE AND TECHNOLOGY

AND

GRADUATE SCHOOL OF MANAGEMENT

NORTHWESTERN UNIVERSITY

Evanston, Illinois 60201

Report to

National Institute for Law Enforcement

and Criminal Justice

Studies and Action Programs on the Law Enforcement Equipment R&D System:

Evaluative Study of the Equipment Systems Improvement Program

NILECJ Grant No. 74-NI-99-0004-G

Michael Radnor

Principal Investigator

January 31, 1975

35015

VOLUME II The Research Program

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TABLES

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TABLES (continued)

FIGURES

II. THE RESEARCH PROGRAM

1.1 The Exploratory Pilot Study

The study was initiated in November, 1973 in response to an initial request for proposals from NILECJ for an evaluation of E.S.I.P. It was our conviction at the time that neither the data base nor the clarity of perspective or goals for E.S.I.P. were sufficiently well established for a meaningful evaluation to be made. What was first required was a more fundamental examination of the whole R&D system for law enforcement equipment from producers to users. The results of such systematic study could then provide the basis for a grounded process of evaluation and formulation of policy options. This concept was accepted by NILECJ and we undertook the study to achieve this objective.

Our thinking was based on the expertise we had developed over many years in numerous studies in the general area of R&D systems and R&D management. Our initial task was to become familiar with the world of law enforcement equipment -- products, sources, users, media and functions. Using our general knowledge of the nature of R&D, innovation and markets and in consultation with a number of people experienced in law enforcement we formulated, during the winter of 1973/74, preliminary lists of data sources likely to be productive and of areas for questioning. Extensive questionnaires were designed, a field research team set up that extended across the country, data sites were selected and the exploratory pilot field phase of our research was carried out in the Spring of 1974.

During this first phase of study, we succeeded in familiarizing ourselves with the law enforcement environment and obtained a general perspective on the key issues that were to be investigated in depth in the main empirical phase.

The issue to which we addressed the initial phase of research was the success of the present R&D-manufacturing-marketing system in terms of meeting product needs. Our approach was to develop, based on our prior experience with R&D systems, a list of key steps in the R&D process and then, upon encountering a potential gap in the process, to trace that along the various steps of the system in order to determine the source of the problem. By acquiring an understanding of the mechanics of the system, we were able to identify those elements which served as problem areas.

As a first step in the achievement of this purpose, we established a library of several hundred items consisting of documents, catalogues, brochures and articles related to law enforcement equipment. Among these are various reports of LEAA, NILECJ, Mitre, Aerospace, NBS and ESIP; publications issued by other government agencies, police departments and research institutions; a file of product catalogues and brochures, and an on-going collection of relevant articles. We subscribed to Law and Order and Police Chief and received regular reports from NBS. In addition, we have access to a large number of periodicals, e.g., FBI Bulletin and Association of Public Safety Communications Officers, in the Northwestern University Transportation Center Library. These materials were searched for all information relating to our study.

We also consulted with some twenty persons knowledgeable about equipment, in LEAA, NBS-LESL, the Aerospace and Mitre Corporations, and with experts and R&D specialists in law enforcement agencies and manufacturing companies; and attended conferences and lectures both outside the university and at the Traffic Institute here at Northwestern.

For our survey research, we constructed general questionnaires for users, producers, and distributors of law enforcement equipment that were designed to investigate the R&D process from the state-of-the-art to use in the field. Interviews were administered in 36 selected law enforcement agencies (including metropolitan police departments, state patrols, county police departments, U.S. border patrol and several small town police departments), twelve manufacturing companies, six distributing firms, with additional interviews conducted in federal, and county courts; federal and state prisons; a county jail, coast guard stations, U.S. Customs and a major air line. Interviewees included police chiefs, sheriffs, judges, wardens, technical experts, R&D specialists, security managers, and court clerks.

Many of the indications that materialized in our preliminary data analysis illustrated the expected breakdowns in the R&D system. This analysis revealed that the producers of law enforcement equipment to whom we talked, saw little or no incentive to invest in R&D for law enforcement related products. For some, the law enforcement market was secondary and fragmented and law enforcement equipment often a modification of equipment developed for other markets. Producers felt that the best source of ideas

for new law enforcement products should be the law enforcement agencies themselves, but few ideas had actually originated there. Manufacturers frequently did see the need for a law enforcement government agency to identify, evaluate, specify and test potential products.

Producers seemed, however, to be generally dissatisfied with the role of government agencies in regard to standards and regulations. While they felt the need for more state and federal standards, user agencies -- particularly small police departments exhibited a low awareness of needs for standards. Few user organizations had facilities for testing new equipment, but all indicated a willingness to participate in programs to try out new equipment for manufacturers. Good information on product availability and quality represented a major shortcoming.

In user organizations, innovative equipment was not a budget priority, and awareness of and utilization of external funding sources was minimal. When innovative equipment was purchased, its utilization was often contingent upon the technical skills of the organization. Communication between user organizations -- particularly neighboring units -- while largely informal seemed frequent and regular, but cooperation in the form of joint purchasing and formal equipment sharing arrangements seemed to be rare. While producers believed that innovative equipment could be of great importance to the law enforcement field, users felt that equipment was only of marginal importance.

Recurring suggestions from producers included aggregation of the market, increased technical skill of users and better need identification channels. They were typically of the opinion that most law enforcement users lack the capability necessary to effectively use the products that were currently available.

The initial phase of research culminated at Northwestern on May 6 and 7, 1974 in a workshop attended by ESIP advisory board members and NILECJ-ESIP personnel as well as Northwestern project members from all over the country. The list of attendees is shown in Figure 1. At this conference, results of the data analysis were formally presented and feedback was elicited from all present. From this convergence of thinking from the researchers and experts, the model of the R&D process shown in Figure 2 emerged:

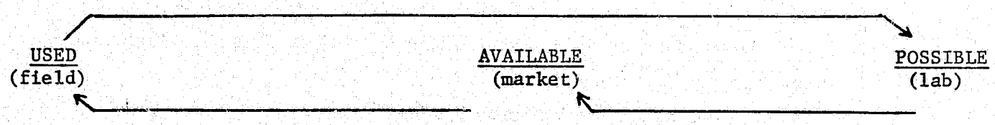
Figure 1. ATTENDEES AT JOINT NORTHWESTERN/NILECJ PROJECT WORKSHOP
NORTHWESTERN UNIVERSITY May 6-7, 1974

Name	Affiliation	Address
Donald Derning	Chief of Police, Winnetka Police Dept. Immediate Past Pres. IACP	Winnetka, Illinois
J. T. Kochanski	ESIP, NILECJ	Washington, D. C.
Kieth Bergstrom	Miami Police Dept. ESIP Advisory Board	Miami, Florida
George Shollenberger	ESIP, NILECJ	Washington, D. C.
Michael Beller	NILECJ	Washington, D. C.
David Anderson	California Crime Technology Research Foundation, ESIP Advisory Board	Sacramento, California
Earl Young	Illinois Institute of Technology	Chicago, Illinois
Martin Adler	George Washington University	Washington, D. C.
David Tansik	University of Arizona	Tucson, Arizona
Charles Shepherd	Northwestern University	Evanston, Illinois
Glennys Ulshak	Northwestern University	Evanston, Illinois
Ron Goldstein	Northwestern University	Evanston, Illinois
Myron Block	Northwestern University	Evanston, Illinois
Ray Buckley	Northwestern University	Evanston, Illinois
Michael Radnor	Northwestern University	Evanston, Illinois
Bonnie Hoffman	University of Michigan	Ann Arbor, Michigan
Richard Rosenthal	Georgia Institute of Technology	Atlanta, Georgia
Terry Conolly	Georgia Institute of Technology	Atlanta, Georgia
Giorgio Inzerilli	Wharton School, University of Pennsylvania	Philadelphia, Pennsylvania

Figure 2. THREE STAGES OF R&D PROCESS

1. Need identification

problem: lack of communication between users and producers



2. NEED FOR DIFFUSION

problems:

inefficiency of bidding system

ineffective purchasing channels

lack of funds

Lack of standards

insufficient information flow between producers and users and between users and users about what's available

lack of technical skills to utilize innovative equipment

3. NEED FOR R&D

problems:

anticipation of problems in 3.

monopolies

fragmented market

low profit margin

lack of funds

government interference

reluctance to acquire law enforcement image

An important parameter that was noted was the legal constraints on the use of certain types of equipment.

1.2 The Main Empirical Phase

Following the workshop we adopted a slightly new approach toward which to channel our research efforts. Having identified some of the critical policy issues and pinpointed some of the specific problems characterizing the law enforcement equipment R&D system, we were then prepared to focus in detail on the R&D steps involved in a few specific equipment items. In order to do this, we synthesized our list of issues into an initial set of six key areas of potentially important policy implication, which was then expanded into the eight issue areas we finally used -- and the product analysis format that was adopted for the main study.

a) Funding and budgeting
b) Information transfer and dissemination
c) Marketing
d) User receptivity -- later expanded into:
   i Need identification
   ii Acquisition process
   iii Installation, utilization, maintenance and assessment
   iv Cooperation between users.
e) Producer research, development and engineering process
f) State of the art considerations -- later expanded into the total product analysis.

We then, with the active assistance of various law enforcement equipment specialists, selected a number of equipment types which are either currently undergoing innovation or currently in need of innovation. They represent equipment used in a broad range of both law enforcement functions (e.g., patrol, investigation) and equipment types. They include items of high and low technology, various cost and usage ranges, products designed primarily for law enforcement use and those for which law enforcement agencies are only a minor consumer, equipment manufactured primarily by large companies and that produced largely by small ones. The following is a list of these items:

1. Body armor
2. Holster utility belts
3. Low-light photography and surveillance equipment
4. Nonlethal weapons

5. Portable transceivers
6. Vehicle locators
7. Voice identification
8. Weapons detection
9. Building design for courts and prisons
10. Court recording systems.

By conducting a series of in-depth case studies on these ten equipment items, we have been able to zero in on the trends as we studied the barriers, if any, impeding the production, purchase and utilization of specific equipment items.

In addition, decisions were made to extend our interviewing so as to reach the final equipment user levels (e.g., patrolmen) and also to conduct studies in special law enforcement agencies (e.g., private security), in prisons and in courts. The general implication was to work with relatively small samples of organizations but in depth. Table 1 shows the distribution of organizations and personnel we interviewed.

The producer questionnaire consisted of four parts: general company features, corporate law enforcement effort, the background of the product line that was of interest to us, and the history of specific models of our equipment items. The models on which we collected information were 1) the latest, 2) the main selling, and 3) the failures. We traced each model's history from its inception to its sale.

Working in 71 companies, we were able, as can be seen in Table 1, to conduct interviews with most (83) of the approximately 111 past and present manufacturers of our equipment items that we located (some firms made several of our products). In large companies, we interviewed a number of persons, among them division heads, R&D specialists and marketing experts.

The user questionnaire was divided into three parts: agency features, departmental features and an equipment profile. Here we were interested in product models that 1) were in use, 2) had been in use, and 3) had been considered for use. This questionnaire traced the history of each model from need identification through utilization. We interviewed on as many equipment types as was appropriate to each agency.

The 47 user organizations we interviewed included large metropolitan police departments, city and large suburban police departments, some smaller suburban police departments, planning agencies, state and county police departments, several major air lines, and courts and prisons. At user agencies we also

TABLE 1. Distribution of Producers, Users, Intermediary Organizations and Distributors

a) Producers
(i) By Size

Size Category	Company Size	LE Div. Size	Main Study #	Main Study %	Pilot Study #	Pilot Study %	Total #	Total %
I Large	Large		1				1	
	Large	Large	8		2		10	
	Large	Medium	2				2	
	Sub Total		11	15	2	17	13	16
II Medium	Large	Small	5				5	
	Medium		4		1		5	
	Medium	Medium						
	Sub Total		9	12	1	8	10	12
III Small (a)	Large	Tiny	1		1		2	
	Medium	Small	2				2	
	Sub Total (a)		3	4	1	8	4	5
(very) Small (b)	Medium	Tiny	1				1	
	Small		18		1		19	
	Sub Total (b)		19	27	1	8	20	24
	Sub Total		22	31	2	17	24	29
IV Tiny	Small	Tiny	2		1		3	
	Tiny		27		6		33	
	Sub Total		29	42	7	58	36	43
	TOTAL		71	100	12	100	83	100

*Definitions: (No. of Employees)
Large -- more than 2500
Medium - 500 - 2500
Small - less than 500
Tiny - less than 50 people and/or less than one million dollars in sales

(ii) By Concentration on Law Enforcement Products

Main Study

Company Size	L.E. only		L.E. plus other		Have given up Law Enforcement	
	#	%	#	%	#	%
I			11	20		
II			9	16		
III	3	25	16	28	3	100
IV	9	75	20	36		
Total	12	100	56	100	3	100

(iii) By Geographic Region

	South			West			East			Mid-West		
	Main	Pilot	Total	Main	Pilot	Total	Main	Pilot	Total	Main	Pilot	Total
#	10	1	11	18	2	20	23	5	28	20	4	24
%			13			24			34			29

(iv) By Level of People Interviewed

	Main	Pilot	Total	%
Presidents, etc.	18	4	22	21
Vice Presidents	12	2	14	13
Middle Managers	64	6	70	66
Total	94	12	106	100

(v) By Equipment Type

Main Study

Equipment	Producer Size Category I	%	II	%	III	%	IV	%	Total #	%	Total Identified	% Interviewed
Body Armor	1	6	3	30	3	13	8	26	15	19	19	79
Holster-Utility Belts	1	6			3	13	4	13	8	10	17	47
Low-light Surveillance	3	19	1	10	3	13	4	13	11	14	15	73
Non-lethal	2	13			2	8	2	6	6	7	7	86
Portable Transceivers	5	31	2	20	8	33	3	10	18	22	22	82
Vehicle Locators	3	19	1	10					4	5	6	67
Voice I.D.					1	4	1	3	2	2	3	67
Weapon Detection			3	30	3	13	6	19	12	15	17	71
Building Design							3	10	3	4	3	100
Court Recording	1	6			1	4			2	2	2	100
Total**	16		10		24		31		81		111	

*Percentages shown are of the total of companies of that size category in the equipment area.

**Note that totals may be larger than the number of companies of that category - since some firms are in to more than one product area. Some totals reflect interviews with producers of related equipment.

***These particular groups are also listed in section on Intermediary Agencies.

(b) Users

(i) By Size

Typology	Main Study #	%	Pilot Study #	%	T.I. Studies* #	%	Total #	%
1	7	15	2	4	6	10	15	9
2	2	4	9	17	4	6	15	9
3								
4			2	4			2	1
5			1	2	9	15	10	6
6			6	11	10	16	16	10
7	8	17	8	15	21	34	37	23
8	3	7	4	7	7	11	14	8½
9	16	34	3	5	5	8	24	15
10			1	2			1	½
11	2	4	2	4			4	2½
12	4	8	4	7			8	5
13	3	7	10	18			13	8
14	2	4	2	4			4	2½
Total	47	100	54	100	62	100	163	100

*Traffic Institute Studies

The typology used for Users:

1. State Police
2. County and Sheriffs

Small Towns
3. 1-9 officers -- remote or nucleus
4. 1-9 officers -- suburb or sattelite

Towns
5. 10-49 officers -- remote
6. 10-49 officers --suburb or sattelite

Cities
7. 50+ officers --- remote
8. 50+ officers --- suburb or sattelite

Large Cities
9. 52 largest cities (by population)*

10. Township
11. Courts
12. Prisons
13. Special agencies - Governmental
14. Private associations, agencies, or Depts.

*52 largest were selected because there are 52 cities with populations over 250,000.

(ii) By Person Interviewed

	Main Study	Pilot Study	T.I.*	Total	%
High level	43	30	5	78	30
Lower level	88	25	60	173	68
Other (Specialists)	2	3		5	2
Total	133	58	65	256	100

(iii) By Geographic Region

	South				West				East				Mid-West			
	M	P	T.I.	T	M	P	T.I.	T	M	P	T.I.	T	M	P	T.I.	T
#	6	7	12	25	9	15	3	27	8	19	8	35	24	13	38	75
%				15				17				22				46

M - Main Study
P - Pilot Study
T - Total

*T.I. - Interviews of users conducted at the Northwestern Traffic Institute

(iv) By Equipment Type

TYPOLOGY

	1	2		7	8	9	11	12	13	14	TOTAL
Body Armor	5	2		4	2	8		1			22
Holsters-Utility belts		1		3	1	6		2			13
Low-light Surveillance	2	1		5	2	8					18
Non-lethal	5	1		5	2	8		3		2	26
Portable Transceivers	6	1		7	3	13		2	1		33
Vehicle Locators	1			5	2	8					16
Voice I.D.	3			3	1	6			1	2	16
Weapons Detection	3			3	2	3		3			14
Building Design							2	1			3
Court Recording							2				2

INTERMEDIARY ORGANIZATIONS	
Universities	3
International, National & State Organizations	6
Architects	2
Special Consultants	1
Total	12

DISTRIBUTORS	
Pilot Study	6
Main Study	2
Total	8

interviewed several people; e.g., police chiefs, R&D specialists, equipment specialists, equipment technicians, department heads, patrolmen, judges, clerks, court recorders, building managers, architects, wardens and security managers. 65 users were interviewed at the Traffic Institute.

The typology we used to identify user organizations makes use of the typology used by NBS in its 1972 Police Equipment Survey, which was:

Description	# of Depts.
State Police	50
County Police and Sheriffs	3137
City 1-9 officers	5486
City 10-49 officers	1985
City 50 officers (excluding 50 largest cities)	554
City 50 largest (by population)	50
Townships	1574

The NBS typology was odified in 2 ways:

1) It was expanded to include additional types of law enforcement agencies, specifically, Courts, Prisons, Special Agencies, and private agencies.
2) It was expanded by adding a sub-categorization of three city classifications to distinguish between suburban (or sattelite) cities and remote (or nucleus) cities. This classification refers to the relative degree of dependence or influence of a P.D. on neighboring municipalities.
   This classification is based on the city's relationship to its surrounding municipalities, which is derived from examination of a map of the area.

The typical interview lasted approximately one and one half hours. This was generally sufficient to cover most of the items in both producer and user questionnaires. However, in some cases time did not permit every single item being dealt with. Also, in some cases, not every item turned out to be of relevance for the particular respondent being interviewed. The net result is that some variation results in sample sizes, depending on the data items being analysed.

In preparation for our interviews, we compiled a series of detailed information packets consisting of background statistics on each company to be interviewed, product line information from each company, and general background on each equipment type.

1.3 The Analysis and Findings

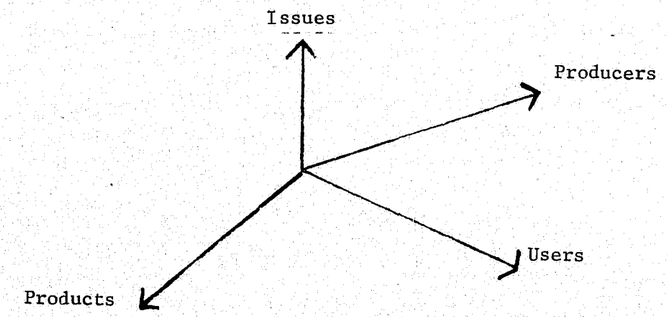
The data was processed and analysed along four dimensions:

1. By the eight selected law enforcement equipment R&D system issues (cooperation, information transfer, etc.)
2. By product type --based on the ten selected product areas (low light, etc.)
3. By type of producer (size and technology)
4. By type of user (size and function).

In addition, separate analyses are being made of:

5. Intermediary organizations
6. Distributors

In each of the four analysis dimensions we are examining for the interaction with the other three dimensions. Thus we could visualize the analysis as taking place in a four dimensioned space, that is, we



are asking what types of issues arise in connection with a particular product manufactured by a particular company being used by a particular law enforcement agency in a specific way.

These analyses are presented sequentially starting with the review of the eight issue area. The format in each case will be to present and define the terms of the issue area and detail out the sub-issues and any hypotheses with

which we went into the main empirical phase. Following a general review of the findings available to this point suggestions are made of some policy options and revised hypotheses meriting further investigation. We recommend that these revised hypotheses be considered in a future reanalysis.

The methods by which the data has been analysed have been very explicitly and formally prepared. In each case the analysis instrument is keyed in to either the producer (P) or user (U) questionnaires. This questionnaire data is then supplemented with information gathered from the literature and other documentation.

1.3.1 Analysis of Law Enforcement Issues

1. The Producer-Research, Development Engineering Process

General Statement of Issue

The R, D & E process refers to the technical innovation process in producer organizations, i.e., research, development, and engineering. Producers vary greatly in their ability and willingness to develop new products for the law enforcement field. Understanding these factors and the problems producers encounter in developing new equipment for L.E. users are necessary to develop policies designed to improve the equipment innovation process.

Sub-Issues

The R, D & E process in companies producing for the L.E. market can usefully be considered from the following perspectives:

1) How willing are producers to manufacture additional L.E. products?
2) How willing are producers to invest in R&D for L.E. products?
3) What are the capabilities of firms to produce for L.E. markets?
4) What are the primary project selection criteria for L.E. products?
5) What specifications are utilized in designing L.E. products?
6) What are the primary problems encountered in R&D for L.E.?
7) What information sources are utilized during R&D?
8) To what extent do producers cooperate with users in developing L.E. products?

Sub-Issue #1: How willing are producers to manufacture additional L.E. products?

Definition: This sub-issue refers to the extent to which producers commit resources, i.e., manpower, funds, and equipment, to produce new products for the L.E. market. In essence, this issue is a reflection of a producer's net estimate of the profitability of this market and his interest and commitment to working in it.

Rationale: It was felt that producers would vary widely in their assessment of the L.E. market. Knowing the major and recurrent factors that caused producers to have a positive (or negative) image of this market would form the basis for policies aimed at increasing and improving their efforts to make L.E. products.

Hypothesis 1: Producers who produce for markets in addition to law enforcement will generally exhibit the following tendencies:

(a) Not be willing to produce L.E. products not currently made by the firm.

(b) Not want to produce competitor's type of product.

Hypothesis 2: The smaller the firm the greater the following:

(a) Willingness to produce L.E. products not currently made by the firm.

(b) Desire to make competitor's type of product.

TABLE 2 Willingness to Produce LE Products Not Currently Made by Firm (Only includes firms producing in markets in addition to L.E.)

Type of Firm	TOTAL NO. FIRMS	Willing to produce L.E. products not currently made by firm			NO RE-SPONSE
		YES	NO	OTHER	
Tiny	20	7	8	1	4
Small	12	3	7	0	2
Medium	7	4	2	0	1
Large(1)	17	5	7	3	2
Total	56	19	24	4	9

Interviewee Comments:

Tiny Firms

"Yes" Response

- Wished had more time and money. Being a successful company kept him from getting into L.E. market.
- Lack of money

(1) Throughout this section Large refers to Corporate size.

"No" Response

- Don't want too many L.E. lines - too many eggs in one basket. Will get into consumer protection first since so little in that market.

"Other" Response

- Not now. Will go to soft armor after Aerospace finishes its program, but not until.
- Did make a bullet proof helmet. Discontinued because of insufficient demand.

Small Firms

"Yes" Response

- Lack facilities

"No" Response

- We are soured on the police department market in general.
- No plans for further L.E. involvement.
- Not at this time

Medium Firms

"Yes" Response

- Don't because of L.E. agency reluctance to assemble kits and also they are doing quite well outside the L.E. market so they feel no great urge to enter it.
- Would like to build radios for government agencies but we don't have the engineers, personnel and money is tight.
- There are so many possibilities from a technological point of view that people do not utilize.
- Yes, we don't because our background, production equipment, and product sales system does not lend itself to the products.

"No" Response

- Communications market is tied up by Motorola and G.E.

Large Firms

"Yes" response

- Consider L.E. an interesting market.

"No" response

- Money is tight.
- Not interested in new L.E. line.
- Will not make products specifically for L.E. market.

"Other" Response

- Have an extensive list.
- Not worth their time.
- Don't feel they could add anything.

TABLE 3 Willingness to Produce Competitors' Type of Product

Type of Firm	Total No. Firms	Would like to produce competitor's type of product			
		Yes	No	Other	No responses
Tiny	24	7	11	2	4
Small	16	3	11	0	2
Medium	7	2	3	2	0
Large	17	4	11	0	2
Total	64	16	36	4	8

Interviewee Comments:

Tiny Firms

"Yes" Response

- There would be marketing problems.

"No" Response

- Cannot afford to do anything but improve own product.

"Other" Response

- Blames lack of technical awareness of user for demand.

Small Firms

"No" Response

- We are soured on P.D. market in general (same response for item II-2)
- Too competitive

Medium Firms

"No" Response

- We are the leaders. This question would be more pertinent to our competitors ... If we wanted to get into a competition product line badly enough, we would acquire another company rather than gear up for production here.

Large Firms

"Yes" Response

- Not equipped with technology.

"No" Response

- Update and redesign what they have.
- Only trying to get rid of inventory now.
- Don't have competitor's equipment.

Analysis of Findings

Hypothesis 1 (a) was weakly supported by the data gathered in interviews. However, a number of "yes" responses were qualified by the interviewers perceived need to change their own organizations or environmetal conditions i.e., user receptivity, government assistance, etc. before producing additional L.E. products. (See interviewee comments above). Also, "other" responses while not a direct "no", are generally negative.

Hypothesis 1 (b) is supported more strongly than 1 (a). If a market is generally viewed unfavorably, this bias may be easier to deal with when examining a competitor's product in that market than ones own product line.

The generally negative attitudes expressed toward the L.E. market is further reinforced by the intention of some companies to limit their L.E. activities or to leave the market altogether. In comparison, none of the "yes" responses are accompanied by intentions of expanding L.E. lines.

Neither hypothesis 2 (a) or 2 (b) appears to be supported by the data based on visual examination i.e., the size of the firm is not a factor in determining willingness to invest in the L.E. market.

Policy Implication

Hypothesis 1 indicates a need to deal with several structural problems at the producer-user interface. A general campaign to attract producers to L.E. markets will not be effective so long as the marketing process is so prolonged and complex. In short, the producer has all the difficulties of selling to government agencies, but to relatively small organizations for small often non-recurrent orders.

Hypothesis 2 indicates that increasing producer willingness to invest can not be reduced to one type of producer. This implies that the problems are more likely to be found at the producer-user interface than directly on producer willingness to invest. Combined with the implications of Hypothesis 1, it does not appear that policies aimed at the producer level of awareness, attitude toward L.E. agencies, or information on L.E. needs are as critical as starting points as are measures to improve user capabilities. Among these capabilities are "willingness to utilize existing products" and to "assist in the development of new products." Although it should be noted that these measures aimed at producers are still important components of an on-going program to improve, L.E. equipment development on delivery systems.

Hypothesis 3:

Equipment producers will tend to limit the scope of their commitment to L.E. product line primarily to minor improvements on servicing the current line.

Hypothesis 4:

The smaller the firm, the greater the scope of its commitment to the L.E. market.

TABLE 4 Scope of Commitment to L.E. Market

		Scope of Commitment to L.E. Market					
Type of Firm	No. of Firms	(1) Major improvements in Current Line/ New Products	(2) Minor improvements in Current Line	(3) Service current line, improve as necessary	(4) Leave L.E. Market	(5) Other	No Response
Tiny	24	2	9	6	3	2	2
Small	16	1	5	4	1	2	3
Medium	7	0	3	1	1	1	1
Large	17	0	4	6	3	3	1
Total	64	3	21	17	8	8	7

Interviewee Comments:

Tiny Firms

Category 1

- Trying to get $200,000 in private funds to go with $250,000 asking in federal funds as capital. Purpose of this money is for development of R&D capabilities.
- "Chemical mist" a new product.

Category 2

- The use of better materials as they develop.
- Continually improve and refine .
- Keep current and add innovations of market seems to exist.

Category 3

- None with exception of special requests, if feasible.
- Make improvements as necessary when defects, etc., are discovered.
- Maintain the line.

Category 4

- Tenuous may leave the L.E. area .
- Phase this out, no new items.

Category 5

- Depends on market research.
- Nothing new in leather products.

Small Firms

Category 1

- Continue to produce, bring our product up to the state of the art. A solid state base station is our next product.

Category 2

- Continually modify and improve design and quality.
- New innovations and better quality.

Category 3

- No major changes are foreseen.
- No, have just recently gotten into transceivers.

Category 4

- More industry a market (i.e., as opposed to L.E. market.

Category 5

- Some top secret work for military.
- Communicate to city that P.D. need it.

Medium Firms

Category 2

- Try to build quality reliability.
- Growth, increase sales, additional options and accessories.

Category 3

- Continue to offer to market.

Category 4

- Doing well outside L.E. market, no great urge to enter it.

Large Firms

Category 2

- Develop and market the _____ system.

Category 4

- Phasing out, selling out inventory, will not replenish.
- We are only trying to get rid of inventory now _____ abolished due to lack of sales and profit.

Category 5

- Not really in L.E. Market, sell for industrial security.

Analysis of Findings

Hypothesis 3 is supported by the data. This assertion is consistent with hypothesis 1, that is, firms that do not view the L.E. market as attractive will limit the scope of their commitment to minor product improvements or servicing the current line. Again, the higher incidence of negative reactions than positive reactions to the L.E. market is evident (See comments above).

Hypothesis 4 received very weak support. Out of 57 firms responding only three were willing to make major improvements in the product line or to add new products as these were either smaller tiny firms. However, in category 2 there is no significant trend related to company size, i.e., 40.9% of the small firms, 50.0% of the medium, and 25.0% of the large firms. In categories 3 and 4 combined, the incidence of large firms limiting their activities to servicing their current line or to leaving the market is higher (i.e., 9 out of 16 or 56.3%) compared to the tiny firms (i.e., 9 out of 22 or 40.9%). The significance of this trend is minimized by the reverse trends for small and medium firms.

In general it appears that several producers might be willing to expand based on their desire to improve current products. However, a significant total number of firms in categories 3 and 4 (i.e., 16 out of 57) are at a level of minimum development or are ready to leave the market indicating that market conditions and user receptivity may be a major problem area.

Policy Implications

This analysis reinforces the one for hypothesis 1 and its policy implications are similar (see above). One factor of potential interest is the slight support for hypothesis 4, indicating there may be a potentially valuable resource in the development of small firm capabilities on the L.E. market; that is, if it is true that similar market conditions result in a greater willingness to make a commitment to the L.E. field than evidenced by large firms.

Sub-Issue #2: How willing are producers to invest in L.E. R&D?

Rationale: While producers may be quite willing to produce products requiring only minor modification limiting risks to production and marketing problems, it is quite another thing to invest in R&D. It is important to determine the extent to which producers are willing to make this investment, since it offers the most attractive alternative in a market economy. It is also important to determine why firms are not willing to invest in R&D if government funds or other assistance are to be offered as incentives in this area.

Hypothesis 5: Producers, will tend to be unwilling to invest in R&D for L.E. equipment.

Hypothesis 6: Small and medium sized firms will be the most willing to invest in R&D for L.E.

TABLE 5 Willingness to Invest in R&D

Type of producer	Total No. Firms	Willingness to invest in R&D		
		Low	High	No Response
Tiny	24	14	6	4
Small	16	9	6	1
Medium	7	4	0	3
Large	17	7	8	2
Total	64	34	20	10

Interviewee Comments:

Tiny Firms

Low

- Marginally now, major with soft armor in future.
- If two or three dealers indicate a desired innovation and if it seems it will sell - O.K. I'm very conservative.
- Some not a lot due to poor financial position.
- None. A question of money, we would if we could get government money. Not doing much currently (in L.E.). For other markets infinity for L.E. nothing.
- No experience. Probably unwilling.
- If demand warrants and prospects look good.
- Some interest depends on market.
- Limited - Small investment, short R&D time.
- Not at all
- Other market areas. Military private security, banks. Some products are sold so there is no distinction between markets.
- R&D is mainly at leisure of owner and when time presents.

High

- Hard to answer. Have moral obligation and market is ready. Question is marketability. I'm enthusiastic. 80% of R&D in L.E. through this product. If it fails, it will jeopardize whole corporation.
- Very extensive and very willing. Less than military, but in R&D, the two overlap.

Small Firms

Low

- 10% of company business in L.E.
- $20,000 per year
- Company not willing to invest in R&D
- "Little", very small in L.E.
- _____ does not have R&D capacity to be innovative.
- Do not see themselves as a growth company.
- Only reason we haven't is funds. They are tied up in production.
- R&D costs a lot. We would invest little unless it was a firm deal.

High

- Very willing to invest - only market.
- 75% on new items; 25% on revising current items.
- Yes, whenever feasible, L.E. an attractive market marginally.
- Original product research higher than expected.
- As much as possible.
- Fair amoung, sometimes specific to L.E.

Medium Firms

Low

- Develop for public safety and other markets.
- No R&D for L.E., market too limited.

Large Firms

Low

- Not interested in L.E. R&D
- Willing to extent a return is feasible. L.E. not a market that commands a lot of resources.

TABLE 6 Amount of R,D&E Effort

Type of Firm	No. of Firms	AMOUNT OF R,D&E EFFORT								Owner only R&D Effort	No R&D (Not applicable)
		At Outset				As Ongoing Process					
		Lo	Med	Hi	No response	Lo	Med	Hi	No response		
Tiny	24	4	2	5	6	5	2	4	6	3	4
Small	16	3	2	4	3	4	0	2	6	0	4
Medium	7	0	1	1	0	1	0	1	0	0	5
Large	17	3	1	7	5	2	1	5	8	0	1
Total	64	10	6	17	14	12	3	12	20	3	14

Interviewee Comments (Owner Only R&D Effort)

- Of my personal time since March, 1974, 6½ days/week, 11 hrs/day, picking minds to design it.
- Just the personal time of the owner which was not estimated as a cost.
- My own knowledge of guns, ammo, nylon.

Analysis of Findings

The generally low willingness to invest in R&D in the L.E. field (i.e., 34 out of 54 responding firms or 63.0% in the first table above) tends to support hypothesis 5. What is surprising is the rather high incidence of firms (i.e., 20 out of 54 or 37.0%) willing to invest in L.E. R&D. These latter figures are offset by the qualifications which accompany them. (See comments above). Of equal interest was the great number of specific reasons why L.E. was not a good field to invest in, while the majority of those indicating a willingness to invest in R&D were generally not explicit as to their reason. Findings in the second table do not show significant differences between initial and on-going R&D efforts. One point of interest is the owner-entrepreneur who is the only source of R&D effort in the tiny firm.

Policy Implications

Willingness to invest in R&D is an even more sensitive indicator of willingness to invest in a market because of its uncertain outcome and longer pay off period. Therefore the finding that this indication was not much weaker than those used in testing hypothesis 1 and 3 (see above) is surprising. It may be that R&D efforts and marketing testing and servicing may require different types of companies whose energies have to be combined on an overall L.E. technology development/diffusion strategy fostered by government intervention.

Sub-Issue #3: What are the capabilities of firms to produce for L.E. markets?

Definition: Capability to producer refers to the capability of L.E. producers to identify, design, and produce new L.E. products.

Rationale: This factor provides an index of technical and productive capability for L.E. products. The extent to which market forces fail to attract producers willing to invest in developing the R&D capabilities necessary to produce new L.E. equipment, this becomes a problem for policy makers. It then becomes important to know the types of R&D capabilities required and the conditions under which

similar capabilities exist and operate. It is especially important to know if there are unique R&D capabilities which are required and cannot be developed profitably in the private sector.

Hypothesis 7: The larger the company the greater the likelihood of conducting R&D which is common to L.E. and other areas.

TABLE 7 Extent of Common Effort

(Only includes firms producing in markets in addition to L.E).

Type of Firm	Total Firms	EXTENT OF COMMON EFFORT				No response
		Major Regular	Minor Regular	Occasional	None	
Tiny	20	7	1	0	6	6
Small	12	8	1	0	2	1
Medium	7	1	1	2	0	3
Large	17	8	0	5	4	0
Total	56	24	3	7	12	10

This hypothesis is not supported by the data; in fact, the rates of small firms with a common R&D effort is highest of all from types. In fact, it is interesting to note that even in the tiny firms (i.e., up to 50 employees) it is useful to conduct R&D so it serves several markets. Part of the explanation may lie in the ability of large firms to specialize R&D so that L.E. is a separate effort.

Policy Implications

In the case of tiny firms, a major portion of their R&D effort may be totally absorbed by the L.E. market. Small and medium firms, on the other hand, may be potentially a major source of innovation in L.E. equipment based on the concept of a R&D effort in common with other fields. This enlarges the number of potential firms that can effectively utilize R&D funding. Also, funding smaller and medium size firms may result in a higher commitment to L.E. markets than in large firms where the number of markets receiving user attention increases rapidly.

Hypothesis 8: The size and scope of R&D capabilities dedicated exclusively to the L.E. market in companies serving more than one market will vary directly with the increasing size of the firm.

Findings: This hypothesis was not substantiated in that no companies indicated separate L.E. R&D capabilities in their responses to the questionnaire (item II-8); this sample included 24 tiny firms, 16 small firms, and 7 medium, and 17 large firms. Expertise for L.E. R&D was indicated in companies of all sizes. This would seem to imply that R&D for L.E. equipment was more related to interest in the field than size of the firm.

Policy Implications: As in hypothesis 1, the implication is that small and medium sized firms may also be a resource for improving innovative L.E. equipment, equal to (perhaps greater than) larger firms.

Sub-Issue #4: What are the primary RD&E project selection criteria for Law Enforcement products?

Definition: Project selection criteria refer to the research, development, and engineering (R,D&E) considerations utilized by producers to choose projects that will lead to new products for the L.E. market.

Rationale: Information on producer R,D&E project selection criteria is useful in determining the extent of producer research orientation in equipment development, and as a basis for comparison of similarities and differences with user equipment purchasing criteria. Corollary to this, it is important to know who participates in the R,D&E project selection decision, in the event of policy maker attempts to influence the decision process.

Hypothesis 9: Producers of L.E. equipment will tend to have the following R,D&E project selection preferences:

1) Highest priority to marketing consideration, followed by production, engineering, development, and research factors, in that order.
2) A short innovation cycle
3) Low estimated development risks

Hypothesis 10: Priorities for project selection criteria will differ among producers according to their size in the following manner:

1) A marketing orientation will be stronger, the smaller the firm.
2) An R&D orientation will be stronger, the larger the firm.
3) A preference for short term projects will be stronger, the smaller the firm.
4) A preference for low risk projects will be stronger, the smaller the firm.

Hypothesis 11: The order of importance of producer executives in the R,D&E project selection process, as indicated by the frequency of times cited as participants, will be as follows:

a) Top management
b) Marketing Manager
c) R&D Manager
d) Production Manager

TABLE 8 Participants in Decision to Select

Type of Firm	No. of Firms	PARTICIPANTS IN DECISION TO SELECT								
		Top Management	Marketing Manager	R&D Mgr.	Production Manager	Owner	Board of Directors	Venture Group	No response	Not applicable
Tiny	24	10	2	1	0	1	1	0	11	3
Small	16	9	2	0	0	0	0	0	7	0
Medium	7	1	2	0	0	0	0	0	4	0
Large	17	5	2	0	0	0	0	1	10	0
Total	64	25	8	1	0	1	1	1	32	3

TABLE 9 R&D Project Selection Criteria

Type of Firm	Total No. of Firms	R&D PROJECT SELECTION CRITERIA														
		Estimated R&D Costs	Estimated Production Costs	Estimated Marketability	Estimated Market Potential	Estimated Development Risks	Length of Innovation Cycle	Regulatory Agency	Price	Public Safety Market	Method of Financing	Method of Marketing	Time	Quality	Will It Save Lives	No Response
Tiny	24	4	6	7	7	3	3								1	10
Small	16	2	2	5		2	2									11
Medium	7	1		1												6
Large	17	1	5		9	2		1*	1	1	1	1	1	1		6
	64	8	13	13	16	7	5	1	1	1	1	1	1	1	1	33

*FAA regulation

Analysis of Findings

The evidence supporting Hypothesis 9 is weak, although "estimated marketing potential" was cited more times than other considerations in selecting projects. Also, when responses to this factor are added to those for "estimated marketability", then market considerations appear to be the most significant selection criteria.

Evidence for a gradually decreasing utilization of criteria from production to R&D was not supported, nor was there direct evidence to support a preference for a short innovation cycle and low development risks. However, these latter criteria may be inferred if a market orientation, coupled with a production instead of a research orientation in product development, dominates as appears to be the case so far.

So far there is insufficient evidence in support of (or against) Hypothesis 10. However, it is interesting to note the lack of any reference to R&D criteria by large firms. This is contrary to initial expectations.

Hypothesis 11 is supported strongly with respect to the pre-eminence of the marketing manager. The descending number of response from the R&D manager and the production manager technically support the hypothesis, but what is even more interesting is almost the total exclusion (or assumed exclusion or minor role) of these executives in the decision process for new R,D&E projects.

It could have been hypothesized that the increasing importance of the chief executive would be even more essential smaller firms. However, there is little evidence to this effect. Top management is involved in the decision making process in 10 of 13 tiny firms, 9 of 9 small firms, 1 of 3 medium and 5 of 7 large firms.

Policy Implications

An emphasis on marketing criteria coupled with a production instead of a research orientation can make it difficult to get certain types of L.E. products produced and distributed, i.e., high risk, long term, high technology equipment; equipment for a limited number of initial users and for a limited total market; and equipment which creates opportunities for repeat business (except normal replacement), high user resistance, or a need for substantial user staff development and upgrading. Unfortunately, these aforementioned factors are all too characteristic of many of the products now required in the L.E. field. The problem that emerges is, again, one of how to enlist the interest and cooperation of potential producers in L.E. markets, and how to increase the efforts of those already in the field.

If R,D&E projects for L.E. equipment differ significantly among different types of producers, this may mean policies to attract and sustain interest in the L.E. market may have to be adjusted according to producer types. For example, if small producers are more interested in L.E. markets, but the capabilities of larger firms are required for R&D, how are the efforts of each best harnessed to the L.E. market? In such a case, are both to have a role in R&D for L.E. equipment? If so, how will it be distributed?

With respect to hypothesis 11, the most significant finding, even in this limited sample, is the apparent omission of the R&D manager in selecting R,D&E projects for L.E. equipment, given the inclusion of the marketing manager. Taken together this reinforces hypothesis (1) and (3) and further indicates the emphasis on marketing and the low priority of R,D&E considerations.

Sub-Issue #5: What specifications are utilized in designing L.E. products?

Definition: Product design specifications refer to the design parameters developed by the producer and those required by state and federal agencies.

Rationale: It is important to know to what extent producers take into account users, government agencies, and/or associations in making design specifications. It is also important to know reasons why these sources may not be utilized. The use of external sources in design specifications is an index of the sensitivity of producers to new needs and regulations and standards governing a given equipment area.

Hypothesis 12: Producers will tend to rely on their own staff as a primary source of information for designing job specifications; users will be a secondary but minor source of specifications; and government sources will be the least important consideration.

Hypothesis 13: The size of the producer will not be a factor in the type of external source as its frequency of use.

TABLE 10 Primary Method of Developing Standards

Type of Firm	No. of Firms	PRIMARY METHOD OF DEVELOPING STANDARDS			No response
		User	Producer	Other	
Tiny	24	4	11	5	4
Small	16	3	5	3	5
Medium	7	2	1	2	2
Large	17	4	4	5	4
Total	64	13	21	15	15

Interviewee Comments:

Tiny Firms

User

- Threats were assessed and products were tested against them.
- Reports from field users
- Designed a prototype based on a description given by a potential customer.
- Performance standards were developed by request and really no formal reason.

Producer

- In-house research
- By seat of our pants, what we could do, would it help? Not they say what we want.
- In-house technical literature
- One man worked it up in his basement.

Other

- U.S. military standards
- Police Weapons Center certification process a complete farce based on $200.00 payment (assumed result not used, therefore comment not tabulated above).
- The company and specifications from other companies.
- Other existing products and own information.

Small Firms

User

- Developed from national incidents where weapons detection was needed.
- Developed from working with NYPD.
- Performance specifications geared to products already on market.

Producer

- By trial and error
- Performance specifications were developed by scientists.
- Sales manager made them up as they went.

Other

- LEAA requested a certain product.
- FCC standards were used in the headset.

Medium Firms

User

- Based on market
- Looking at other products, consumer requests

Other

- Original equipment manufacturer

Large Firms

User

- Consulting with Witchita P.D. & Association of Public Service Communications Officer
- L.E. depts. had influence
- User needs

Other

- Developed form military applications.
- Government organization set specifications.

Hypothesis 12 is supported with respect to companies using their own in-house resource to set design specifications as supplied by the small number of external sources cited. However, users are a slightly less important source of design specifications than other L.E. agencies or associations. With respect to federal agencies it is interesting to note the use of Department of Defense and military standards for design specifications. It is also important to note the law incidence of reference to other government agencies for equipment design specifications, especially in the field of L.E.

Hypothesis 13 is supported, there is little significant difference in the type of sources utilized for design specifications, or the frequency of their use.

Policy Implications

The apparent low rate of reference to either users, regulatory agencies or associations in the sample group, if generally true, is indicative of the lack of user-producer feedback and the low impact of any standard setting organization.

Sub-Issue #6: What are the primary problems encountered in R&D for L.E.?

Definition: Problems are defined as those recurrent barriers and conditions confronting producers which appear significant and which may be ameliorated by appropriate policies and programs. This definition does not include project-specific technical problems.

Rationale: (See definition)

Hypothesis: None

TABLE 11 Types of Problems Encountered in Various Firms

FREQUENCY OF OCCURRENCE REPORTED IN SAMPLE FIRMS				
Tiny 24 Firms	Small 16 Firms	Medium 7 Firms	Large 17 Firms	Type of Problem
1				Supplier of Parts
1		1		State-of-Arts Developments
1				Testing
1				Obtaining Authority
1				Funds
1				Technical Equipment Acquired
1				Lack of Training in Use of Equipment
			1	Training Users in Use of Equipment
1			1	Finding Material to Meet Project Performance Specifications
	1			Obtaining Scientific and Technical Information
		1		Inadequate Marketing Capability
		1	4	Meeting Cost Requirements

Analysis of Findings

The lack of responses to the question are perhaps more revealing than actual problems cited. That is, the lack of specific barriers and problems cited in the L.E. field, where so many other indicators point to its marginal place in many firms, further reinforces its marginality. Except in the case of a few tiny producers, most firms have failed to give L.E. products much attention.

Policy Implications

Even the few firms responding indicated a wide variety of producer problems amenable to policy intervention. One class refers to producer assistance, i.e., technical information, equipment, funds, testing, while another refers to user related problems, training and marketing.

Sub-Issue #7: What information sources are utilized during R&D?

Rationale: Knowing the type and frequency of information utilized, can provide a basis for improving the dissemination of L.E. equipment needs and specifications through current channels or the development of new channels.

Hypothesis: None

TABLE 12 Sources of Information Utilized During R&D

Sources of Information Utilized during R&D	Frequency of Usage by Type of Firm			
	Tiny 24	Small 16	Medium 7	Large 17 Firms
Federal laboratories	3	1		1
Aerospace	1	1		
Technical journals	6		1	4
Basic scientific/engr. info.	1	1	1	7
Another industry	5	1	3	6
L.E. agencies	1	1		7
Professional Personnel	5	4	1	6
Private laboratories		2		2
Parent Company			1	
Suppliers			1	
Feasibility Study of Competitive Product Consultants			1	1
Military				2
Total	22	11	9	36

TABLE 13 Sources of Standards

Type of Firm	Total No. Firms	Stds. for Product Development					No resp.	Stds. for Controlling Production					No resp.
		State	Federal					State	Federal				
			FCC	EIA	FAA	Other			FCC	EIA	FAA	Other	
Tiny	24	1	1			2 [a]	2						2
Small	16		2			1 [b]	2	1	2	2			2
Medium	7		2	2				1					0
Large	17		2		1	1 [c]	2	1					2
Total	64	1	7	2	1	4	6	3	2	2			6

[a] Military specifications
[b] Unspecified in interview
[c] IACP and NBS

Analysis of Findings

Generally, questions regarding information sources during the R&D process drew little interest from interviewers. This may have been due to their level of interest in or knowledge of the topic. The information collected and shown in the first table above indicates a limited but balanced range of sources. No attempt was made to assess their utilization or effectiveness.

The second table above indicates the very limited use made of either state or federal standards either during product development or during production.

As might be expected, the number and type of information sources utilized increased with the size of the firm (i.e., 36 sources for 17*large firms, or 2.12 per firm reported compared with 1.29 per medium firm, .69 per small firm and .92 per tiny firm.

In general, a picture emerges of low sensitivity to external technical information sources and prevailing standards. This is indicative of both an inward focus and reliance on one's own resources. It may also indicate a low level of interest in the L.E. market generally.

Policy Implications

This lack of awareness of sensitivity to; and utilization of external information sources may be rationalized if user needs are known and if technical information required is readily available in the firm. However, it is not an effective approach if user needs require precise definition, if development of related technical specification, and if compliance with existing standards and regulations. Unfortunately, the latter conditions exist in the L.E. equipment field all too frequently, as performance requirements become more complex which, in turn, often implies more complex technology. Government efforts to disseminate information to producers, in veiw of their current level of interest in L.E., require close examination and evaluation.

Sub-Issue #8: To what extent do producers cooperate with users in L.E. products?

Rationale: Producer-user cooperation is essential to design equipment to identify and fill user needs for L.E. equipment effectively.

Hypothesis 14: Producer's cooperation with users will increase with the size of the firms.

TABLE 14 Producer/User Cooperatinn

Type of Firm	No. of Firms	Coop. with L.E. agent in testing	Other (Specify)	No response
Tiny	24	16	1 Uof Mich - Voice Lab	4
Small	16	9		2
Medium	7	3	1 US Forestry Dept. Fire Depts. 1 Underwriters Lab	
Large	17	6	2 FAA 1 Ford Motor Co.	5
Total	64	34	6	11

Anaylsis of Findings

Hypothesis 13 is not supported; in fact, a slightly higher proportion of smaller firms corperates with users in testing (i.e., the rates for tiny firms is 16 out of 20 responding or 80%, 7 out of 14 or 50% for small firms, 3 out of 7 or 42.9% for medium firms, and 6 out of 12 or 50.0% for large firms). This may also be due to a lack of testing facilities than any increased desire to cooperate with users. In general, their is a high level of user cooperation with respect to testing.

The extent to which this is true in other areas is examined in section 5: Cooperation Between Users, above.

Policy Implications

The need for user cooperation was considered significant enough to warrant a separate section (see section 5: Cooperation Between Users, above.)

Areas requiring further research

1) More information is required on the conditions which prompted producer expansion into new L.E. products.
2) More specific itemization of both incentive and barriers to entering the L.E. market.
3) Identification of differences among producers with respect to (1) and (2) for different producer types and for different product lines.
4) The potential role of small firms in L.E. should be more fully explored, especially as it relates to technological innovation and diffusions.
5) Information on incentives required to get producers to invest more in L.E. R&D is required.
6) Information should be developed on firm size and market size required for each major type of L.E. equipment, depending on the function(s) performed, i.e., research development, engineering, production, marketing, in order to sustain a competitive market.
(7) Identification of those products which have not and/or cannot be produced by the private section is required.
(8) Identification of the possibilities for producers to perform only a part of the innovation process. That is, what types of firms are willing to consider specialization and work in some joint program with other firms?

(9) Determination of the impact of competition on innovation in firms producing for the L.E. market.

(10) Examination of the extent of R&D efforts common to several markets.

(11) Assessment of the role of marketing laboratories as a source of L.E. R&D, as well as an examination of the possibilities of common R&D program areas.

(12) More extensive identification of information channels and sources utilized in the R&D process for L.E. equipment and their relative effectiveness.

(13) Information should be gathered on the interests of individual scientists, engineers, and technicians in companies that might potentially serve the L.E. goals, and it may well be that the social priority of crime prevention and law enforcement may be very appealing to individual professionals.

Illustrative Policy Options*

1) Conduct analyses and evaluations of producer L.E. programs. Analysis of selected products and their diffusion in law enforcement agencies are required to assess more accurately producer motivation and interest in law enforcement, as well as the problems they face. The alternatives to private enterprise are costly and, as in the case of the ESIP Aerospace Corporation contract, seldom solve the problem of commercialization of a new product.

2) Provide producer information services. Some producers see the L.E. market in positive terms and are willing to invest. For these firms, accurate market information is a key incentive to effective expansion. Market information for each major L.E. product group could be provided to current and potential producers. In addition, a market information service could be made available to answer producer inquiries.

3) Initiate programs to develop small scale technological entrepreneur serving the L.E. market. Their combination of technical expertise, willingness to undertake risk and develop innovations, as well as their commitment to the L.E. field may make them a good bet for program building.

(4) Provide funds selectively to R&D producers already working in the L.E. field. Develop the sub-contracting mechanism between large and small scale producers as part of this program.

(5) Experiment with joint venture arrangements between large and small scale producers when the responsibility for R&D is assigned to the larger firm and distribution to smaller firms.

*These policy options focus primarily on producers. Those relating to users are considered of more immediate importance in the establishment of a market for innovative equipment. These user oriented recommendations are covered in those sections dealing more directly with user.

(6) Give contracts for prototype development and initial orders to provide a market aggregation effect so as to reduce distribution and marketing costs and to allow the firm to concentrate on R&D.

(7) Undertake a comprehensive survey of current R&D capabilities for the L.E. market. This should include university and government laboratories and private firms and laboratories.

(8) Limit federal R&D projects to concept and possibly prototype development, but only utilize this means if no effective alternative exists in the private enterprise system.

(9) Initiate programs to include producers in performance standards development.

(10) Design programs to develop new capabilities with respect to evaluating purchasing and utilizing innovative L.E. equipment.

(11) Develop a program to systematically explore the possibilities of transferring technology from other sections, especially the military.

2. Law Enforcement Markets

General Statement of Issues

Apparently many products required by L.E. organizations are not produced, while others are produced and not widely distributed. There are indications of poorly developed markets and a lack of communication between producers and users. Before any effective long range program to develop L.E. equipment can be implemented, the market and its general characteristics must be determined. This includes analyzing specific markets for selected products, producer types and users. Of particular importance are the malfunctions and gaps in the marketing system for L.E. equipment. A useful way of examining these markets is indicated in the following sub-issues.

Sub-Issues

1) What are the dominant characteristics of the L.E. market?
2) What are the major characteristics of distribution channels in L.E. markets?
3) What are the major characteristics of selling procedures and practices utilized in the L.E. market?
4) What are the barriers, problems and opportunities in the L.E. market as perceived by producers?
5) To what extent can L.E. markets be aggregated?
6) To what extent are L.E. products originally developed in other sectors and transferred to the L.E. market with little or no modification?
7) To what extent is it necessary for producers of L.E. equipment to combine sales in the L.E. market with other markets?
8) How competitive are L.E. markets perceived to be?
9) What problems do firms encounter when first attempting to enter the L.E. market?

Sub-Issue 1: What are the dominant characteristics of the law enforcement market?

Definition: Dominant characteristics refer to such factors as size of the market, importance of the L.E. market to the producer, degree of product adaptation, degree of competition, utilization of bidding procedures, degree

of market fragmentation. These and other characteristics are also examined in sub-issues (2) through (8) in greater detail.

Rationale: While markets for individual products will each have their distinguishing and unique feature, it is useful to determine the general characteristics of the L.E. market. Such information will help determine the overall strategy for developing policies to stimulate and guide development and distribution of new L.E. equipment.

Hypothesis 1: L.E. markets will tend to exhibit the following characteristics:

a) The L.E. field is only of secondary importance, as a market to some producers of L.E. equipment.
b) The L.E. field is a restrictive market (small in size) in relation to the total market (i.e., non-law enforcement market for similar products).
c) Producers see law enforcement as a highly fragmented market to sell to in volume.

Findings

The character of the L.E. market is to a great extent the consequence of the extreme fragmentation of the market, i.e., over 40,000 police departments (ranging in size from one man to over 30,000) make independent purchase decisions on equipment. Purchasing by other federal, state and local law enforcement agencies is also fragmented. Utilization of one piece of equipment by one law enforcement agency does not assure that it will be accepted by others. Each potential user must be approached and persuaded on an individual basis. This fragmentation has operated as a major obstacle in marketing L.E. equipment.

The majority of companies interviewed were uncertain of the total size of their market -- except of course for those that had an exclusive piece of equipment in the market place. High technology companies were more sure of their market size than companies of medium and low technology. Most items reported were stock items; very few companies made special orders. Some would adapt their stock items to a new system, but "specials" were much too costly for the low profit margin.

Most companies did not find it economically feasible to sell just to the L.E. market. Sales in L.E. were low with marginal profit. This is partially

accounted for by tight money and a great deal of bureaucracy especially on the bidding items. Most companies did much better in other major markets such as the military, government agencies and public service organizations with the exception of voice I.D. which is used in medicine and speech therapy.

Implications

The generally negative picture of the law enforcement market emerging from the verification of Hypothesis 1 above, leads to considering two major approaches to developing innovative L.E. equipment: 1) strengthening the private sector by eliminating barriers and providing incentives for producers to serve this market, and 2) intervening with government action programs which, to greater or lesser extent, supplant the efforts of private firms in developing new equipment. Of course, it may be possible to differentiate the types of technology requiring government intervention to achieve development, but such decisions are not easily made using any clear-cut a priori premises. Whichever course is followed, information of the sort described above is necessary to design effective policies.

Sub-Issue 2: What are the major characteristics of distribution channels in L.E. markets?

Definition: Distribution channels refers to all means utilized to bring products from the manufacturer to the user. These include direct salesmen, manufacturers' representatives, catalogue sales and the use of distributors.

Rationale: It is important to ascertain the way L.E. products are distributed and to ascertain the relative effectiveness of each method. This information will aid in the development of more effective marketing programs and in designing programs to improve marketing channels.

Hypothesis 2: The level of technology incorporated in a product is a major determinant in the channel of distribution utilized. Specifically:

a) Highly technical products are sold on a direct basis.
b) Less technical or maintenance type products are sold through distributors, manufacturers' representatives, or catalogues.

Analysis of Findings

Hypothesis 2(a) is supported by the data, i.e., high technology products account for 77% (23 out of 30) of the companies using direct sales (See Table 15). However, Hypotheses 2(b) is not supported by the data. In fact, it is of great interest that high technology firms reported utilizing all methods of distribution to a greater extent than low technology firms. These differences are exaggerated by a lower response ratio from low technology firms (on this particular question).

More specifically, 46% of the tiny companies used catalogs and direct mail as their method of distribution. 38% of the small companies used both catalogs and direct mail and 43% used direct sales. 66% of the medium sized companies used direct sales and 88% of large companies used direct sales. Large companies did not use manufacturers' reps at all, while a small percentage of the other size companies did.

Among small companies, 38% employed advertising and mentioned exhibits at trade shows, 66% of the medium sized companies also employed advertising, exhibits and demos at trade shows and 75% of the large companies used demonstrations and exhibits at trade shows. An interesting comment made by a producer of trade shows was as follows:

> "the psychology of trade shows, one man commented:
>
> -- nobody goes to the exhibits... so they come up with the method of getting a card stamped (by all the booths) and you turn it in for a chance on a prize (note: I had noted many persons coming by like little puppy dogs to get their "card" stamped)
>
> -- at this show (Bank Administrators Institute), those people are not oriented to security.
>
> -- police convention exhibits do not attract any more interest than exhibits at other conventions. They go to the IACP conventions as a vacation and don't go to the meetings. They do walk through the exhibits at least once."

Most companies employed multiple methods of distribution.

TABLE 15

MANNER OF DISTRIBUTION BY LEVEL OF TECHNOLOGY

AND SIZE OF COMPANY

Manner of Distribution*	Level of Tech.	Company Size: Tiny 29 Firms	Small 21 Firms	Medium 6 Firms	Large 8 Firms	Total
Direct Sales	Lo	1	1	0	0	2
	Med	3	1	1	0	5
	Hi	6	7	3	7	23
	Total	10 (30%)**	9 (43%)**	4 (66%)	7 (88%)	30
Catalog and Direct Sales	Lo	0	1	1	0	2
	Med	5	4	1	1	11
	Hi	9	3	1	2	15
	Total	14 (46%)	8 (38%)	3 (50%)	3 (38%)	28
Manufacturers' Reps	Lo	1	0	0	0	1
	Med	0	2	1	0	3
	Hi	6	2	1	0	9
	Total	7 (23%)	4 (19%)	2 (33%)	0	13
Advertising	Lo	1	2	1	1	5
	Med	2	1	3	2	8
	Hi	8	5	0	0	13
	Total	11 (27%)	8 (38%)	4 (66%)	3 (38%)	26
Exhibits and Demonstrations at trade shows	Lo	1	4	1	1	7
	Med	1	1	3	3	8
	Hi	5	3	0	2	10
	Total	7 (23%)	8 (38%)	4 (66%)	6 (75%)	25
Distributor	Lo	0	0	1	0	1
	Med	1	1	1	0	3
	Hi	3	5	1	2	11
	Total	4 (13%)	6 (29%)	3 (50%)	2 (25%)	15
Other Methods	Lo	0	1	0	0	1
	Med	0	0	0	0	0
	Hi	4	1	0	0	5
	Total	4 (13%)	2 (10%)	0	0	6

* Most companies employed multiple distribution methods

** 30% = 10/30, 43% = 9/21, etc.

Policy Implications

More accurate and extensive information is required on the type of distribution channels, both by product type and size of firm. There is sufficient information at this point to indicate significant differences exist along both dimensions. Also, it is important to know the relative effectiveness of the various channels. Two major policy issues arise in regard to manner of product distribution, neither of which are reflected in the preceding data: 1) effective distribution channels for tiny and small producers, especially those with products requiring demonstration, extensive technical service, or user training; 2) direct access to new equipment by small users especially those who are in remote locations.

To some extent this exposure is provided at infrequent intervals at trade shows and exhibitions, but these are no substitute for direct producer-user contact when product needs are identified or when producers are able to demonstrate their products on the user's premises. One method of intervention in the L.E. market is to establish some form of centralized or joint purchasing to reduce the number of user calls a producer must make for a given number of products sold. Another is to provide a regional test and evaluation center with widespread dissemination of results.

Sub-Issue 3: What are the major classifications of selling procedures and practices utilized in the L.E. market?

Definition: Selling procedures refers to the variety of techniques utilized by producers to market L.E. equipment. These include: allocation of resources for marketing the product, advertising media, demonstrations, trade shows, technical service, meeting user specifications, bidding, and studying problems unique to law enforcement.

Rationale: It is important to know which selling procedures are effective for different types of law enforcement products. This knowledge is useful in developing policy options, especially in marketing products developed with government assistance, and in strengthening existing institutions.

Hypothesis 3: Selling procedures and practices in L.E. markets will include the following characteristics:

a) Bidding procedures complicate the selling process (extensive papers to be filled out, guarantees, etc., special purchasing, multiple shipments, etc.).
b) Technical service or training of users is required by the manufacturers of highly technical or sophisticated equipment.
c) Specifications for products are developed jointly by producer-user.
d) Sophisticated equipment is best sold by actual demonstration to the potential user.
e) Sophisticated equipment needs to be sold by highly trained individuals.

Findings

Some comments made by the producers on the bidding process are as follows:

1) "Half of the people who write bids (specifications) are idiots." Agency should specify what they want equipment to do. Instead municipalities ribbon clerks insist on technical overspecification. The first salesman in writes the specifications. Agencies frequently have to spend appropriated funds before a certain date. Rush causes them to buy wrong equipment."

2) "It (the L.E. market) is a "bit" market...i.e., the quantity is greater than for industry per order in relation to communication.... it tends to go to BID frequently, which means that the price levels go down to where the profit per unit is lower than in the commercial market. Thus, the L.E. market pays less than anywhere in the world."

"What makes the market worthwhile is that it tends to be large for each order...and they tend to innovate more.....LEAA money and assistance has helped this innovativeness.....I can do more experimentation with systems or equipment...such ideas are more difficult in industry.....and sometimes there are spinoffs for the commercial market... the L.E. market is too big and too innovative not to be in it, yet it is the least profitable overall.....it was innovative before LEAA; it always has been....e.g., the Detroit P.D. re. PORTABLE TRANSCEIVERS....the portable transceiver idea came out of conversations with them (I was there) re. better ways to handle situations that were beginning to occur....at that time, our product line was the

big model (basically the HT200, though it was not called that then) ...it was a helluva problem re. how to carry, mount, where to put cords, antennaes, etc.....but this was done without LEAA money.... there are guys who have been innovative."

3) "yes.....L.E. agencies have a tendency to pay their bills (as cf., e.g., with taxi companies), so it is attractive re. cash flow.... it is also a big market potential....further, what P.D.s use today can later be used/sold re. other businesses (P.D.s are product forerunners)"

4) "-- cash flow; they pay on time
-- they are forerunners for other markets
-- most is bid, and a negative part of this is politics, where they are low bidders and don't get the bid but the purchasing agent won't even talk about why not; thus, a lot of their dealers do not even want to bid, even though they are "home-town" people.... bidding also is a problem in that in at least one instance, they lost the bid simply because they were not known....this bidding process differs from other business bidding processes in that businesses specify what they need rather than a specific product....businesses want the best product for their money, and you have a chance to show them how and why your product is their best buy
--he notes that the Federal govt. is "clean" re. bidding (the manufacturer's product must be approved re. specs before it is even submitted for bidding)
--he also notes the "specmanship" game (writing your specs to make your product appear better)
--with State Police and city L.E. agencies, he feels he has to be in on the original negotiations, but this takes personnel and is therefore a problem."

Analysis of Findings

There is no clear cut support for Hypothesis 3(a) regarding bidding procedures. There is no quantitative data and the few illustrative comments excerpted above indicate both advantages and disadvantages to the purchasing process. Advantages include: opportunity to demonstrate product, to be in on original negotiations, and a clean market, i.e., prior product approval before submitting bids. Disadvantages include politics, producer must be known to purchaser, and lack of experitse among users in writing specifications.

No data of significance was collected regarding Hypotheses 3(b), 3(c), and 3(d), although they are still presumed to be true, based on impressions gathered by interviewees. Hypothesis 3(e) is supported on a qualified basis, but so few responses were obtained on characteristics of salesmen (see Table 16) that it is not possible to make firm assertions. Secondly, technical qualifications are also a prerequisite of salesmen in firms with an intermediate level of technology. Lastly, there were only two responses from firms with low technology and neither of these indicate technical qualifications, other than those gained by experience.

Table 17 indicates that several journals are used to advertise L.E. products. Those most often cited are Law and Order (6) and Police Chief (3), although most citations were not specific.

Policy Implications

Bidding procedures should be considered in conjunction with a more extensive analysis of purchasing procedures (see section 7: Equipment Acquisition Process)

An analysis of salesmen's qualifications raises the question of how well salesmen meet these requirements especially those imposed by the technical sophistication of the product. Low user capabilities invite producers to lower their standards for sales and technical personnel. In part, this can be offset by regional testing and evaluation of products and upgrading user capabilities.

Sub-Issue 4: What are the barriers, problems and opportunities in the L.E. market as perceived by producers?

Definition: Barriers refer to obstacles as perceived by producers which either inhibit entry into the L.E.market or constrains marketing efforts of

TABLE 16-SALES CHARACTERISTICS OF L.E. SALESMAN USING DIRECT SALES

Technology of Product		
Low (2 responses)	Medium (8 responses)	High (6 responses)
• Familiarity with guns • 35-40 years - good background selling	• Expertise in electronics • Tech background, market skills experience in L.E. • Product knowledge • Selling background • Experience as court recorder • Mechanic engineer know photograph & sales • Tech - application feasible • Ability to sell	• Will have equipment knowledge & perseverance, basic honesty with product • Smooth selling technique ability • Product knowledge, tech oriented systems understanding • Good salesman - willing to work • Understanding user needs, product knowledge • Tech orientation - product knowledge

TABLE 17- MEDIA EMPLOYED BY PRODUCERS WHO ADVERTISE

Level of Product Technology	Size of Firm: Tiny (11 firms responding)	Small (8 firms responding)	Medium (4 firms responding)	Large (3 firms responding)
Low Technology Product	1 1 Law & Order *(1) Made to Measure	3 3 L.E. Publications (1) Gun World	0	0
Medium Technology Product	7 (2) Law & Order (3) Police Chief (1) National Sheriff (1) Security World (1) L.E. Journals 2 N/A 1 Trade Shows	2 1 L.E. Journals 1 N/A	1 1 Law & Order & Other Journal	0
High Technology Product	3 1 L.E. Journals Communications 1 Non L.E. Journals 1 Fuel Oil News Radio Communications	2 1 Law & Order 1 L.E. Magazines	3 (3) L.E. Magazines (1) Signal Magazine 1 International Publications	2 2 L.E. Journal
Floaters (Mixed Technology)	1 APCO 1 Fire Engineering 1 Business Radio Action 1 Law & Order	1 1 L.E. Journal 1 L.E.		1 1 L.E. Journal

*( ) - Multiple response

those already selling in this market. Problems refer to unsolved issues which producers confront in marketing L.E. equipment. Opportunities refer to the perceived potential for development in the L.E. market.

Rationale: It is essential to know producers' perceptions of the L.E. market, if policies are to be developed to influence the scope, direction and innovativeness of producer activities. It is necessary to ascertain the accuracy of their perceptions and modify those which are inaccurate and where they are accurate, to assist in removing barriers, solving problems and enhancing opportunities.

Hypothesis 4: Producers will view the L.E. market as one in which barriers and problems far outweigh opportunities in their scope and significance. That is, producers will have a generally negative attitude toward the L.E. market.

Findings

In general, this hypothesis is supported in the qualified responses to the inquiry regarding identification and evaluation of L.E. markets, their problems and potentialities.

The following comments were made by interviewees:

1) "Finding the person who makes the purchase decision is a major problem. The process (purchasing) is a maze." "Don't have expertise to defend infra-red viewer in the budget." "Example of Japanese National Police Force. Test and evaluate equipment for L.E. If they think equipment is beneficial they will influence the distributors of the equipment. For smaller, less wealthy police departments, the national P.D. will assist in funding and procurement. For larger, wealthier P.D.s, the national will exert pressure to have them acquire and use equipment."
2) "No national standards for equipment. Need to research and market each state separately due to differing standards."
3) "It takes one and one half years from the first contact to purchase. Need other business to afford own equipment for production."
4) "Regarding communication equipment, it takes too long (2 years) to get FCC type acceptance of a new transmitter."

5) "Police don't have enough money, education (that order) and are handicapped by the legal system, in their opportunities to do a better job."
6) "Bidding Chiefs often lack technical skills so studies don't follow through."
7) "Lack of information on what is needed."
8) "High opportunity cost, lack of information dissemination, uncertainty over what will sell."
9) "Relatively low level of acceptance by LEAA and lack of funds in police budgets for new equipment."
10) "Limited markets."
11) "L.E. market: this is too unstable to attract business...e.g., when LEAA puts up money, it attracts business, but then when they don't... the more equipment is really needed, the less likely it is to be budgeted."
12) "**Politics:** a mayor has so many groups (including L.E. groups) to contend with, and the groups are interested in themselves, and so these groups watch each other..."
13) "**Training:** having equipment without upgrading of personnel is a problem."
14) "A prime example of the major problem in law enforcement equipment is the nonexistence of reliable information on what products exist. Your study should focus on dissemination, not innovation."
15) "...the equipment is the same, but prices are doubled. He blames manufacturers."
16) "all P.D.s operate so differently....i.e., some may get money and others may not."
17) "would like equipment at a reasonable cost."
18) "felt that so many new products are simply a waste of money because they are no good or do not do what they are supposed to do. He feels such products should not be allowed."
19) "L.E. agencies have no one technically qualified to say if they are getting a good deal or are getting screwed."
20) "the small company with a good product has no ability (because of limited financial ability for P.R., etc.) to communicate; further L.E. agencies have lesser confidence in the smaller companies."

21) "the procurement situations of L.E. organizations is bad... they don't have adequate data for judgment, nor do they control the money to be spent in purchasing equipment.....i.e., those who control the funds and those who know what they are doing are two different sets of people, and there is no pipeline of communication."
22) "Few companies have made large sales in the L.E.-C.J. field.... there are large markets for fleet autos, computers, electronics, i.e., where the company has a product and can adapt it to L.E.-C.J. use."
23) "people are trained in their equipment and there is the spare parts problem....an L.E. agency compounds its problems if it uses a variety of manufacturers."
24) It is a hazardous market. Large companies will not go under if the L.E. market slips, but small companies would. For example, there was the LEAA boom, but now a lot has dried up because of criticism of equipment (hardware) purchased by P.D.s."
25) A lot depends upon the local budget. Here, if there is a choice between (a) a raise, (b) training, and (c) equipment, the choice would be in that order, with the raise being clearly the priority choice because it is less of a political problem for cities than spending money elsewhere."
26) Criminal Justice, esp. P.D.s, have not always spent money prudently in the past, and this hurts the market."

Summary of Findings

1) Several key factors stand out as barriers. These include:
   a) Purchasing procedures (see (1) and (21) above)
   b) Lack of user technical expertise (see (1), (5), (13), and (19) above)
   c) Lack of national standards for equipment (see (2), (18), and (23) above)
   d) Length of procurement cycle (see (3) and (4) above)
   e) Limited funds (see (5), (9), (20) and (25) above)
   f) Bidding procedures (see (6) above)
   g) High opportunity cost (see (8) above)
   h) Uncertainty over product marketability (see (8), (11) and (24) above)

i) Lack of acceptance by LEAA's (see (9) above)

j) Limited markets (see (10) and (22) above)

k) Political influence (see (12) above)

l) Reliable information (see (14) above)

m) Increasing price of equipment (see (15) and (16) above). Note: It is not clear from the responses the extent to which this is the result of inflation and the rest due to a manufacturer's marketing advantage.

n) Product quality (see (18) above)

o) Confidence in producer (see (20) above)

p) Past pattern of expenditures (see (26) above)

2) The question apparently hit a fruitful area of investigation. Each of the several dimensions (a-p) should be examined in more detail to determine the relative importance and interrelatedness of these factors.

3) Factors (a-p) are especially important in limiting the <u>entry of new firms</u> in the L.E. market.

4) Considerable know-how is necessary on the part of the producer in dealing with L.E. agencies.

5) Barriers are especially hostile to the introduction of <u>innovation equipment</u> since they increase risk and uncertainty.

6) Differential technical sophistication of producers and users may be a major problem in marketing in the L.E. market. If the market is large enough the producer can adjust his marketing tactics with appropriate personnel. In small markets it may not be worth it to him.

7) Innovation for L.E. equipment may be a low producer (and for that matter user) priority.

8) The L.E. market may be secondary to a large number of producers. It is important to find out the extent to which this is a factor in key product areas.

TABLE 18

PERCEIVED ATTRACTIVENESS OF L.E. MARKET BY SIZE OF FIRM

		Perceived Responsiveness			
Size* of Firm	Product Line	Yes	No	Qualified Response (Y=Yes, N=No, UC=Unclassified)	No Response
Tiny	Portable Transceiver	2			2
Small		3		1-No, market is too small and too specialized (N)	1
Medium		2		1-Yes, highly competitive (Y)	
Large		1		1-Yes, profit is low due to competitive bidding (Y)	3
				1-Not especially (low profit margin) (N)	
Tiny	Voice I.D.			1-L.E. is an excellent market (Y)	
Small				1-No, tight money, bureaucracy, more attractive markets -- medicine, speech therapy (N)	
Tiny	Non-lethal Weapons		2	1-Yes, if we market product at $1.50/unit (Y)	1
Small		1			
Large		1			
Tiny	Body Armor	3	1	1-No, too small, limited sales (N)	5
				1-Two years from now, yes; now, no (N)	
Small			1	1-Marginal profit but otherwise attractive (Y)	1
				1-Hard market..takes lots of money (in) big cities (UC)	
Large				1-Market is diffused and fractured (N)	
Small	Court Recording	1			
Large		1			

* Refers to corporate or division size.

(Table continued on following page)

TABLE 18 (Continued)

PERCEIVED ATTRACTIVENESS OF L.E. MARKET

Size of Firm	Product Line	Perceived Responsiveness: Yes	No	Qualified Response (Y=Yes, N=No, UC=Unclassified)	No Response
Tiny	Weapons Detection			1-Not an attractive market (N)	2
				1-Yes and growing market (Y)	
				1-Not so far (N)	
				1-Courts are a big market (UC)	
				1-We think it could be; have not surveyed (UC)	
Small				1-Not really; a small sideline to L.E. (N)	2
				1-Soured on L.E. (N)	
				1-Yes obvious application, but market (is) inadequate (Y)	
				1-Discouraged from market; standards not universal; hassle of standards (N)	
Medium	Vehicle Locator			1-Yes, is commercial once developed, stable, reasonable, predictable, expanding (Y)	
Large				1-just gotten into market (UC)	1
Tiny	Low Light Photography	1	1	1-Not at present (N)	1
				1-Very attractive (Y)	
				1-Extremely difficult; requires winning buyers (UC)	
Small			1		
Medium			1		
Large				1-Limited (N)	1
				1-All products go through dealers (UC)	

(Table continued on following page)

TABLE 18 (Continued)

PERCEIVED ATTRACTIVENESS OF L.E. MARKET

Size of Firm	Product Line	Perceived Responsiveness: Yes	No	Qualified Response (Y=Yes, N=No, UC=Unclassified)	No Response
Tiny	Utility Belt and Holster	3			
Small		2		1-Yes, demand and production to increase (Y)	
Total		21	7	29 (Yes=10, No=13, Unclassified=6)	22

Grand Totals		
	Yes	31
	No	20
	Unclassified	6
	No Response	22
Total Number of Product Line Assessments		79*

*Some companies interviewed make more than one product for the L.E. market

TABLE 19

PERCEIVED ATTRACTIVENESS OF L.E. MARKET BY PRODUCT

Product Line	(1) Yes	(2) No	(3) Unclassified	(4) No Response	(5) Attractiveness of Market *
Portable Transceiver	10	1		6	Highly attractive
Utility Belt & Holster	6				Highly attractive
Court Recording	2				Attractive
Vehicle Locator	1		1	1	Attractive
Non-Lethal Weapons	3	2			Moderately attractive
Voice I.D.	1	1			Moderately attractive
Body Armor	4	5	1	5	Moderately unattractive
Weapons Detector	2	5	2	2	Unattractive
Low Light Photography	2	5	2	2	Unattractive

*Based on ratio of Column (1) to Column (1) + (2)

TABLE 20

PERCEIVED ATTRACTIVENESS OF L.E. MARKET (LEVEL OF TECHNOLOGY)

Reporting Companies = 56

Size of Company	Level of Technology: Low Yes	Low No	Medium Yes	Medium No	High Yes	High No	Total by Size Yes	Total by Size No
Tiny 25	3	0	9	10	3	0	15	10
Small 17	3	0	3	6	3	2	9	8
Medium 6	0	0	1	2	3	0	4	2
Large 8	0	0	3	2	2	1	5	3
Total by Tech.	6	0	16	20	11	3	33	23

TABLE 21

PERCEIVED DIFFERENCES IN L.E. MARKET AND OTHER MARKETS

Size of Firm	Product Line	Perceived Differences
Small Medium Large	Portable Transceivers	- Cash flow, pay on time, forerunner of other markets; mostly bid. - Size of market, small not enough standardization - Highly specialized, bid business, politically oriented. - More sophisticated, stringent regime, tougher. - Competitive bids - more sales service; more paperwork; performance requirements very high; competitive bids - Competitive bids; lack of sophistication of users
Tiny Small	Non-lethal Weapons	- More receptive, critical need situation - Discriminating market; L.E. agencies (have) considerable initiative
Tiny Small	Body Armor	- Smallness of sales - More specific kind of market; takes more labor (i.e., sale effort) for L.E. industry - Lack of standards. Too willing to believe sales pitch; don't understand available standards
Large	Court Recording	- Not sure L.E. is viable industry
Tiny Small Medium	Weapons Detection	- Seldom have large single sale in L.E. market; not a standardized market - It is a personal market - All technology; weak in utilization - Results (are) measured better in industry - L.E. (is) too inconsistent; L.E. reluctant to assemble kits

(Table continued on following page)

TABLE 21 (Continued)

PERCEIVED DIFFERENCES IN L.E. MARKET AND OTHER MARKETS

Size of Firm	Product Line	Perceived Differences
Medium	Vehicle Locator	- Direct selling (is) difficult; different people in their thinking diverse; under public eye both in group and as individual; military is great company
Tiny	Low light Photography	- Can not communicate - Poor decision making; bureaucracy; slow payer - Unknowledgeable buyers - Don't know contacts; not educated; bribing
Small		- Budget cycles difficult to work in
Medium		- Lack of sophisticated buyers; bidding headaches; volume too small
Large		- High cost; low sales for marketing

Analysis of Findings

The problems of L.E. markets, as perceived by producers, are extensive as the foregoing illustrative list and summary indicate. These problems are enumerated as starting points for more intensive analyses, since there is no indication of the incidence of these problems, nor their relative priority.

The perceived attractiveness of the market is not easily analyzed. Ostensibly, the market is attractive to a majority of the firms interviewed (31 found it attractive against 20 who found it unattractive). However, many of the responses were qualified (see Table 18). Also, the attractiveness of the L.E. market varied among the various product lines (see Table 19)

In view of these negative perceptions of the L.E. market, it was surprising to find that the majority of the companies reporting felt the L.E. market was an attractive one (see Table 20). High technology and low technology producers felt it was the most attractive. Actually, medium

and large companies said "yes" by a greater percentage probably because they have the marketing staff to do research, where small and tiny companies do guess work or go by sales since their incomes are limited by size. As in the case of Hypothesis 2 in the preceding section on the R,D&E process, many apparently positive reactions to the L.E. field were qualified or tempered by reactions to several problem areas.

Finally, the L.E. market is perceived by some interviewees to differ significantly from other markets in which they operate. Some noted negative factors such as bidding, small market size, and user personnel limitations, while others noted positive features such as level of sophistication, more receptive, and forerunner of other markets. (See Table 21)

In view of these varied reactions, Hypothesis 4, as stated, is not supported, and, in general, the high incidence of problems cited and qualifications on opportunities are indicative of limited commitments of many producers to the L.E. field.

Policy Implications

Each of the problems listed above in the summary of findings, is indicative of important policy issue. They are all covered elsewhere under appropriate sub-issues.

Sub-Issue 5: To what extent can the L.E. market be aggregated?

Definition: Market aggregation refers to the extent to which a standard product can be sold in the L.E. market without having to make product modifications to meet individual user needs.

Rationale: This is an issue of critical importance. If markets can be aggregated, then many of the techniques of mass marketing and production and product standardization can be utilized. On the other hand, if users require a number of modifications, then the market will have the high marketing and production costs associated with small orders and considerable customer service. Especially important is the need to ascertain the extent of misconceptions regarding market aggregation.

Hypothesis 5: Special requirements of individual users will cause producers to make changes in their product which will limit the possibilities of aggregating the market, mass production, and product standardization.

Findings

1) This hypothesis, so far, has not been supported. Producers were asked whether they could generally sell stock equipment or were there local conditions which make major and/or special modifications necessary? The great majority of responses were that they sold from stock, or stock products with occasional modifications. A minority made regular local modifications. Additional observations based on interview comments:
    1) Most companies interviewed sell to L.E. agencies from stock.
    2) Producers do not want to make product modifications.
    3) Most producers make product modifications in order to accommodate the user, not to protect their markets (product differentation).
2) In reply to a question asking what problems did the demand for special designs create for them, most reported no problems. Problems that did receive mention were time, "creates higher production costs and causes personnel problems", "favors U.S. manufacturers - since they do this better than foreign firms."
3) Producers were also asked, how much did they modify equipment to meet individual user requirements and perferences? Most replied that they made either no or only slight modifications. (One reply was that modular construction permits modification and potential addition of features.) A minority indicated major modifications or "made as necessary" (where profit margin permitted).
4) Interviewees were also asked how much adaptation to local requirements went on? Most responded that there was none or only a little. They were also asked how much of a necessity is this adaptation to local requirements and again the majority felt that it was of little or no importance, although there was an indication that urban versus rural as well as city size did require some adaptation.

To the question of what problems does special adaptation of problems create, most producers replied none. Some did indicate problems of time, effort, etc., that it creates more costly products and places stress on people relationships. Most producers felt it was not possible to be profitable and innovate just in the law enforcement part of the business, although a large minority did not see it this way.

Policy Implications

A few firms can make it by serving only the L.E. field. The characteristics of these firms and their products should be determined as well as how they differ from firms serving the L.E. field only incidentally. Incentives to innovate L.E. equipment may differ considerably between the two classes of firms.

Sub-Issue 6: To what extent are L.E. products originally developed in other sectors and transferred to law enforcement market with little or no modifications?

Definition: Other sectors refers to any market other than law enforcement.

Rationale: It is important to know the source of innovations for the law enforcement market. If most major product innovations are transferred from other sectors, it may make sense to go directly to these sources for L.E. innovations, rather than attempting to build R & D capabilities exclusively for law enforcement.

Hypothesis 6: Law enforcement products are usually developed in other sectors and adapted to L.E. needs with little or no product modification.

Findings

Based on the data in this study, this hypothesis is supported. Most producers indicated that their law enforcement products were an extension of and/or a modification of products developed for other sectors. That is, circumstances leading to the developement of the products were not the L.E.

market as such but products were developed because of a need -- the armed services, hijacking, the riots, treasure hunters, industrial security and aviation.

Nine companies reported that their product was developed just for the L.E. field and market, a very small segment of the companies interviewed.

Policy Implications

1) According to firms interviewed, L.E. equipment is primarily a modification of equipment developed for other markets.
2) If true, this has important implications for the development of innovative equipment for the L.E. field, eg., it may have to be developed first for (or in conjunction with) other markets.
3) These findings also imply that measures must be taken to insure a) knowledge of product innovations in other markets that may be relevant to L.E. and b) means are available to make this equipment available to L.E. agencies and c) methods of stimulating inventions.

Sub-Issue 7: To what extent is it necessary for producers of L.E. equipment to combine sales in the L.E. market with other markets?

Definition: This issue refers to the producers need to sell the same product simultaneously in law enforcement and other markets.

Rationale: It is felt that firms wholly dependent on the law enforcement market will react differently to incentives to increase or change the scope of their marketing efforts than those to whom L.E. equipment is a sideline.

Hypothesis 7: Most producers of L.E. equipment will consider it necessary to be in other markets in addition to L.E. markets.

TABLE 22

ECONOMIC FEASIBILITY OF MARKETING EXCLUSIVELY FOR L.E. MARKETS

	Economic Feasibility			
Type of Equipment	Yes	No	Qualified Response	No Response
Portable Transceiver	4	5		4
Voice I.D.		1		1
Non-lethal Weapons	1		1 - Depends on support we get 1 - Project cancelled - lost money 1 - Yes, as a phase out 1 - Product not a profitable item	
Body Armor	3	3		5
Court Recording		2		
Weapons Detector		4	1 - Only market but it is small 1 - No, not for large corporation because (it is a) slow moving evolving market	4
Vehicle Locator			1 - Sales never high - very few sold	2
Low Light		6	1 - Barely but less so 1 - No, but pays bills 1 - No, but there is potential 1 - Delays in selling L.E. agencies	1
Utility Belts and Holsters	4		1 - Yes, private security too	1
Total	12	21	12	18

Analysis of Findings

The data from this study tend to support this hypothesis. Most producers felt that it was very or moderately important in terms of profitability and innovation to be able to combine their law enforcement equipment with equipment sold in other markets. For example, out of 44 companies, 66% of companies felt it was not economically feasible just to be in the L.E. field, while the remaining 34% felt the L.E. field was a big enough market to stand by itself.

Policy Implications

The fact a majority of the firms interviewed found it necessary to also sell in other markets is indicative of the marginality of the L.E. market. This may result in certain benefits of an increased infusion of new technology through a common sales force. It may also result in insufficient attention being given to the L.E. market by producers. The latter situation reflects the general problem of strengthening the market and other producer-user contacts.

The mixture of firms operating in several markets include L.E. while other firms operate solely within this market, complicates the problem of implementing any set of policies to strengthen the market. This is a result of the different level of commitment which is likely to exist with these two types of firms.

Sub-Issue 8: How competitive are L.E. equipment markets?

Definition: Competition refers to the number of firms making a similar product and capable of selling it to the same users.

Rationale: It is generally assumed that competition leads to product improvements and lower prices. To the extent that markets are not competitive it is often assumed that these two advantages do not occur. To the extent that this promise is true, it is important to ascertain the extent of competitive practices in a given market.

Hypothesis 8: Law enforcement markets are generally not competitive.

TABLE 23

PRODUCERS' APPRAISAL OF DEGREE OF COMPETITIVENESS OF MARKET

Product	Low	Medium	High	N/A*	Total
Utility Belts	0	0	6	1	7
Body Armor	1	4	5	5	15
Portable Transceivers	0	1	15	2	18
Non-Lethal Weapons	2	0	3	1	6
Court Recording	2	0	0	0	2
Building Design	0	2	0	0	2
Voice I.D.	2	0	0	0	2
Vehicle Locators	0	2	0	1	3
Weapon Detection	1	1	2	5	9
Low Light Photography	3	0	7	1	11
Total	11	10	38	16	75

*Not Appraised

Analysis of Findings

The competitiveness of the market varied with the type of equipment, not necessarily the degree of technology or the size of the company. Utility belt manufacturers and portable transceivers producers found the market highly competitive. Over 50% of the producers of non-lethal weapons and low light photography felt the market was highly competitive, but less than one third felt there was low competition. Building design and vehicle locators fell right in the medium degree of competition. Court recording and voice I.D., newcomers to L.E., felt the competition was low. Weapon detection and body armor was spread over all three categories with highly competitive being the most significant.

With these differences according to product line, it is difficult to generalize about the competitiveness of L.E. markets, although 64% (38 out of 59) of the firms responding perceived their markets as highly competitive.

It should be recognized that even in a competitive market where one or two firms dominate (e.g. transceivers) the majority of firms might still tend to "perceive" their environment as competitive. Further research is required in this area.

Policy Implications

Assuming the extent of competition is indicative of product improvements and lower costs, it is important to insure that these conditions prevail. This implies considerable government intervention in markets which have developed on a marginal basis. This presents a major problem since the size of many markets is not sufficient to insure more than a very limited number of firms.

The degree of competiton must be examined more extensively in the important product lines, so that policies can be implemented more effectively. More important, the extent of competition must be evaluated in terms of its impact on innovativeness, product quality, price and service.

Hypothesis 9: Innovativeness is a basis for competition in law enforcement markets.

Findings

There is some limited support for this hypothesis. Many producers felt that there was competition between firms on the basis of innovation. One producer reply was "If anything is developed, it is copied." Another replied, "To maintain its share of the market, -------, -------, -------, compete in upping the state of the arts in the hand mobile communications field." A third producer indicated that there was not really competition on innovation. Another replied, "The companies in this field are weak companies as far as innovations because of the types of companies involved". Beyond this, few comments were made on innovativeness as a basis for competition.

Policy Implications

Apparently, innovativeness is a basis for competition in some L.E. markets. There is a need to identify the degree of competition by major product types to ascertain its impact on innovation.

Sub-Issue 9: What problems do firms encounter when first attempting to enter the L.E. market?

Rationale: If firms are to be attracted to the L.E. market, it is essential to know the major problems they will face so that action can be taken to mitigate their problems.

TABLE 24

PROBLEMS PERCEIVED FOR NEW COMPANIES ENTERING THE L.E. MARKET

Size of Firm	Product Line	Problems Perceived
Tiny	Portable Transceivers	- Financial backing - Competition for larger companies
Small		- Getting to be known - being aware of market needs - Financial resources - Product acceptance
Medium		- Manpower, money, reputation, specifications - Competitive engineering, sales competition - Recognized reputation, high volume, low profit
Large		- Lack of expertise, money, experienced salesmen - Very competitive financing - Large amount of capital, distribution, maintenance required; customers are unsophisticated
Tiny	Non-lethal Weapons	- Money, credibility, size - Sales, volume - Establishing contact with L.E. agencies
Tiny	Body Armor	- Not a large market so a new company would have little to sell - Not many get a product; selling it - Mainly money - Reputation, getting known, diffused market - Trouble gaining access to buyers
Small	Court Recording	- Credibility, personal knowledge, immediate responsiveness to market

(Table continued on following page)

TABLE 24 (Continued)

PROBLEMS PERCEIVED FOR NEW COMPANIES ENTERING THE L.E. MARKET

Size of Firm	Product Line	Problems Perceived
Tiny Small	Weapons Detection	- Market saturation with competitors - Very competitive, must educate seller (i.e., distributor) - No experience - Maintenance of sales volume - Product has to adapt to L.E. use, hazardous market, demand dries up quickly - Similar to all commercial markets, a large number of display models is required, getting expenditures in next year's budget
Medium Large	Vehicle Locator	- Small company, can't afford best people - Limited budgets, sell at only one level, extreme rank consciousness - Not enough money for system, too long to wait for sale
Tiny Medium	Low Light Photography	- No demand - Need large amount of capital; very technical - Hard to handle L.E. political influences; highly competitive - Volume too small; purchasing procedures
Tiny Small	Utility Belts and Holsters	- Develop good products and representatives - Tight market - Competing with major established company - Market crowded, competition

Analysis of Findings

The above list of problems makes it apparent that entering the L.E. market is no easy task. However, as in any list such as this, the incidence of these problems by product line and size of firm must be determined before policies can be designed and implemented.

Policy Implications

Entry into the L.E. market should be facilitated so that new firms with innovative L.E. equipment can attempt to sell their product without insurmountable barriers. The importance of new firms entering the L.E. equipment field underscores the need to get better statistics on the size, growth rate, entry and exit of firms, and their rate of innovation in the L.E. field.

Areas Requiring Further Research

1) Analysis of market size by product line to determine funding available for R,D&E from private enterprise for product development; requirements (if any) for external funding; and number of firms which can be economically supported by the market.
2) Determination of the extent to which sales in non L.E. markets must be combined with L.E. markets.
3) Assessment of the degree of competition in each of the major product lines and its impact on product development, cost, quality and service.
4) Comparative analysis of the effectiveness of alternative channels of distribution by product line and size of firm.
5) Identification of problems encountered by firms entering the L.E. market and assessment of their incidence and relative importance by product type and size of firm.
6) Identification of the patterns of technology transfer for new L.E. products originating outside the L.E. market.
7) Determination of the impact of the bidding process on distribution patterns by product line and product size.
8) Analysis of the buying patterns of different types of users in each of the major product lines.

Illustrative Policy Options

1) Dissemination of market information -- There is a need to have comprehensive studies made of actual equipment needs in L.E. agencies. These probably require government sponsorship to assume widespread dissemination after their completion.
2) Centralized purchasing -- A centralized agency would be able to test, inspect, and recommend the best equipment as well as purchasing it in an economical lot size. This would make it easier for producers to sell their products as well.
3) Equipment rental -- One means of insuring exposure to new equipment would be to rent it for a trial period with an option to buy. Such arrangements may not be feasible for small producers and worthwhile to larger ones. Arrangements for rental could be undertaken in conjunction with centralized purchasing (see (2) above).
4) Joint purchasing arrangements -- An option at the local or state level to combine purchasing power.
5) Subsidized prices -- Some law enforcement agencies are not able to purchase all their basic equipment needs much less new innovations. Arrangement to distribute equipment to these organizations should be explored.
6) Need contacts to survive and many existing companies are small and they need protection. They are certainly not given it now because of patent costs and laws. If new person came in, he would have edge for short term until product, assuming it was innovative, was copied. Otherwise, a new company would not really be able to survive, if it were just going to produce the existent products, without contacts.

3. Information Transfer and Dissemination

General Statement of Issue

This issue deals with the communication that takes place between various elements of the R&D system in law enforcement. This includes communication from producers to users, other sources of information by which users learn about products, communication from users to producers, and the sharing of information between users.

Specific areas of concern are with type and adequacy of information available, sources and credibility of the various information sources to L.E. users, the feedback from users to producers and the extent to which producers encourage and utilize such feedback and the patterns and extent of user to user communications.

Sub-Issues

1) Can the communication that takes place between producers and users be improved?
2) What is the usual pattern of communication between users and how can this method of information exchange be improved?
3) What role can the government and other third party sources play in the dissemination of information?

Sub-Issue 1: Can the communication that takes place between producers and users be improved?

The exchange of information is a definite problem in law enforcement with respect to innovative equipment. Information dissemination is both limited and distorted. The most serious problem rests in the transfer of information between producers and users. These two components of the R&D system neither respect one another nor attempt to communicate very extensively with each other. As long as this difficulty persists, the utilization of innovative equipment in law enforcement will be seriously impaired even when producers are conscientious about developing useful innovations and users are desirous of new and improved equipment to aid in law enforcement.

The Producers (N=71)

Communication To Determine User Needs:

Producers show little effort to solicit user input on the development or modification of equipment. In those instances where a law enforcement user has had suggestions or recommendations to make regarding the creation of innovative equipment, these ideas have been communicated generally only through the initiative of the user who contacts appropriate

producer either formally or at conventions. In addition to this fact that most innovations are developed and manufactured by producers rather independent of solicited user input, most of these producers (with the exception of some larger companies who also actively service users in other fields) also make little or no attempt to gain information from users in the form of market research after a product is developed in order to develop an accurate estimate of demand. Few producers indicated having a truly realistic idea of how a product will sell. In fact, there were several situations in which companies overperceived demand by misinterpreting (overgeneralizing) the enthusiasm that was communicated to them by a limited number of users who were hardly representative of the range of law enforcement agencies.

Communication to Determine Effectiveness:

Coupled with the rather limited effort that most producers exhibit regarding determination of law enforcement needs directly from users is the general failure of producers to solicit feedback from users regarding equipment effectiveness. Unless complaints are made by the users, most manufacturers are unaware of difficulties that might arise more than infrequently regarding either maintenance or utilization. For instance, many users of voice identification have experienced annoying maintenance problems rather frequently although the producers did not acknowledge an awareness of this situation.

The failure of producers to determine user needs and equipment effectiveness is attributed to several factors. One structural cause is the separation of producer and user. These parties are buffered by salesmen or distributors who do not consider such activity as part of their role. When the salesmen are uninterested in performing this function and no other formal channels of communication generally exist, it is not surprising that potentially significant information is frequently not exchanged. A second reason is that many producers simply don't want input from users. This is based on a fairly widespread belief among company representatives that law enforcement personnel are not knowledgeable. Given the view that most users aren't smart enough to know what they need and frequently aren't sophisticated enough to adequately make use of existing equipment capability, most producers feel no desire to get information from law enforcement users because they do not see such input as having much credibility. A third reason is that many companies

view the law enforcement field as only marginally profitable (and then frequently only when the product is sold in conjunction with other markets) and therefore don't see much payoff from making the effort to know what is happening regarding needs or successes and failures.

Communication About Product Line:

As expected, producers are far more conscientious in communicating about the equipment they have for sale. In order of importance, the most frequently adopted means of communicating about products is: direct sales, magazine advertising, and convention exhibits. Mailings and free samples are also used on occasion. Generally a company relies upon some combination of the three most prevalent marketing approaches. A special problem exists for the small producer. He frequently lacks the money and manpower necessary to communicate widely to users about their products. Therefore it is more difficult to create awareness of their product list. Typically it is the small user and the rurally situated user who is most likely to suffer from this limited ability to communicate.

In addition to product availability, many producers also make the following supplementary information available either to consumers or potential consumers.

Type of Information

	standards	list of previous purchasers	instruction manual	service manual
% of producers supplying the information	26%	42%	48%	26%

Quotes on Producer Attitudes Toward the User

"Equipment is not useful until L.E. groups are educated about the new technology and its application."

"Equipment is more sophisticated than the user. Too often they go in for gimmickery."

"We actually seek and receive very little feedback."

"The small company with a good product has no ability (because of limited financial ability) to communicate. Furthermore, L.E. agencies have less confidence in the small companies."

"Our company is physically and financially constrained and can't get to potential buyers who would buy the product if they could see it."

The Users (N= 47)

User Communication of Needs:

Twenty one per cent of all producers indicated that they had received information regarding user equipment needs in law enforcement. In only one fourth of these instances was this information solicited by the producer; in all other instances the users initiated the exchange. This usally occurs through personal contact. This personal contact generally involves finding the appropriate channels of communication. User needs would be communicated more readily if 1) Formal channels already existed, or 2) the users were not constrained by their intense distrust of producers. This attitude severely limits any desire or willingness on the part of users to express their views to producers. Largely it appears that this view is based on unfortunate personal experiences rather than some ill formed stereotype that was largely perpetuated due to rumor and misinformation.

User Communication Regarding Effectiveness:

Again, there is an unwillingness to communicate anything to producers. In the area of effectiveness, lack of trust is only one reason. Typically it appears that most users perform informal and rather crude evaluations (if any at all) and most users do this for personal information or because of a government requirement. In either case, users generally make no effort to publicize the results so that either the producers or other users might benefit from their experience.

User Communication Regarding Desire to Purchase:

Because of user attitudes regarding producers, most users are hesitant to base their purchase on information provided by salespeople. Therefore, most information about innovative equipment is solicited from users currently operating the equipment under consideration. Only after, the initial impressions are formed on a basis of information supplied from other users.are producers either contacted or listened to seriously. At this point other users have suggested specific producers (to use or avoid so that information is only seriously sought and processed from a limited number of potential suppliers. Information exchange during the prepurchase phase is therefore limited to later stages and occurs only among a small proportion of potential sources of information.

User Quotations:

"If we had an idea for new equipment, we wouldn't know right now where to go or to what manufacturer."

"We view L.E. equipment salesmen with suspicion."

"We rely heavily on other Police Departments to learn about new products. We have an inherent distrust of manufacturers..in fact one salesman almost killed himself demonstrating a poor product to the department. We learn about less than 20% of all innovations via manufacturers."

Policy Implications:

1. Work on training programs designed to improve the willingness of producers and users to communicate with each other.
2. Develop centralized function (eg. a national clearinghouse) which will more readily permit communication. Both small producers and small users are seriously limited in their ability to either obtain or disseminate pertinant information under the existing R&D system.
3. Convince users (through training programs, etc.) of the positive consequences that would result from more readily reporting to others the results of innovative equipment they have purchased and utilized.

Sub-Issue 2: What is the usual pattern of communication between users and how can this method of information exchange be improved?

Most of the users reported that they rely primarily on other users to learn about new developments regarding innovative equipment. This dependence on other users is basically due both to a desire to take advantage of the expertise and experience of more innovative users and also to avoid the need to rely on producers who are typically viewed with distrust if not contempt. There are definite gatekeepers in law enforcement and information on availability and effectiveness of new equipment diffuse downward from these users. The advice of these innovative users is frequently solicited and typically followed regarding adoption, what to buy, and from what source.

Most communications between users is informal, occuring through discussions at association meetings, as a result of conversations with friends and acquaintances in other departments, or by direct contact when a specific need arises. Typically, communication between users follows this type of pattern:

a) Small users generally obtain information at regional and state and local L.E. meetings.

b) Medium size users obtain information from other users of equal or larger size within their state.

c) State police get information from other state police or from regional meetings.

d) Large users typically

(1) buy minor (unsophisticated) equipment direct from producers.

(2) for larger purchases

(a) some buy direct from manufacturer on basis of internal evaluation (36%)

(b) some seek information from other large L.E. users (large but not really an early innovator) 34%

(c) others obtain information from non law enforcement equipment users. (26%)

Thus, there is a definite pattern to the exchange of information between users. Typically the users who need the information act as the initiators of the communication. They generally contact other users of similar or somewhat larger size. Small law enforcement agencies are hesitant to contact very large users. Largely this is because they are uncomfortable about making requests of such busy departments where there is no way of reciprocating for the favor. Therefore there is a trickle effect. Smaller departments are informed by somewhat larger users who are informed by larger ones.

An alternative approach is to have regional (e.g. portion of state, total state, multistate) associations whereby information can be exchanged formally.

Problems with this approach to communication between users:

1) Information is available on request. It is not typically publicized or made readily accessible to a wide number of users.
2) It is sometimes difficult to know which users are doing what innovatively in order to request the information.
3) There is frequently a large time delay before smaller users are exposed to innovative experiences.
4) Distortion can occur by user x telling user 4 what user 2 has done?
5) Frequently what works well and is appropriate for one user is wrong for another user with different circumstances and needs.
6) Users are often not adequately trained to understand what they learn from other users.
7) The most knowledgeable users can not always informally service all interested requests for assistance.

Quotes

"More and more we are borrowing ideas and information from other state police."

"Salesmen come and tell us what police departments are doing what and then we call the departments directly."

"Ordinarily if the chief wants information, we will call others, especially within the geographical area of the state."

"If you sell a couple of big police departments, the small ones will see the product and even use the manufacturer's specs or big police department bid request to make their own order."

Policy Options

1. Develop more formal channels by which users can exchange information on innovations.
2. Make information regarding the experiences of innovative users readily accessible to all other law enforcement agencies.
3. Establish a national clearinghouse to provide information.

Sub-Issue 3: What role can the government and other third party sources play in the dissemination of information?

Most users agree that neither LEAA nor JACP do an effective job of communicating important information. 23% of all the users analysed indicate that they would like a national clearinghouse or some other technique to easily and effectively learn what is available and how good it is.

Most users complain

(1) A lot of useful information on effectiveness of equipment never gets conveyed to other users.

(2) Much of the information available from producers or through the media have questionable credibility. There is a consensus that law enforcement users need more information which is trustworthy and easily accessible.

Thus, most users agree that much really helpful information is not accessible (particularly a) regarding really new innovations, b) pertaining to equipment available from small producers, c) relating to the actual experiences of innovative users) and much of the information that is accessible can not be taken at face value.

A clearinghouse could provide information quicker, easier, and more accurately, permitting users to become more knowledgeable, be better prepared to decide whether an innovation is really appropriate for their needs, to aid in the selection of proper equipment, and to help eliminate the needless reoccurence of innovative failures and fiascoes. It could also reduce product costs thereby increasing the attractiveness of the L.E. field as a market -- at present a very serious problem.

Quotes:

Producers

"A real need is a central repository to assemble and disseminate new product information to L.E. users."

"Would like to see LEAA making search of what is available for users."

"There should be a clearinghouse for L.E. equipment which either endorses it or disapproves of it."

"Dissemination of information about what exists is the key to getting innovative equipment into the law enforcement field.

"A national group is needed... the user would know where to go and get info... the producer would have the benefit of having his product made

known at less expense to himself... also each user agency does not need to know who has expertise about each product."

User

"We need a central repository so we would know exactly where to go with an idea."

"I would like to see a national service to set standards and evaluate... also information dissemination to local police departments."

"If everyone's ideas were in a common pool; how x has worked in practice so we could go to a central source for information it would be helpful... all the time, there are things you think should work but often don't, and it would help to know the experiences of others."

"Yet practically no one has heard of the experiment... no distribution from LEAA. They should be distributing the report to get widespread reaction."

"What we do in the name of innovation does not get recognition and we do not publicize it... e.g., you may have two P.D.s doing a similar innovation and they are not aware of each other, so they cannot compare notes... if there were some kind of clearinghouse, repository.... I guess there is... the LEAA... but I'm not really aware if it is... the problem is that lots of planning officers have lots of ideas... if there was some place they could go and get information to see if others have tried it."

In addition, something needs to be done to improve user-producers attitudes toward each other. As long as each has limited respect for the other, little can be achieved regarding better transfer of information. Training may be one way of starting to improve this problem.

Policy Options

1. It is apparent that alternative means of communicating are needed. A national clearinghouse is one option which could provide users with information regarding the availability of equipment and the standards which might exist as well as to publicize the results experienced by users who have implemented and evaluated innovative equipment.
2. Make readily available to all other users the results of evaluations

required of all law enforcement users who use federal funds to purchase innovative equipment. A frequent complaint is that this wealth of feedback on equipment effectiveness is lost to other users who could use such information to avoid the repetition of failures.

3. To adopt training or some other intervention to improve producer and user perceptions and attitudes about each other in order to increase their willingness to communicate with each other.

4. Need Identification

General Statement of the Issue

In general, this issue is concerned with how the needs for equipment become salient in law enforcement. There are 2 points at which this need identification is an important factor - at the user and at the producer.

There are two general processes by which needs become salient in user agencies.

Process A. Performance evaluation may indicate operational deficiencies and a search may be initiated for information about equipment to improve operational effectiveness.

Performance Evaluation → Awareness of Operational Deficiency → Search for Information

Process B. Awareness of the existence of a piece of equipment may generate desire for improvement in operational effectiveness (even though effectiveness had been perceived as adequate) and a search may be initiated for information.

Awareness of Existence Equipment → Desire for Operational Improvement → Search for Information

Each process carries a different implication for a policy of intervention in the process. If Process A is prevalent in L.E. (or some significant portion) then intervention would be more effective if it was directed at giving L.E. agencies greater capability for performance evaluation. On the other hand, to the extent that Process B is more prevalent, then intervention in the form of publicizing and popularizing innovative equipment will be more effective.

The identification of user needs by producers is also important. Figure 3 indicates 4 processes by which producers could become interested in producing and/or marketing a product to L.E. In general, 3 processes are distinguished by level of sophistication of the producer. The major implication of identifying the prevalent process is, again, to be better able for NILECJ to effectively intervene in the process. A fourth process (4) indicated is one in which L.E. is not a major factor for the producer in determining market strategy, etc. and L.E. essentially purchases what's available. For the sake of discussion, the processes can be labeled as follows:

1 - Impulsive, 2 - Cautious, 3 - Reactive, 4 - Unconcerned

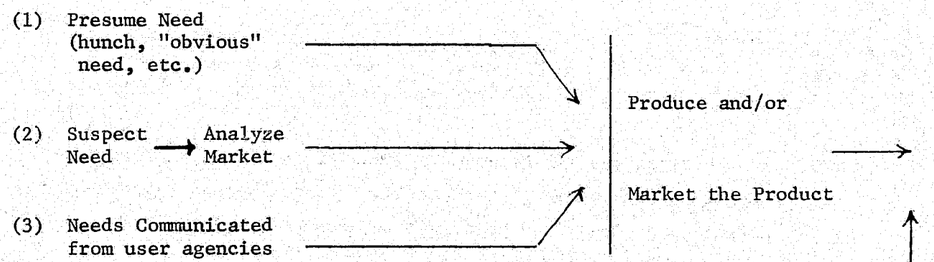


Figure 3

Alternate Method of Identifying Needs by Producers

Sub-Issues

This issue is analyzed in the context of the following sub-issues:

1) Is one of the user processes (A or B) prevalent for different equipment types? For different users?

2) Is one of the producer processes (1,2,3, or 4) prevalent for different products? For different producers?

Sub-issue 1: Is one of the user processes (A or B) prevalent for different equipment types? For different users?

The data used to analyze this sub-issue consists of specific responses or inferences about this sub-issue given in the interviews with the 47 user agencies. Of the 47 agencies, 6 agencies provided no analyzable responses. Referring to our user typology, these 6 "no response" agencies consisted of:

2 - #7-8 cities

3 - #9 largest cities

1 - #14 private agency

The remaining 41 user agencies provided 103 responses relating to this sub-issue. The 103 responses are tabulated in Table 25 according to equipment and user typology. The organization of data in Table 25 is the basis for the conclusions presented below. Each response was classified as being either Process A or B or ambiguous. The response was also classified by the type of user agency providing the response. Table 25 provides the number of each classification of process - response (A, B, ambiguous) for each user type by each equipment type.

TABLE 25 NEED IDENTIFICATION PROCESS BY USER TYPE AND EQUIPMENT TYPE

Equipment Type \ User Type	1			2			7-8			9			11			12			13			14			Totals		
	A	B	?	A	B	?	A	B	?	A	B	?	A	B	?	A	B	?	A	B	?	A	B	?	A	B	?
Body Armor		1			1		1		1	2	4	2													3	5	4
Holsters/Utility Belts					1					1															1		1
Low Light Equipment		1	2	1			2	2			2	1													3	5	3
Non-lethal Weapons				1			1			3	2	2				1	1								6	3	2
Transceivers	1	1		1			4	1		2	3	3				1									9	5	3
Voice Identification	1	2	1						1		1	2													1	3	4
Weapon Detectors							1			1						1	1	1			1				4	1	1
Vehicle Locators	1						1	2		3		1							1						6	2	1
Building Design													1												1		
Court Recording													2												2		
General Response	1	1	1					2	2	2	1	1				1									3	5	4
Other Equipment	1						3			1	2	1	2			1		1							8	3	1
TOTALS	4	7	4	3	2		13	7	4	15	15	15	5			3	4	1	2			1			47	32	24

LEGEND: A - Process A
B - Process B
? - Ambiguous

Note: User Types #3-4, 5-6, and 10 are excluded from the table because no responses were recorded on this issue from these types.

Findings:

Analysis of Table 25 on a cell-by-cell basis does not provide for any robust conclusions to be drawn because no single cell contains sufficient data. Certain cells could possibly be referred to for some tentative conclusions, but such cells are more appropriately discussed below in the context of more global analyses. The row and column totals in Table 25 provide the bases for some worthwhile conclusions.

Equipment Types. The sub-totals for equipment types (row totals) give evidence of some potentially important patterns. The totals for body armor and low light equipment seem to be evenly distributed over the three types of process responses (A, B, ambiguous), leading to the conclusion that for these equipment types, no single pattern of need identification has emerged. Unfortunately, this could mean either:

1) the L. E. market is responsive to either process of need identification, or
2) both processes are operating but it isn't clear which process is more effective.

However, even the ambiguity of this conclusion has important implications for anyone attempting to influence the market for either of these equipment types. Since neither process has emerged as clearly dominant, then a marketing strategy must not neglect either process for the product areas, although we might also note that, to the extent that either process was indicated by the data, it was Process B rather than A.

A prevalence of Process A appears to be operating in the markets for the following equipment types:

non-lethal weapons
transceivers
weapon detectors
vehicle locators

For each of these types, this prevalence is expressed over several types of users, further supporting the conclusion that Process A is operating for these types of equipment, i.e., the needs for these equipment types have been more frequently determined from an organizational performance evaluation than from exposure to the equipment. It should be made clear, however,

that this does not imply that the user organization itself performs this evaluation but rather that some organizational deficiency is made salient, thus leading to a search for an equipment solution.

In some cases, the evaluation of the user organization is clearly performed outside the organization. For example, it is clearly expressed in the responses that the search for non-lethal weapons has been undertaken many times in direct response to public reaction to "police brutality".

For one equipment type, voice identification, Process A is clearly not the prevalent process. The high amount of ambiguity found prevents concluding that Process B is prevalent, but it does permit a tentative conclusion that Process B is operating either by itself or in interaction with Process A. Such a tentative conclusion is inferable from the ambiguity of the responses. Based on the meager number of responses included here, it can at least be said that user agencies have not as yet identified an organizational deficiency which is closely related to a soluction involving voice identification equipment.

User Types. The sub-totals for user types (column totals) also provide for some worthwhile conclusions. The responses from user type #9 and #12 (largest cities and prisons) indicate that neither Process A nor B has emerged as prevalent, particularly in largest cities where a considerable amount of ambiguity is encountered. Within the largest cities (#9 type), a definite process seems to be associated with two equipment types: low light equipment shows a weak association with Process B and vehicle locator equipment shows a slightly stronger association with Process A. However, in both cases the associations are based on very few responses and can only be presented as highly speculative.

In the case of prisons (#12 type), the responses relating to the study equipment types indicate prevalence by neither Process A nor B.

Table 25 indicates that Process A is prevalent in the following user agencies:

#2	- sheriff's departments
#7-8 (combined)	- cities
#11	- courts
#13	- special government agencies
#14	- private agencies

The evidence is strongest for the courts (#11). Every response from courts indicated that performance evaluation leads to search for equipment (Process A). The tone of the responses indicates that:

1) the performance deficiencies of the courts are becoming highly salient both through self-evaluation (lawyers, judges, etc.) and through external evaluation (public, police departments, etc.)
2) producers in general do not view courts as a discrete, viable market.

The evidence for a prevalence of Process A is more equivocal but still rather strong for city police departments (#7 & 8 combined). The prevalence is particularly noticeable in the cell related to transceivers, but it is also suggested for several other equipment types. A question that arises is why does either process emerge as dominant for this type of user (cities) and not for type #9 - largest cities. One plausible explanation is that, while the occurrence of Process A is also high for type #9 (15 incidents), this potential dominance is moderated by an equally high occurrence of Process B (also 15 incidents). This is to be expected when it is realized that the producers frequently, and persistently, demonstrate and advertise their products to many of the largest police departments. At least two reasons explain such behavior:

1) largest police departments represent the biggest potential sales,
2) largest police departments represent either actual or presumed endorsement of a product.

The conclusion to be drawn is that both types of police departments (#7-8 combined and #9) are experiencing performance evaluation (either internal or external) but the largest police departments (#9) are more frequently the targets of producer's sales efforts.

The evidence for a prevalence of Process A in sheriff's departments (#2), special government agencies (#13), and private agencies (#14) is not sufficiently strong to allow any conclusions to be drawn.

Evidence indicates that Process B is prevalent in one user type - State Police (#1). This prevalence is not associated with any particular type of equipment but rather is accumulated over several types of equipment. This would lead to a conclusion that performance deficiency is not a strong incentive for equipment search in State Police Departments (based on the limited data available). Very likely related to this is the general understanding that State Police are less frequently critically evaluated by

external agents (legislators, public, etc.) than are large metropolitan police departments.

Implications

The general implication of the findings for this sub-issue is that there is considerable variation among user agencies in the processes by which needs for different equipment types are identified. Some trends may be detectable for a prevalence of one process or the other for certain equipment types. If such trends are confirmed by further research, the implications for intervention in the diffusion process of such equipment types become obvious.

The implication of a lack of prevalence of a process within user types is mainly that, if one process is more desirable than the other, then intervention should clearly be directed toward enhancing the emergence of that process as dominant. It would seem desirable for L. E. agencies to demonstrate a prevalence of Process A based more on self-evaluation than on external evaluation. Intervention should, therefore, be directed toward developing L. E. agencies' capacity for self-evaluation of performance.

Sub-issue 2: Is one of the producer processes (1, 2, 3, or 4) prevalent for different products? For different producers?

The data used to analyse this sub-issue consists of specific responses or inferences given about this sub-issue in the interviews with the producers. Of the 73 interviews,* 7 did not provide useable responses for this sub-issue. The remaining 66 producers provided 71 responses, 9 of which concerned "other" equipment, i.e., equipment other than the types included in our study typology. Therefore, the analysis of this sub-issue is based on 62 responses.

Findings:

Table 26 shows the relationship between the different equipment types and the 4 need-identification processes. No outstanding relationship is evident but closer analysis uncovers some subtle, but potentially important, relationships.

The unconcerned process (#4) does not appear to be an important influence in this sample of producers. This is an important finding for understanding that, whatever their motives or success, the large majority of the producers in this sample were concerned about the L. E. market. It would have been a serious situation if the unconcerned process had been significantly represented.

*Includes two architects

TABLE 26

COMPARISON OF NEED IDENTIFICATION PROCESS AND TYPE OF EQUIPMENT

Equipment Typology	Need Identification Process 1 Impulsive	2 Cautious	3 Reactive	4 Unconcerned	Total
Body armor	5	2	4		11
Holsters and utility belts	1		6		7
Low light equipment	4	3	1	1	9
Non-lethal	2	2	1		5
Transceivers	1	8	2	1	12
Vehicle locator	1		1		2
Voice identification			1	1	2
Weapon detection	4	1	3	1	9
Building design		2	1		3
Court recording			2		2
TOTAL	18	18	22	4	62

The totals for each of the other processes (column totals) show that the processes are rather evenly distributed, indicating that no single process is prevalent. However, if the processes for transceivers are removed, the cautious process (#2) is reduced significantly, and the distribution becomes:

Process	1 Impulsive	2 Cautious	3 Reactive
Totals	17	10	20

The pattern suggested here is that, across all of equipment types except transceivers, producers tend to enter the market either on impulse or in reaction to specific requests from L. E. Such a conclusion leads to the speculation that either producers see L. E. as a market ready to absorb equipment or they don't give it much consideration until a specific need is brought to their attention. This could have important policy implications for intervention in the producer's perception of the L. E. market.

A corollary of the above conclusion is that in the field of transceivers, producers are generally cautious in identifying needs and that, since there are many who entered the market, they apparently perceive a viable market for transceivers in L. E. This does not square with the general notion that this field of L. E. is dominated or monopolized. In fact, the area of transceivers is the only area in which the cautious process is prevalent.

Table 26 indicates that the reactive process (#3) is particularly prevalent for holsters and utility belts. However, this is not an astonishing finding since many of the producers of these products had previous L. E. experience themselves, usually as police officers.

Table 27 shows the relationship between the 4 need-identification processes and the size of producers. No outstanding relationship is evident but closer analysis uncovers some subtle, but potentially important, relationships.

TABLE 27

COMPARISON OF NEED IDENTIFICATION PROCESS AND SIZE OF PRODUCER

	Need Identification Process				
Producer Size	1 Impulsive	2 Cautious	3 Reactive	4 Unconcerned	Total
Tiny - less than 50 employees	9	6	9		24
Small - 50 - 500 employees	3	4	7	2	16
Medium - 500 - 2,500 employees		2		2	4
Large - over 2,500 employees	6	6	6		18
TOTAL	18	18	22	4	62

The row totals of Table 27 show clearly that medium sized companies are sparsely represented. This seems to be representative of the field rather than an artifact of the sample selection, given the selection procedure used. If one can legitimately combine the small and tiny categories it becomes clear that the market contains many small producers. On the face of it, this is not an important finding because in any market, it is unlikely that large companies will outnumber small companies. However, further analysis of the 18 responses of large companies reveals important findings. Of the companies represented by the 18 responses, companies representing 7 responses have left the L. E. field entirely, companies representing 3 other

responses are not actively pursuing the L. E. market any longer and companies representing 3 other responses have only recently gotten into the L. E. market. In terms of number responses then, instead of 18, there are only 6 responses from large companies with any L. E. experience still actively pursuing the L. E. market.

In more concrete terms, the 18 responses in Table 27 came from 15 companies. Of those 15 companies, 4 have terminated their operations in L. E., and 3 are not really active in it, leaving 8 large companies in the L. E. market (from our sample). Of those 8, 3 have only recently gotten into L. E. To say that there are only 5 large companies in our sample who are both active and experienced in L. E. may be misleading - there may well be many such large companies in L. E. who don't happen to be in our sample. Of more importance is the finding that, given the manner of selection of the sample, it seems significant that virtually 50% (7 of 15) of the large companies have left the L. E. market, either actually or in practice, and that these companies had been in at least 4 different types of equipment.

(Further analysis along these lines is not possible without violating our commitment of confidentiality).

Table 27 also shows none of the 3 need-identification processes (excluding #4) to be prevalent among the tiny-small size companies. Only a slight trend can be detected toward small companies (50 - 500 employees) being approached by L. E. (process #3) more frequently than either of the other 2 processes. This could have implications for any intervention considered in the user-to-producer feedback process.

In passing, it is worth noting that all 3 processes are represented equally in the sample of large companies, indicating that entering a market on impulse (process #1) is not restricted to small companies. Large companies are also sometimes apt to do it.

Implications

The implications of the findings regarding this sub-issue have been mentioned above but they are summarized here for convenience.

Analyzing totals for each of the 3 processes (1, 2, 3) shows some indication that producers are either impulsive (#1) or reactive (#3), (excluding transceivers). This finding, tentative though it may be, should be considered if intervention in the L. E. R,D&E process is considered at the point of trying to interest producers to enter the market. Perhaps more

*Refers to corporate size

important is consideration (and understanding) of the reasons why producers are not more cautious and calculating about getting into the market (process #2). Is this a case of faulty perception on the part of the producers? Or an accurate perception of an unattractive market?

Serious implications arise from the finding that so many large companies have left the field in so many equipment areas. Large companies don't normally act so without good reason. This finding should be kept in mind if any consideration is given to intervention in the form of subsidizing a producer's entry into the market. If such entry is advisable, perhaps a small, rather than large, company should receive the subsidy.

The findings indicate that small companies are often made aware of a need for their products by direct contacts from L. E. There could be implications here if any intervention is considered regarding feedback mechanisms from L. E. to producers. For example, if the findings were taken to indicate some affinity for small producers on the part of L. E., then a conference designed to bring users (L. E.) and producers together would probably be more successful if small producers were included rather than medium or large producers.

5. Cooperation Between Users

General Statement of the Issue

The extent of cooperation between user agencies has important implications for the L.E. market. Cooperative purchase and/or use of innovative equipment may effectively reduce the size of the market, in terms of the number of discrete potential buyers, which could, in turn, discourage potential producers. On the other hand, cooperation among users would also bring about greater standardization of performance requirements, which could, in turn, encourage potential producers through clearer definition of user needs.

Before conclusions such as the above can be attempted, the issue of cooperation between users must be examined at a more elemental level. It should first be determined whether L.E. agencies exhibit a willingness to cooperate with each other, what the patterns of such cooperation are likely to be, and what benefits and problems such cooperation are likely to produce.

The issue has been examined at this elemental level in the present study.

Sub-Issues

The issue of cooperation between users was examined in the context of the following sub-issues.

1. To what extent do L.E. agencies cooperate with each other in the acquisition/purchase of equipment? What types of equipment and agencies are involved?
2. To what extent do L.E. agencies cooperate with each other in the use of equipment? What types of equipment and agencies are involved?
3. What advantages and disadvantages are perceived or realized through cooperative activity?
4. What is the relationship between communication patterns and cooperation patterns?

Sub-Issue 1: To what extent do L.E. agencies cooperate with each other in the acquisition/purchase of equipment? What types of agencies and equipment are involved?

TABLE 28

Users Cooperation in the Acquisition/Purchase of Equipment

User Typology	Cooperate to some degree in purchase of equipment	Do not co-operate in purchase	No response
1 - State Police	1	6	
2 - Sheriff's Offices	1		1
3-4 - Small Towns			
5-6 - Towns			
7-8 - Cities	1	8	2
9 - Largest Cities	5	7	4
10 - Townships			
11 - Courts		1	1
12 - Prisons		3	1
13 - Special Gov't. Agencies	2	1	
14 - Private Agencies		1	1
Total	10	27	10

Cooperative acquisition/purchase between users seems clearly not to be a well-established or well-developed pattern among users.

As Table 28 shows, an impressive majority of the sample does not cooperate in any way in the acquisition/purchase of equipment. This negative response is further shown to be well distributed across all types of user agencies in the sample.

The types of equipment involved in the reported instances of cooperative acquisition/purchase include communications, squad cars, laboratory equipment, training facilities, surveilance equipment, and a helicopter. Two of the users indicating cooperation did not report the types of equipment involved. From the types reported it might be concluded that, in general, high cost equipment and facilities are the focus of cooperation. However, the sample of reported instances of cooperation is too small to draw such a conclusion with any degree of certainty.

Discussion:

While it may not be the typical pattern, the sample does indicate that there are several reported instances of cooperation which could serve as valuable sites for research.

There appear to be 2 general patterns of cooperative acquisition emergent in the data. One group of 3 users seem to be cooperating because of the presence of a supra-agency with considerable fiscal control over the reporting users. Such users include specialized federal agencies (cooperating through the mechanism of the Federal budgeting process) and state agencies (cooperation having been mandated by state legislature).

The second, larger group of 6 agencies include large metropolitan police departments who have cooperated in acquisition/purchase based on a common, regional interest in law enforcement with surrounding L.E. agencies. This group represents the relatively few but rich examples of cooperative effort that should be researched in detail to determine early in the diffusion process of this innovative organization structure the problems and advantages as they are encountered.

The large police departments involved in these instances of cooperative acquisition/purchase generally serve as a focal point of the cooperation. They are either the nucleus of a group which includes the large city and all the surrounding suburban and rural police departments or they are a more co-equal "partner" cooperating with other L.E. functions such as courts and prisons. Based on the data included here, the first situation serves to be more prevalent, i.e., cooperative acquisition/purchase arrangements more frequently include a large police department as a nucleus and the surrounding suburban and rural L.E. agencies.

These cooperative efforts also dramatize the potential influence that LEAA has in the L.E. equipment diffusion process. One acknowledged stimulus toward cooperation in each of these instances was the more efficient utilization of available LEAA funds, distributed through the block grants program. This use of influence to stimulate cooperation was recognized and encouraged by the State Criminal Justice Planning Administrators.(1) However, the organizations

(1) State of the States on Crime and Justice, National Conference of State Criminal Justice Planning Administrators, Frankfort, Kentucky, June 1, 1973, p. 16-17.

that are evolving to administer the cooperation are quite varied in form and concept. This variation of organizational structure is but one focus for additional research to determine the relative effectiveness of the different forms. By following a policy of allowing organizations to "evolve", LEAA runs the risk of having cooperative acquisition fail in some instances because of a lack of guidance concerning the establishment of effective organizational structures.

Sub-issue 2: To what extent do L.E. agencies cooperate with each other in the use of equipment? What types of equipment and agencies are involved?

TABLE 29

Users Cooperating in the Use of Equipment

User Typology	Cooperate in some respect in use of equipment	Do not co-operate in use	No response
1 - State Police	6	1	
2 - Sheriff's Offices	1		1
3-4 - Small Towns			
5-6 - Towns			
7-8 - Cities	10	1	
9 - Largest Cities	12	1	3
10 - Townships			
11 - Courts			2
12 - Prisons		2	2
13 - Special Gov't. Agencies	3		
14 - Private Agencies	1		1
Total	33	5	9

Findings:

Cooperative use of equipment between users seems clearly to be a well-established pattern among users.

As Table 29 shows, 33 agencies of the 47 analyzed reported some degree of cooperation in the use of equipment, while only 5 reported no such cooperation.

Table 29 also shows that the agencies involved in cooperative use of equipment include several of the types within the study typology.

In general, cooperative use involved a large police department as the nucleus (or supplier) and the surrounding suburban and rural police departments (the region with a common L.E. interest). There were isolated reports of cooperative use of equipment between police departments and courts or prisons. These few cases usually involved laboratory - or computer-related equipment.

The equipment reported as cooperatively used are shown in Table 30. While most involve high cost and intermittent or infrequent use, there is also some reported sharing of rather low cost equipment (tear gas, flares, etc.). In general, these were reported by State Police Agencies as being shared with small local police departments "as needed". It is inferred from the described instances that these are rather incidental occurrences and probably do not represent a significant impact on either participating party.

TABLE 30

Equipment Reported in Cooperative Use

"Men and equipment" and special squads	14
Criminal laboratory	8
Surveilance equipment (including low light)	7
Training	6
Communications	5
Metal detestons	2
Breath Analyzers	2
Voice Identification	1
Video Tape	1
Computer	1
Body Armor	1
Flares	1
"Portable equipment"	1
Tear gas	1

Discussion:

Comparing the figures for reported cooperative use (33/5) with those reported for cooperative acquisition/purchase (10/27) dramatizes the extent to which users already cooperate in the use of equipment. The same comparison also leads to the conclusion that cooperative acquisition/purchase is not a prerequisite condition for cooperative use.

Since cooperative use appears to be a prevalent practice, it should be helpful to know more about the organizational mechanisms by which such cooperation takes place. By far, the most prevalent arrangement reported was an "informal agreement". Of the remaining instances, 1 was a case of equipment being shared by several specialized federal agencies, 6 were unspecified, and 8 were regional mutual aid agreements.

The 18 "informal" and the 8 mutual aid agreements represent the most promising area for further research. In virtually all of these 24 reported instances, the cooperation is taking place among L.E. agencies sharing a common L.E. interest. The geographic region may be a county, a metropolitan area, or some larger division, but in all cases, the element of common L.E. interest is present.

Closer analysis of the reports gives the clear impression that the commonality of L.E. interest is so pervasive as to bring about cooperative use without specific legislative mandate for such cooperation. In some few cases, the cooperation takes place in spite of legal restrictions or impediments.

As suggested above, the 8 reported formalized cooperative agreements should be investigated to determine the implications of such agreements and to develop model programs for other agencies to adopt. The potential that such research has for detecting valuable policy implications is discussed in the analysis of Sub-issue 3 below.

Sub-issue 3: What advantages and disadvantages are perceived or realized through cooperative activity?

Findings:

The data included in this study are not sufficient to draw strong conclusions regarding this sub-issue. In many cases, the details of the cooperation were not known to the respondents although the practice was. In other cases, the informality of the arrangement did not lend itself to critical appraisal because it "just seemed to happen". However, the potential influence of cooperative activity between users can be inferred from the strong

inclination to cooperate which is evidenced by the many instances of informal sharing of equipment (sub-issue 2 above) in spite of the general lack of cooperation in acquisition of equipment (sub-issue 1 above).

This phenomenon of cooperation should be further researched to explicate the advantages and disadvantages and, as a result, to develop a model program of cooperation. The potential for such research, in terms of policy options for NILECJ, is indicated by the comments of some of the agencies reporting cooperation.

Comments concerning the advantages of cooperation included:

"More efficient use of available federal funds".

"L.E. job is so big, we need all the help we can get".

"The quality of personnel and equipment supplied is high".

"Procurement costs can be reduced".

"Sharing equipment compensates for a (local) lack of personnel".

Comments concerning the disadvantages of cooperation included:

"Local needs differ".

"Local constraints (against cooperation) are a problem".

"Each L.E. agency jealously guards its prerogatives".

"Cooperation is a drain on the resources of the agency supplying (the men or equipment)".

These comments, while too few to be conclusive, do indicate that there has been sufficient experience in cooperation to allow some rather sophisticated aspects to emerge. Further research could well reveal that:

L.E. agencies are willing to cooperate,

the impediments to cooperation are not insurmountable,

cooperation on a regional basis could be a significant step toward crime control.

Sub-issue 4: What is the relationship between communication patterns and cooperation patterns?

The rationale for this sub-issue is that cooperation, of necessity, involves communication, but that it cannot be assumed that L.E. agencies will report communication patterns closely parelleling their cooperative activities. It is entirely feasible that large police departments would more frequently report communication with other large police departments than with local surrounding police departments. On the other hand, it would be of significant value to learn that the communication patterns do closely resemble the cooperation patterns.

If it can be shown that communication patterns are related to cooperation patterns, then it becomes feasible to consider development of appropriate communication patterns as a viable policy option for NILECJ or any other agency seeking to influence the L.E. market.

Findings:

Two types of communications were investigated - formal and informal. Communication between users is analyzed in depth as a separate issue (see Section 3 on Information Transfer). Of interest here is the extent to which different types of agencies reported the two types of communication. Table 31 compares the totals for each type of communication with the totals for cooperative activity.

Analysis of Table 31 indicates that both communication patterns are generally comparable to cooperation in use but not in acquisition. However, based on the premise that cooperative acquisition requires a more formal arrangement than is required for cooperative use, then it would be expected that formal communication patterns would more closely approximate cooperative acquisition. Such is not the case, although the corollary prevails, i.e. the patterns of cooperative use and informal communciation are closely related.

Further investigation of the formal communication patterns indicates that most of the reported instances involved communications through national, state, or regional associations of a special expertise (e.g. communications) or administrative function. It must be concluded that these formal communication patterns are not effectively promoting or developing arrangements leading to formal cooperation regarding acquisition.

Implications:

It becomes evident that informal communication patterns can be thought to at least enhance, if not actually precipitate, informal cooperation. The obvious policy implication for NILECJ is to further enhance the possibility of informal communication patterns, keeping in mind that such patterns center around local - regional L.E. interests.

Of further implication is the possibility that formal communications also centered around local - regional L.E. interests could precipitate more cooperation regarding acquisition. To the extent that some formal communication already takes place within regional associations, such associations could well be used as instruments for communication of details of model programs of cooperative acquisition.

TABLE 31

Comparison of Communication - Cooperation

Type of Interaction	Yes - some activity reported	No - no activity in this area	No response
Informal communication	35	4	8
Formal communication	29	4	14
Cooperative Acquisition	10	27	10
Cooperative Use	33	5	9

Many patterns of formal communication presently are not organized around a local-regional interest in L. E. These patterns are not expected to lead to formal arrangements for cooperative acquisition. NILECJ could initiate programs which would promote formal communication centered on local-regional L. E. interests.

The present study has uncovered these potential implications. Further research should explicate the details and consequences of such implications.

6 Funding and Budgeting

General Statement of Issue

The issue is concerned with the availability of funds from various agencies for the development of new innovative law enforcement equipment as well as the availability of funds from both internal and external sources for the purchase of such equipment. The analysis of the producer data will convey the availability of such funds and their source. A statement will include how funds were actually obtained.

The analysis of the user data will reveal the actual mechanism as well as the source of outside funds to acquire innovative equipment. It is important to determine the flexibility of the budgets procedure set up by the user and to determine what constraints may be imposed on his using outside funds as well as the mechanism he had to employ to acquire this assistance.

Producers

Sub-Issues

1) To what extent are producers aware of external funds for the development of law enforcement equipment?
2) To what extent do firms use external funding for L.E. products?
3) To what extent are organizations satisfied with current funding procedures to develop new law enforcement equipment?
4) To what extent do producers believe funding will help get innovative law enforcement into the law enforcement field?

Sub-Issue #1: To what extent are producers aware of external funds for the development of law enforcement equipment?

Hypotheses:

1) Very few producers are aware of funding for R&D.
2) Small manufacturers are more aware of funds than large manufacturers since they need the money to support their R&D process.
3) Government agencies tend to offer more funding grants than other agencies do for R&D purposes.

Findings: In general the findings support the above hypotheses with 51 companies out of 71 reporting on funding in the questionnaires only a small percentage were actually aware of available funds. The number of companies who actually used funds was very small. 26% of the tiny companies used funds, 7% of the small companies, 20% of the medium sized companies and no large companies at all used funding. Tiny and small companies tended to be more knowledgeable about what was available to them. Companies of low and high technology seemed to be more aware of available grants than companies of medium technology (our largest group).

Larger companies considered it unprofitable to obtain grants for R&D and did not try to apply for aid but funded their own R&D. Some small companies didn't try because they thought they would never get anything, some felt they didn't have the "credentials". Several other companies did not want "strings attached" to the products they produced. A few companies felt rushed during the R&D process and couldn't plow through the red tape of funding. "We don't feel the hassle is worth applying for".

But the most important fact is the low level of awareness on the part of the manufacturers about what funds could be made available to them. Of the few grants used, Federal Government funding was the most prevelant.

Policy Implications

The picture of poor communication between the manufacturer and the funding agencies is quite apparent. Two approaches to this problem could be utilized. A board representing the various funding agencies could be set up as an information center to the manufacturer, this same board could produce a booklet containing the various available funds and the process needed to acquire them. The booklet and the board should be advertised through media that would reach the proper manufacturer of L.E. equipment. In a second approach the funding agencies can set up an association whose members could be the producers who are interested and desire funding. A small fee for the service could cover the cost of the booklet and mailings.

This board or association would function out of the National or State clearing houses mentioned in other sections.

TABLE 32 PRODUCERS OBTAINING OR USING

EXTERNAL FUNDING

Companies Reporting - 51

Company Size	Tiny		Small		Medium		Large	
	#	%	#	%	#	%	#	%
	23	45	15	29	5	10	8	16
External Funding								
Yes	6	26	1	7	1	20	-	-
No	7	74	14	93	4	80	8	100
Source of Funds*								
Federal	3[a]	50	1[d]	100	1[e]	100	-	-
State	2[b]	33	-	-	-	-	-	-
Other	1[c]	17	-	-	-	-	-	-
Degree of Technology of Products Produced								
Lo	4	17	2	13	-	-	-	-
Med	15	66	11	74	3	60	6	75
Hi	4	17	2	13	2	40	2	25
Funding by Degree of Technology of Product								
Lo	2	50	-	-	-	-	-	-
Med	2	13	-	-	1	33	-	-
Hi	2	50	1	50	-	-	-	-

*Source of Funds
a - Federal grant, Dept. of Defense, Bureau of Mines
b - LEAA (2) - one was a failure
c - Ford Foundation
d - U.S. Navy
e - Dept. of Defense

Sub-Issue #2: To what extent do firms use external funding for L.E. products?

Definition: External funding refers to financial assistance received from external agencies for the purpose of developing new L.E. equipment.

Rationale: External funding is not a clear cut indicator; it is evidence of a firm's need for and willingness to utilize external funds, as well as a funding agencies interest in the project. However, these are all of interest to L.E. policy makers, if funding R&D in private firms is considered an option.

Hypothesis 4: External funding will not be utilized extensively by L.E. producers, regardless of size.

TABLE 33 USE OF EXTERNAL FUNDS

Type of Firms	No. of Firms	Use of external Funds		No response
		Yes	No	
Tiny	24	1 (a)	14	9
Small	16	1 (b)	12	3
Medium	7	0	5	2
Large*	17	4 (c)	3	10
Total	64	6	34	24

(a) DOD contract
(b) Navy contract
(c) DOD contract, LELA, Other two not specified

Analysis of Findings

Hypothesis 4 is supported by the data. External funding plays a very minor role in L.E. equipment producers. To the extent it does exist, it is primarily through military channels, presumably for equipment also sold in the L.E. market.

* Refers to corporate size

TABLE 34

INVESTMENT IN LAW ENFORCEMENT R&D

Companies Reporting - 67

Company Size	Tiny			Small			Medium			Large*		
	#	%		#	%		#	%		#	%	
	29	43		20	30		6	9		12	18	
Degree of Investment												
Zero	8	28	74	6	30	65	3	50	83	2	17	
Little	14	48		7	35		2	33		5	42	75
Moderate	2	7		5	25		1	17		4	33	
Very Much	5	17		2	10		0	-		1	8	
Incentive to Market Products to L.E. Field For Profit Envisioned	22	76		16	80		6	100		8	66	

* Refers to corporate size

Policy Implications

The possibility of utilizing research results and technology developed on Dept. of Defense projects, as well as other federally funded projects, could be a good source of L.E. innovative equipment. These sources could be tapped in several ways (see areas requiring further research and illustrative policy options at the end of this section). On the other hand, the data reveals that very few firms use external funding for R&D and it is important to determine to what extent this is a result of such factors as lack of funds; lack of producer need or interest; a bias against using external funds; or problems encountered in using such funds.

Sub-Issue #3: To what extent are organizations satisfied with current funding procedures to develop new law enforcement equipment?

Hypothesis 5:

Few companies felt satisfied with current funding procedures.

Findings: The following comments were found in the questionnaire regarding their satisfaction of current fund procedures.

- "When we wanted to adapt the Series 8000 to gun detection (because of the rise in hijackings), we desired to develop a better weapons detector, so we approached the FAA, State Dept., etc., i.e. anyone who might have authority re hijacking... we found no one had the authority... so we gave it up for a while... later, the FAA got the authority but by the time we learned this it was too late; there were already 12-14 companies there."

- "I have seen grant money go out, but much is going to people not familiar with the industry...manufacturers have the greatest knowledge of the market because we talk to users over the years...so we know what is needed and sellable. So I would recommend more attention to actual manufacturers... e.g., there was federal money some time ago for the development of portables and was not with companies previously in this business...and I have never seen the unit, so I assume it didn't work."

Question: "Comment on the funding/grant process."
Answer:
"There is a problem of so much turnover in the State Law Enforcement Commission personnel, so you have to go through all the paperwork of rejustifying the project for new people. We make personal trips to re-educate another bureaucrat."

"They (the State Law Enforcement Commission) have been very good to us... the time frame is a little much... but it is hard to tell if we are being stalled or if they are serious about your project...i.e., there is a communications problem."

Policy Implications

The poor funding procedures are quite apparent in the statements above. The new board and/or association formed under sub-issue 1 would also alleviate the red tape of granting funds plus finding the right company at the right time.

Sub-Issue #4: To what extent do producers believe funding will help get innovative equipment into the law enforcement field?

Hypothesis 6:

Most companies of all sizes believe funding will aid innovative equipment in the L.E. field.

Findings: The majority of companies reporting felt funding was very important to R&D and innovative equipment. The tiny and small companies especially advocated funding as the best measure to get innovative equipment into the field.

The following are comments by the companies interviewed.

- "I feel that the government should get in - I don't believe that policemen should have to buy their own vests, the government should offer grants to help police departments get vests for their men."
- "Innovative equipment is quite important with proper R&D. LEAA would help get innovative equipment into the law enforcement field."

- "Government support could help develop new mental detection devices."
- "Best way to encourage innovation is to get funding from the government for this kind of development because if something is high risk, companies don't like to put money into it."
- "Helping to get innovative equipment into L.E. takes efforts like LEAA making searches of what is available and intervention by the government."
- "Federal Funding would help get innovative equipment on the market."
- "Government Funding."
- "Federal Assistance."
- "Funding - Realistic assessment of specifications, state of art, trade offs."
- "We can get innovative equipment on markets by L.E. agencies funding."
- "Government should do some funding of R&D but let the development company have the patent."

Implications

Funding, then, is a very important issue for innovative equipment. Information about funds must reach the producers who handle the R&D process. This is a must! Suggestions made in the last three sub-issues follow again under this sub-issue. Somehow there has to be better communication flow and information dissemination to and from producers and funding agencies.

Users

Sub-Issues

5) How much money was spent in the past year for acquiring innovative equipment?
6) What budgetary constraints are there on the capability of a user to obtain innovative equipment?
7) What are the constraints on the user in the federal grant process?
8) For what type of equipment does the user seek outside funding in order that it may be acquired? What are the outside funding sources used?

Sub-Issue #5: How much money was spent in the past year for acquiring innovative equipment?

Hypothesis 7:

7) The amount spent on innovative equipment will corellate with user size.

Findings: Hypothesis No. 1 is only partially supported.

TABLE NO. 35

AMOUNTS USERS REPORTED SPENDING ON INNOVATIVE EQUIPMENT IN THE PAST YEAR

	User Typology							
Amount Spent	(1)	(2)	(7)	(8)	(9)	(12)	(13)	Total
Less than $10,000	3		3		4	3		13
$25-100,000			2#	1	1#		1	5
$100-500,000	1		3					4
More than $500,000		1*			5			6

* Regional total, purchased through county sheriff's office.

\# Amount estimated; could be higher than here reported.

The data reported in Table No. 35 above represents only those users who were certain of the amounts they had spent in the past year for innovative equipment(1).

From this data, we may note the following:

1) Approximately one half of the user agencies reported spending less than $10,000 -- including 4 of the nation's 52 largest cities.
2) Only 10 users reported spending as much as $100,000.
3) 3 of 13 users who reported spending less than $10,000 reported having spent nothing.
4) State Police, though large in size, reported low spending in innovative equipment.
5) All of the prisons reported spending less than $10,000.

Of the 13 users who reported spending less than $10,000, 10 also reported low to moderate perceptions of budgetary flexibility, and 6 of these 10 reported low flexibility simply because of lack of funds.

Implications

The overall low spending in innovative equipment is consistent with the finding that most users report low budgetary flexibility and that many report austerity budget conditions. Further, all of the users spending more than $100,000 did so with federal grants. Thus, we may conclude that significant acquisitions of innovative equipment seem at this time to be dependent upon the availability of federal grant funds. There will of course be exceptions:

1) We found some cities of 50+ officers who perceived no funding problems.
2) Emergency conditions can lead to equipment acquisition.
3) Some innovative equipment (e.g., body armor) may be of relatively low cost.

Further, there is enough of a user-size/amount-of-spending correlation to conclude that most medium to small L.E. agencies will be especially vulnerable to the problem of inadequate funds for innovative equipment innovation. Though large in size, state police appear to be vulnerable in this respect. Prisons also appear to be vulnerable.

(1) During the interviews, a surprisingly large number of interviewees (most were administrative officers) were not sure of what had been spent. In other instances, we were not able to obtain data.

The findings raise two important issues which need to be further researched.

1) To what extent do smaller users need innovative equipment? What types of equipment?

One user (50+) noted that proximity to a larger metropolitan area increased L.E. needs out of proportion to the L.E. needs of the user city itself. Another user (50+) made a similar observation because of proximity to a high crime rate area (non-major metropolitan).

2) What role might county L.E. agencies have in relation to the equipment (and other) needs of small cities/towns.

Illustrative Policy Options

1) Determine needs of medium to small users for innovative equipment.
2) Encourage cooperative purchase/usage of equipment between:
   a) small users within a "natural" region,
   b) small users and county L.E. agency
   c) city/county/state L.E. agencies.
3) Develop regional equipment centers
4) Continue funding purchase of innovative equipment

Sub-Issue #6: What Budgetary constraints are there on the capability of a user to obtain innovative equipment?

Hypothesis 8:

8) Users will perceive a low degree of budget flexibility for innovative equipment acquisition.

9) Users who perceive low-to-moderate budgetary flexibility will see lack of funds as the primary causal factor, and will see budgetary procedures per. se. as only a secondary causal factor.

Findings: Users were generally consistent (with local variations) in describing their basic budgeting process for equipment items.

Police Departments: Anyone can make a suggestion; these are usually reviewed first by a department head and then sent up the administrative line for the approval/disapproval of the chief; the budget is then sent to the City Council via the City Manager or some other city agency. Variations in this process within a Police Department are usually dependent upon the chief. Lower level personnel of various police departments indicated differences among chiefs as to the extent of control exercised by a chief and as to a chief's understanding of the needs of "on the street" personnel.

TABLE NO. 36

USER PERCEPTION OF BUDGET FLEXIBILITY, BY USER TYPOLOGY

	User Typology									
	(1)	(2)	(7)	(8)	(9)	(11)	(12)	(13)	(14)	Total
Low or Not At All	3		4	1	5		2	1		16
Only Moderate		1	1		1			1		4
Is Flexible	1		1					1		3
High	1		2		1		1			5
Total	5	1	8	1	7	0	3	3	0	28

This same basic pattern was indicated by state and federal L.E. agencies. Hypothesis No. 8 is clearly supported (see Table No. 36).

a) 20 users perceived their budgetary flexibility as being none-to-only-moderate (16 = none-to-low; 4 = moderate).

b) Only 8 users perceived their budgets as being flexible (N=3) or high (N=5).

c) Users in all categories of our typology perceived low budgetary flexibility, though a smaller percentage of users in Category 9 (6 of 16) had this perception than did users in Category 7 (5 of 8).

d) Interestingly, 2 users in Category 7 (as cf. only one user in Category 9) perceived their budget as being flexible.

Hypothesis No. 9 is clearly supported. As one interviewee stated: "There is no problem if you have the money." Of the 22 users perceiving low-to-moderate budgetary flexibility:

a) 5 called their budget an "austerity" budget

b) 4 noted that other major budgetary priorities(1) left no funds available for innovative equipment acquisition

c) 3 others simply stated "lack of money"

d) only 6 specifically pointed to the budgetary process per. se.

Additionally, we may note that the largest portion of any user's budget will be for non-equipment items; and of equipment items, communications, uniforms, and vehicles will tend to be "given" (parametric) major equipment expenses.

Combined data from users and intermediary organizations indicates that state courts may have sufficient influence within state legislatures to obtain equipment if desired.

Of the 6 users who specifically mentioned budgetary processes per. se. as the reason for perceived low budgetary flexibility:

a) 3 noted the length of time involved in getting a budget item approved;

b) 2 noted that the agency having final budgetary approval authority (e.g., a City Council) does not understand the needs of L.E. agencies;

c) 2 stated inability to shift or re-prioritize budgetary items.

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(1) One user noted that "autos and uniforms are the major part of our equipment budget." Another noted that P.D./F.D. pay raises, along with having to match funds for a federal grant program, left no funds available for equipment acquisition.

Users typically noted a 6 month to one year period for the total budgetary process.

We hypothesize that the time involved in the total budgetary process is more of a constraint on ability to acquire innovative equipment than is shown by this study because:

a) Where funds are simply not available, time becomes an irrelevant factor;

b) Contrarily, where funds have become available via federal grants, users did comment on the slowness of the grant process;

c) We hypothesize that users did not comment on the length of time re. local budgeting processes largely because they do not perceive this as being amenable to change except under emergency conditions.

An interesting dynamic occurred when users were asked to describe the nature of any potential budgetary flexibility: even users who perceived low-to-moderate flexibility responded.

a) The most often mentioned (N=9) process of potential flexibility is via special request to the funding authority (i.e., City Council, State legislature). Interestingly, this process was mentioned by users perceiving low budgetary flexibility as often asking users perceiving their budget to be flexible.

b) Five users (all perceiving their budgets to be flexible) noted flexibility via user control over already approved budgetary items. One stated: "We are responsible to the City Council only for the bottom line of the budget." Two had special budget items which allowed for some kind of discretionary use. Another had a program rather than a line-item budget. None of these complained of strongly restricted availability of funds.

c) Three users perceived flexibility in emergency conditions (two perceived low flexibility under "normal" conditions).

Implications

Flexibility of budgetary processes per. se. is irrelevant where availability of funds is strongly restricted. Where available funds are not so restricted, specific types of budgetary processes can be utilized to increase flexibility (e.g., program budgets, discretionary-type line items, "bottom line" as ct. "line item" accountability).

Illustrative Policy Options

1) Continue federal grant funding of L.E. agencies.

Sub-Issue #7: What are the constraints on the user in the federal grant process?

Hypothesis 10:

10) Users will perceive complexity and amount of time involved as major constraints in the federal grant process.

Findings: Hypothesis 10 is basically supported:

1) Fifteen users complained that the process is in some way burdensome. Representative comments were:

-- "By the time they got through reviewing and re-reviewing one particular bid, the bid had expired and the cost went up. We had to explain to them that there was only one manufacturer."

-- "There are so many groups."

-- "We are understaffed and overwhelmed with paperwork."

-- "It takes 2-3 years."

-- "If a company can't deliver on time, we lose the grant because of the grant cut-off date."

-- "Decisions are made by higher ups who aren't cops."

The themes most often mentioned by these fifteen users were: the length of time; lack of grant personnel's understanding of a request; the amount of work involved (paperwork, numbers of groups who review, etc.).

2) Five users noted that the state grant commission's guidelines determined what they could apply for or not. Questions were raised as to grant personnel's understanding of the "real" needs of users. One user noted that the states "annual plan" is to a large extent built around information supplied by users within the state. Another user said much the same thing but in a less positive tone: "They wind up doing what Police Departments tell them to do anyway."

3) Two users felt they (and other users) did not really know "what funds are available" and were unknowledgeable about the grant process. Conversely, one user stated that having user-related special "grant process" personnel increased their ability to obtain grants.

4) Three users noted that competition for available grant funds is a constraint.

5) Three users commented upon the follow-up costs to be borne by the user after the grant funding ceased.

6) Two users saw "no problems".

7) Three users made positive comments about the grant process. Of these:

-- Two saw state commission personnel and funding as key to the development of a project, and one of these had encountered City Council resistance.

-- One is in the Impact program and appreciated the ability to go direct to L.E.A.A., thereby bypassing the state commission.

Implications

Forty-two of the 47 users interviewed reported usage of federal funds for equipment acquisition. However, approximately one-third of these users saw the grant process as being in some way burdensome. Taken in the context that users generally perceived low availability of funds for equipment acquisition within their own budgets, we may conclude that:

a) It is unlikely that users will not try to obtain federal funding; but

b) The percentage of users seeing the grant process as "burdensome", warrants an effort to improve the grant process.

The key elements of the grant process, from the user's perspectives are:

a) length of time involved;

b) amount of time/effort expended in paperwork and meeting with various review committees;

c) the adequacy of understanding of grant review personnel re. L.E. needs/dynamics.

This latter element of the grant process is affected by:

a) Grant review personnel's familiarity with L.E. dynamics and needs;

b) The type and extent of communication between state grant review personnel and L.E. agency personnel;

c) Availability to users of personnel familiar with the grant process.

Illustrative Policy Options

1) Simplify the grant process to reduce the time/effort required of users and to reduce the length of time involved in the grant process.

2) Provide guidelines for state/regional grant process administrative agencies:

a) Guidelines for characteristics of grant process administrative and committee personnel to insure personnel's familiarity with the needs and dynamics of L.E. agencies;

b) Guidelines re. search for/reception of communications from L.E. agencies re. equipment needs so as to maximize user input into the development of "annual plans" of state grant process agencies.

3) Provide users with personnel who are familiar with the grant process. These persons would be intermediary between users and grant process review personnel, but would (in effect) be working for users.

Sub-Issue #8: For what type of product does the user seek outside funding in order that it may be acquired? What are the outside funding sources used?

Hypotheses:

11) Private funding sources will not be used.

I2) Usage of federal funding will increase as the cost of equipment increases.

13) Usage of federal funding will increase as the level of technology re. an equipment item increases.

Data used for this issue are 48 instances where users have obtained one of our equipment items.

The final data analysis presented for this issue will include data for all innovative equipment items reported by users as having been acquired within the last year.

Findings: Hypothesis No.11 is partially non-supported.

Users were asked what sources other than local budgets and federal LEAA grant funds had ever been used to obtain equipment. The following responses

were given:

-- highway safety program (federal)..... 6
-- Police foundation..... 4
-- national foundations (private)..... 2
-- local persons or organizations..... 8

The local funding sources included a will, industries, local foundations, V.F.W., J.C.s.

Hypothesis No. 12 is only partially supported. At the extremes re. cost of equipment items studied, all users of vehicular location systems (N=4) reported usage of federal L.E.A.A. funding, while no users of holsters - utility belts reported usage of federal funds.

Users of six equipment items in the $50.00 - 20,000 per unit range reported both federal and local budgetary funding. With the exception of low light equipment (six used federal funds; two used local funds) more instances of local funding (N=25) were reported than of federal funding (N=11). However, even among the five equipment items which were purchased more often with local than with federal funds, the ratio of instances of local cf. federal funding was not consistent with variations in cost levels.

TABLE NO. 37

INSTANCES OF FEDERAL COMPARED TO LOCAL FUNDING

	Vehicle Location	Low Light	Voice I.D.	TRSCVR	Weapons Detection	Body Sensor	Non Lethal	Belts Holsters
Federal	4	6	1	5	1	2	2	0
Local	0	2	2	9	3	8	3	Assumed All

We may further note that utility belts/holsters and some body armor would be purchased by individual personnel rather than L.E. organizations.

On the surface, Hypothesis No. 13 appears to be supported:

-- 10 instances of high technology item acquisition were federally funded; 11 were locally funded;

-- 11 instances of medium technology item acquisition were federally funded; 16 were locally funded;

-- no low technology items were federally funded.

However, there are two confounding factors in this analysis.

1) If we remove vehicular location systems from the analysis of high technology items (on the grounds that they are so expensive as to preclude local funding as the sole funding source), the ratio for high technology items becomes 6 federal/11 local.

2) Of medium technology items more were obtained solely with local funds than with federal funds except for low light, where the ratio was 6 federal/2 local. However, there would appear to be low light-specific factors at work which make low-light an "exception to the rule" -- e.g., need identification in the turbulence of the late 1960's, a degree of expertness required for use of low light CCTV and photography (but not visual surveillance), and (perhaps most strongly) a high degree of "newness" or "strongness" re. equipment and usage.

If we remove both vehicular location systems and low light from the analysis (as being exceptions influenced by other variables), we find the following relationships between funding sources and level of technology:

-- high technology: 6 federal/11 local

-- medium technology: 5 federal/14 local

-- low technology: no federal

Thus, the hypothesis is supported, but perhaps not as strongly as anticipated.

Since neither of the above two hypotheses appears to provide a sufficient understanding of what types of equipment tend to be or not to be funded by outside sources, we sought further insights from our data.

Analysis was made to see if federal funding increased or decreased in relation to the amount (or regularity) of equipment usage.

1) The extent of outside funding does not correlate with high regularity of equipment usage:

	Federal	Local
Vehicular location systems.....	4	0
Portable transceivers.....	5	9
Utility belt/holsters.....	0	Assumed All

2) With the exception of low light equipment, equipment with low-to-moderate regularity of usage was locally funded more often than federally funded:

	Federal	Local
Voice identification.....	1	2
Weapons detection.....	1	3
Non-lethal.....	2	3
Body Armor.....	2	8
Low Light.....	6	2

Analysis was next made to see if the cost, level of technology, and regularity of usage factors in combination would be related to the ratio of federal cf. local funding.

TABLE NO. 38

FACTORS POTENTIALLY RELATED TO USAGE OF FEDERAL FUNDING

	Cost (X Quantity)	Level of Technology	Regularity of Usage	Funding Ratio Federal/Local
Vehicle location	Very High	High	High	4/0
Transceivers	High	High	High	5/9
Low light	Medium	Medium	Medium	6/2
Voice I.D.	Medium	High	Medium	1/2
Weapons Detection	Medium	Medium	Medium-Low	1/3
Non-lethal	Low	Low	Low	2/8
Body Armor	Low	Medium	Low	2/3
Utility Belts/ Holsters	Low	Low	High	0/Assumed All

As can be seen from Table No. 38, combining the three factors does not produce a relationship between type of technology and ratio of federal cf. local funding.

Analysis was also made to see if the relationship between type of equipment and ratio of federal cf. local funding was being confounded by the type of user agency. This analysis found no significant differences in federal cf. local funding patterns between types of user agencies (see User Typology).

As analysis of data about the equipment items of this study did not reveal clear-cut relationships between types of equipment and extent of federal cf. local funding, we analyzed data about any equipment which users reported acquiring within the past year to see if any patterns occurred in types of federally funded equipment acquisitions. We found the following pattern in relation to the functional usage of equipment.

TABLE 39 FUNCTIONAL USAGE OF FEDERALLY FUNDED EQUIPMENT

Functional Usage of Equipment	No. of Users Obtaining Equipment with Federal Funding
Information dissemination/ communication	17
Investigative/evidenciary	12
Weaponry/protective	5

As elsewhere reported, this study has found that L.E.A.A. and state grant process agencies have, over the years, increasingly focused on programs and systems and, simultaneously, shifted emphasis away from equipment purchases per. se. Indeed, several users felt that equipment purchases have become "taboo". Further, we have already noted in this analysis of the funding/budgeting process that the "annual plan" guidelines of state grant process agencies are (and are perceived by users as) determinative of the types of equipment for which federal funds are requested by users. We may here note that "information dissemination/communicative" types of equipment tend to be systems-oriented.

Implications

1) Within the limits of their budgetary capabilities, state/local L.E. agencies will determine what are their priorities re. equipment items.

2) Nonetheless, given the low budgetary flexibility re. equipment acquisition perceived by most L.E. agencies, L.E.A.A. and the state grant process agencies will determine to a large extent both the type and the extent of equipment/equipment systems acquisition and usage of state/local L.E. agencies.

3) From other findings of this study, we may conclude that the effectiveness of L.E. agency equipment/equipment systems acquisitions in relation to law enforcement and criminal justice (which is the basic functional mission of the ESIP program) will depend to a very large extent on

a) the level of understanding which grant process personnel have of the needs/dynamics of L.E. agencies, and

b) communication between state/regional grant process agencies and L.E. agencies.

Illustrative Policy Options

(Same as Illustrative Policy Options for Sub-issue #7: What are the constraints on the user in the federal grant process?)

7. The Equipment Acquisition Process

General Statement of Issue

The acquisition process is broadly defined to include evaluation, testing, bidding, selection of a source and equipment, and purchasing. That is, with the exception of funding and budgeting, the steps taken after there is sufficient interest on the part of the user to initiate an active search for a certain type of equipment until a specific model is acquired from a product. These steps are not employed by all users as outlined in this study and when followed they vary considerably in timing, priority, and formality of the procedures used.

The acquisition process can be considered in two major steps:

1) events leading to a decision to acquire a given type of equipment, and
2) subsequent events leading to the selection and acquisition of an actual piece of equipment.

Evaluation and testing may occur at several points in the acquisition process depending on such factors as the size of the purchase, its newness, riskiness, availability of appropriate standards, and departmental policies.

The acquisition process can be considered from several perspectives.

Sub-Issues:

1) What events prompt action to acquire new technology?
2) Testing and evaluation procedures and the use of standards.
3) What are the most common purchasing procedures and how effective are they?
4) What are the major selection criteria used in acquiring new equipment?
5) What is the role of key user personnel in the acquisition process?
6) To what extent does user cooperation exist in the acquisition process?
7) What problems are encountered in the acquisition process?

Sub-Issue #1: What events prompt action to acquire new L.E. technology?

Definition: Events prompting action to acquire new L.E. technology refer to the set of circumstances which initiate the acquisition process. These may be either from external circumstances or the result of an organized equipment evaluation process.

Rationale: Knowing these events and/or processes will improve our understanding of the acquisition process and possibly our ability to influence it, either by finding ways to improve the decision process or to modify external circumstances.

Hypothesis 1: Initial interest in new L.E. equipment is more likely to be initiated by external circumstances than as a result of an on-going equipment search and evaluation process. That is, L.E. agencies will be characterized by a reactive mode of operating.

TABLE 40

CONSIDERATIONS FOR ACQUISITION OF NEW L.E. PRODUCT

Type of Event	No. of Responses
Active Response Mode	
Internal Planning Process	2
Reactive Response Mode	
Perceived Equipment Need	6
Perceived Equipment Advantage	13
Emergency Situation	10
Vendor Presentation	6
Legal Requirement	4
Availability of Funds	2
Administration	2
Equipment Show	1
Sub Total	44
No Response	6
Total	52

Events Indication of Response Mode (When known, the equipment type is indicated.)

Internal Planning Process

- Own study process
- Planning and Analysis Committee evaluate all equipment needs

Perceived Equipment Need

- Need for speed in processing and communicating information
- Probing the market for a system (vehicle locator system)

- Operational problems. Looked for better equipment (radios)

Perceived Equipment Advantage

- Potential increase in accuracy percentage of those using it (voice identification)
- Fact is not endangering life and crowd; mob deterrence (non-lethal weapons)
- Reduce claims toward police brutality (non-lethal weapons)
- Additional protection in special situations (body armor)

Emergency Situation

- Survived shooting while wearing body armor. Wish press coverage (body armor)
- Crowd control (non-lethal weapons)
- Stop fights; mass riots (non-lethal weapons)
- Three large riots (body armor)

Vendor Presentation

- Invited to New York by manufacturer (vehicle locator)
- Have bought equipment from show
- Impressed by vendor demonstration (body armor)

Legal Requirement or Situation

- Hijacking law Jan. 1973. Equipment mandatory (X-ray screening devices)
- Growing difficulty of making case in court

Availability of Funds

- Federal money available for equipment
- LEAA money available

Administration

- Department being evaluated by State Law Enforcement Emergency Network
- Courts have pushed voice identification systems

Equipment Show

- Bought equipment at show

Analysis of Findings

Based on the responses, hypothesis 1 appears to be supported. Only 4.5% (2 out of 44) of the firms responding indicated an active response mode, i.e., an on-going internal planning process, while 95.5% of those responding indicated a reactive response mode. The events tabulated above reflect the nature of each type of reactive response mode. They all have one characteristic in common, i.e., something occurred in the external environment before equipment was perceived as a potential response.

Two classifications deserve comment: "perceived equipment need" and "perceived equipment advantage". The former refers to those cases where a need (see examples above) results in a search for equipment. It is very possible at this point that the search will begin without even a particular type of equipment in mind or even knowledge of its existence. The latter refers to the perception of an advantage of potential use to the observer in his L.E. agency after he sees or receives knowledge of the equipment and its operating characteristics.

It could be argued that in both cases, in fact in all the response modes, there had to be some on-going search and evaluation, however minimal, in order to have the ability to recognize the potential application of equipment as a response to the incident. Be that as it may, the main point here is that most companies cite external events as providing their main impetus to seriously consider new equipment in spite of whatever search capabilities they may have. (See "Analysis of Findings" for hypothesis 2 for analysis of the active response mode.)

Implications

If this is a general tendency, it has far-reaching consequences for the diffusion and acquisition of L.E. equipment, especially when it is remembered that this study is heavily weighted with large L.E. agencies. For example, it implies that "crisis" management dominates the acquisition process and that there will be a tendency for external pressures to build until it is felt necessary to consider new equipment, even in the most advanced L.E. agencies. This tends to shorten the diffusion process characteristic of less crisis-prone markets, in which a small group of advanced users, the innovators, with the resources, abilities and willingness to risk and innovate, provide the equipment producers a test market, feedback, and experience in advance of mass marketing.

To be sure, there is a group of innovative L.E. agencies; the point is that they, too, become receptive late in the product life cycle (if non-L.E. markets are considered part of the cycle) and imitators who rely on the testimony of these innovators wait until needs are even more pressing and, in fact, obvious. At the same time, another significant factor occurs. By waiting to react, a larger response and hence more resources excluding new equipment must also be allocated to the new "crisis" and consequently, equipment often receives an even lower priority than it might have in an earlier response.

This conclusion must be qualified by the type of emergency or crisis. Ghetto riots and campus unrest characteristic of the late 1960's provided a supposedly clear cut case for equipment. However, the very nature of the response perceived as required, i.e., immediate restoration of "law and order" necessitated tried and proven equipment such as helmets, body armor, guns, and even armored vehicles; hardly an atmosphere conducive to introducing innovative equipment, at least in the early phases of this period. This was developed after the crises and L.E. agencies had gone on to new, more pressing challenges, i.e., drug addiction, safety in the streets, teenage crime and delinquency, etc.

In these latter areas, the need for equipment is less obvious and consequently, it competes with the acquisition of other resources to deal with the emergencies. These resources often take the form of crash programs in which the primary cost is personnel not equipment, and again, since they are emergency programs, and since the staff approach is often easily implemented, equipment is relegated to a lower priority.

The policy implication of such considerations are as follows:

1) How can an appropriate test market be developed for L.E. agencies, if they are generally characterized by crisis management?
2) How does the mass diffusion process occur if only the largest and/or richest departments can afford to acquire innovative equipment?
3) Can the tendency of L.E. agencies to react to crises be utilized as a factor to increase equipment utilization by having it pre-tested and ready for distribution at the time when "need" is ready to be translated into a funded response?
4) Can the crisis management syndrome in L.E. agencies be reduced by effective programs to build user capabilities especially in the areas of planning and equipment evaluation?

Hypothesis 2: Events leading to considering acquisition of L.E. technology are more likely to be initiated by external circumstances than as a result of an on-going equipment search and evaluation process.

TABLE 41

EVENTS LEADING TO CONSIDERATION OF ACQUISITION

Type of Event	No. of Responses
Active Response Mode	
Information Search Process	4
Internal Planning Process	2
Sub Total	6
Reactive Response Mode	
Perceived Equipment Need	10
Perceived Equipment Advantage	5
Availability of Funds	7
Vendor Presentation	6
Equipment Show	5
Emergency Situation	4
Other Users	2
Other Products	1
Sub Total	40
No Response	8
Total	54

Events Indication of Response Mode

Information Search Process

- Nothing in particular; general process of information search
- Officer trips to cities having riots - assumed would have to get it, too.
- Initiated a search for a product
- Looked for information in technical journals

Perceived Equipment Need

- Had to get close for surveillance
- Need demonstrated for speed in communication
- Demands for police services increased (portable transceivers)

Internal Planning Process

- New equipment is handled through the Administration Analysis group, not IACP conventions
- Technical staff pushes to acquire new equipment

Availability of Funds

- Met matching grant criteria
- Federal funds for engineering
- FAA provided funds and information for equipment

Vendor Presentation

- Relies on salesmen
- Various manufacturers
- _____ (mfr.) used _____ (city) for testing

Equipment Show

- IACP show
- NY products shows
- Conventions
- Emergency situation

Emergency Situation

- Prison riots
- Hospital received verbal bombing threats

Other Products

- Other product led up to use and need for (non-lethal weapon)
- Other product - carborundum

Other Users

- Airlines and their equipment

Analysis of Findings

The incidence of responses classified as being in the active response mode, i.e., 13.0% (6 out of 46 responding), is higher than the ratio of similar responses with reference to hypothesis 1 (see above). This may well be

due to the different outcomes considered. Hypothesis 1 referred to initial interest in new equipment, while hypothesis 2 refers to considering requisition of new equipment. By its very nature, the latter process is more susceptible to planning, since for whatever reasons, it presupposes equipment as the only consideration whether or not it is purchased. On the other hand, even if initial activities or events leading to equipment consideration are some form of an active response mode such as planning, this process need not necessarily lead to equipment as a potential solution.

In any case, the ratio of active responses is still very low, and characteristically a reactive response mode dominates. The active response mode, to the extent it is used, is more developed than in the case of hypothesis 1; that is, the information search process is more institutionalized (see above examples). Again, the arbitrariness of the classification scheme can be argued, but the general tendency to a reactive response mode assumed in the above analysis appears to indicate an important starting point not only in future research, but in developing appropriate policies.

Policy Implications

The line of reasoning developed with respect to hypothesis 1 is also applicable to hypothesis 2. Also, one type of response mode is predominant in both cases, i.e., "exposure to new equipment", which can be defined as the combination of the following sub-classifications: "perceive equipment advantage", "vendor presentation", "equipment show", "other users", and "other products". With respect to initial consideration, 47.7% (21 out of 44) of the reactive response mode results from "exposure to new equipment", and 50.0% (20 out of 40) of the time it leads to considering the acquisition of new equipment. In both cases, the role of the vendor is obvious as well as the need to increase exposure where vendors limit their presentations to a select number of L.E. agencies.

Not surprisingly, there is a higher incidence of emergencies (10 out of 44) leading to initial interest in new equipment than is the case when its acquisition is being considered (4 out of 40). On the other hand, the availability of funds is less likely to stimulate initial interest in equipment than it is to lead to considering equipment acquisition. Apparently, the mere existence of funds to acquire equipment does not act so much to channel interest to L.E. equipment as to reinforce already existing interest.

Ignoring this can result in funding efforts that merely reinforce the "equipment-prone" L.E. agencies while ignoring the "equipment-avoiders". The result is merely a further distortion of an already poor distribution system (i.e., from the point of view of the ultimate beneficiaries of the L.E. agencies activities -- the public at large).

Sub-Issue #2: Testing and evaluation procedures and the use of standards

Rationale: Testing and evaluation are the processes by which users insure that a potential acquisition meets performance standards, regulatory requirements, and is competitive or superior to rival products. Omitting these steps or conducting these in a cursory manner may easily result in acquiring an unsatisfactory product. It is necessary to know the emphasis users place on these activities and how they conduct them.

TABLE 42

NO. OF SOURCES CONSIDERED FOR PRODUCT EVALUATION

Level of Technology	Type of Equipment	No. of Sources Considered Per Equip. Eval. 1	2	3	4	5	6	Avg. No. Sources/ Equip. Eval.
High	Voice I.D.	1	1					1.5
	Portable Transceiver	1	1	4	1	3		3.4
	Vehicle Locator	2	1	2				2.0
	Low Light	1	3				1	2.6
Medium	Weapon Detection	1	3		1	1		2.7
	Non-lethal Weapons	2		4			1	2.9
	Body Armor	2	1	1	2	1		2.9
	Court Recording							0
	Holster-Utility Belt							0
Low	Building Design							0
	Other	2	1	3	1		1	2.6
	Total	12	11	14	5	5	3	2.9

Based on 50 evaluations in 39 users, eight users did not respond

TABLE 43

EFFECT OF EVALUATION ON ACQUISITION

Type of Equipment	Evaluation Resulted in Acquisition* Yes	No	No Response
Voice I.D.	1	4	2
Portable Transceiver	15		1
Vehicle Locator	3	7	
Low Light	6	7	
Weapon Detector	5	2	
Non-lethal Weapons	4	5	1
Body Armor	10	4	
Court Recording			
Holster-Utility Belt			
Building Design			
Other Equipment	4	1	
Total	48	30	4

* Based on 80 evaluations in 41 users. Six users did not respond.

Note: Number of evaluations reported in the two previous tables do not correspond. This may be due to difficulty in attempting to recall the number of sources evaluated than simply the results of the evaluation.

TABLE 44

PRODUCT TESTING IN ACQUISITION CONSIDERATION

Type of Product	Lab Test	Field Test	No Test	Total # Cases
Voice I.D.	1			1
Portable Transceiver	4	5	4	10
Vehicle Locator	1	1		1
Low Light		7		7
Weapons Detector	1	2	1	3
Non-lethal Weapon	3	3	1	6
Body Armor	2	7		7
Other Equipment	4	5		6
Total	16	30	6	41

*Based on 28 users responding out of 47.

Use of Standards

In pilot tests conducted in the Spring of 1974, it was evident that L.E. standards from within federal or state sources were not widely known, or if known, were not utilized. In the main filed study, therefore, this issue of standards was explored as part of the more general issue of equipment acquisition processes. The replies to the questions asked regarding standards bear out the findings of the pilot study. For example, aside from indicating the standard itself only seven interviewees regarding ten products responded to the following item on the user questionnaire:

V.8 g) Did you test the product while considering its acquisition? What standards were used in the test?

Of those users responding, most indicated that they developed their own standards in the form of product specifications, such as the following"

"No standards, net company specs."

"Not a test, solely a matter of specs."

"The standards used for testing feasibility of _____ design were basically the requirements imposed by Capt._____."

"Only standards were operational requirements as known to communications department."

Those firms indicated the use of agency standards, i.e., FCC (one user): FCC and EIA one user, EIA (one user), but these were all for communications equipment (portable transceiver), but not L.E. agencies.

One reply indicated a reliance on producer standards: "the 'test' was a demonstration, not a 'meet standards' test, just 'let us see it' in their engineering reports."

The second item in the user questionnaire was as follows:

V.12 g 4) What were the purchasing criteria? Availability of standards of performance for equipment?

Only eight users responded regarding thirteen products, and their responses showed even less reliance on external standards. Only two users indicated use of such source, i.e., IACP, MBA and AID. Some users indicated a very casual approach to standards, such as the following"

"Very superfically --- they sent us one or two sets and we gave them to our lab people to check them out --- no particular standards used."

"no, we had a demonstration - felt it could fill a (L.E.) void."

"It was field tested by a few officers. The distributor supplied a few for test. The reaction was conversational in form. The standards were the personal preferences of the officers. They liked them better than the _____ brand."

"None available or established expertise of my people."

"See results in distance, accuracy, reliability, non-lethal effects."

In contrast, some firms indicated a formal process of developing specifications, but still without any indication of reliance on outside standards. For example:

"Staff research would have written the specs for bidding based on tests of the vests at the firing range."

"The specs actually came from Planning and Analysis, from communications."

"We need it. Our basic information is experience (e.g., we find that our _____ give the best service and are most easily serviced.)"

One firm indicated reliance on the producer for standards:

"No field testing - we had demonstration units on a one day basis - we accepted their specs and stats because of reputation - I added the spec that the supplier must be a major manufacturer with ten years experience in the field because we had a couple of little outfits that contacted us (_____ and _____ which had poor specs). I was just bugged by calls from fly-by-night groups."

The limited basis for purchasing L.E. equipment in some L.E. agencies is revealed in the following comment:

"He pressed on this competitive spirit, relating with disgust that other police departments were getting more favorable publicity. For instance, _____ P.D. received some good press about their newly installed _____ communication system. _____ was outraged, he knew his _____ system was the best. 'How did he know?' I asked. The man from _____ systems told him."

In summary, the low rate of response to the above questions, and the nature of these responses, demonstrate the lack of awareness of or utilization of L.E. equipment standards by state or federal agencies (other than communications agencies or associations). We further observed no meaningful impact of the NILECJ (LESL) standards program in the field, to date. Thus despite both present NILECJ (and IACP - see below) efforts available standards are

not sufficient and/or adapted to use by the typical low skilled police decision makers. Some police departments showed awareness of the LESL effort - most not - of standards out of curiosity but there is no evidence of any impact, to date.

As regards the IACP effort we noted that many police departments tended to view the IACP equipment listings as though they were equivalent to a certification based on performance test. This could lead to very misleading conclusions by P.D.'s. With the exception of one firm, the information on standards dissemenated by the IACP appears to have little impact in user tests. However, members of that organization interviewed expressed many ideas that could be incorporated in a more dynamic standards program supported by LEAA. These include:

1) The organizations sends our reprints of reports on equipment done by other agencies, looks for ideas and documents information in a few specific areas such as protection of "VIPs" and continues to do testing and consulting with equipment manufacturers, both informally and under contract.

2) Major projects now underway include the creation of a geographic data base, an audit program for the Uniform Crime Reporting System to strain out bad data, development of standards for police communications work for the Federal Office of Telecommunications.

3) Information is disseminated through a variety of media including: direct mailing of special reports, Police Chief Magazine (a non technical publication), Training Key (a four page bi-weekly with 70,000 subscribers that covers one subject area per issue), publication of a technical journal (Police Journal??), organizes the IACP convention as well as occasional small conferences to deal with subject of particular current interest.

4) IACP is promoting regional cooperation in recruiting and training and, on an ad hoc basis, helps design cooperative operating procedures among small departments.

5) The IACP can act as a channel of communications between the users and manufacturers through their equipment registration program and data service.

6) To register a product in this program, the manufacturer must supply the technical data required by the IACP. In general, IACP accepts the manufacturers' word on the product specifications provided. If the specs "make sense," the product is registered. The IACP asks for feedback from departments using registered equipment. For some products, notably teargas and other chemical

agents, the IACP requires that the product be tested under IACP supervision before they will register it. Apparently the IACP put out a warning on the Federal Laboratories gas frenade and were influential in having a particular handgun removed from the market.

In addition, several problems in the development and marketing of law equipments were noted in interviews at IACP:

1. Gnerally, there is a lack of feedback from users to manufacturers. Furthermore, the individual departments are too small to have any clout with a manufacturer.

2. Despite manufacturers' claims, the amount of R&D taking place in the law enforcement field is minimal with police doomed, in general, to getting outdated armed forces technology (see attached series of memos). Some examples: police are using obsolete military gasmasks that have long hoses tied to their belts while the newer military masks have a purifying canister built into the mask. Police departments prefer CS1 tear gas to the newer CS2, but the military is pushing CS2 (which is hard to disperse after use) and destroying vast stocks of CS1 despite the demand for it among police departments.

3. There is a widespread lack of sophistication in the procurement process among police departments.

4. Since 1965, the law enforcement market has been fragmented and dominated by a few big companies. Good products often do not get mainstream exposure and/or use. The big companies buy up good small companies with a resulting loss of responsiveness to user needs and a net reduction in R&D activity in a particular product area.

Referring to the question of standards development and testing, the following problems were pointed out:

1. The IACP can afford to do testing only when the manufacturer pays for it.

2. Field testing by different departments yields unclear results due to a lack of generally accepted methods of testing and reporting.

3. MITRE Program - each expert is too isolated from the needs of people in the field. Furthermore, the problems of individual departments are too diverse and too narrow to be dealt with effectively by MITRE.

4. The LEAA equipment program is not geared primarily to answering the everyday practical questions on which departments need help. Furthermore, it was noted that the test standards developed by LEAA appear to be unrelated to user requirements. One interviewee maintains that the problem must be defined by the user before tests and standards can be developed (this implies

that LEAA has failed to create this definition). The opinions were expressed that there is a need for a national testing program which would publish a "consumer reports" dealing with police equipment, and that minimum standards are unnecessary - that police departments should be able to choose equipment that meets their needs without being forced to buy expensive technology that they have no use for.

5. The Research Division at IACP currently has no budget for an ongoing research and test program.

Analysis of Findings

The outstanding feature of the above findings (1) is the limited number of sources considered in each equipment evaluation. For example, in 24% (12 out of 50) of the evaluations, only one source was considered, and 74% (37 out of 50) of the time no more than three sources were examined. There is no apparent pattern, relating to type of equipment or level of technology, and other factors such as the size of the purchase, number of suppliers available, or the size of the user would have to be considered to develop a better understanding of user behavior.

Findings from Table 43 indicate that these evaluations often (61.5%, or 48 out of 78 cases reported) result in acquisition of the equipment. This further substantiates the rather direct purchase process which occurs when once initiated. This is not inconsistent with long delays which may occur either prior to or during the purchase process. In fact, it is entirely possible to have an informal evaluation process with one supplier dominating and a short, almost perfunctory bidding and evaluation procedure which "substantiates" the previously made decision. With respect to equipment types, the more widespread its usage, the more likely is the evaluation to result in acquisition, i.e., portable transceivers (15 out of 15 cases reporting), body armor (10 out of 14), weapons detection (5 out of 7). These figures contrast with newer, more experimental types of equipment such as voice I.D. (1 out of 5), low light (6 out of 13), non-lethal weapons (4 out of 9), or larger purchases such as vehicle locators (3 out of 10).

Findings in Table 44 indicate that there is a high incidence of testing either in the laboratory and/or the field. Figures in this respect, while not inconclusive, are limited, i.e., only 28 users responded out of a total of 47.

Policy Implications

The above findings and analysis indicate a rather limited testing and evaluation procedure on the part of most L.E. users. Resources to search out and contact several suppliers of a given type of equipment are also likely to be limited. Also, most suppliers, except the very largest, are limited in the size of the sales force they can deploy to participate in test and evaluation. The combination of these factors raise the issues of how the market can be improved by a wider exposure to existing equipment, and the need for comprehensive testing and evaluation prior to requesting bids. Measures such as centralized purchasing on a regional basis; regional testing and evaluation centers; joint purchase agreements; dissemination of equipment on a trial basis are illustrative options in this regard.

In the absence of standards and comprehensive testing by either the purchaser himself or some agency similar to Consumers Report or Underwriters Laboratory, (see comment above regarding IACP), most L.E. agencies are forced to rely on their limited evaluation procedures, or as is often the case, the testimonial of larger L.E. agencies. The latter may result in a considerable lengthening of the diffusion cycle for innovative equipment.

In addition, this imitative pattern rests on what is often a faulty premise, i.e., larger L.E. agencies conduct thorough tests and evaluations. To the extent they do not, and at the same time serve as models for other agencies, they delay the diffusion of what might have proved to be superior equipment. On the other hand, since this diffusion model is well entrenched in L.E. agencies, it can be utilized by policy makers by insuring that extensive testing and evaluation are done in the major L.E. agencies, i.e., establishment of a model program for demonstration purposes with respect to test and evaluation.

Sub-Issue #3: What are the most common purchasing procedures and how effective are they?

Rationale: Purchasing procedures may be unnecessarily complex, or they may not provide the necessary safeguards to insure the acquisition of the most

appropriate equipment. It is essential to know the extent to which these procedures facilitate or impede the acquisition process.

Findings

Almost all respondents briefly indicated the main steps in their purchasing procedures. Since their effectiveness is the main concern, only those factors which they felt impeded the acquisition process due to purchasing procedures are indicated below.

Factors Perceived as Limiting the Effectiveness of the Purchasing Process

1) "State purchasing - are concerned that they do not have a 'sole source' so that if Manufacturer A does defunct, Manufacturer B could pick it up; this slows down the process - it is no problem re autos". (State Police)
2) "One problem facing purchasing is that you don't get multiple bids because the state is so slow in paying (3-6 months) that small vendors can't afford this so they refuse to bid."
3) "Is time involved in getting a line item a problem? It is a big problem; you cannot project L.E. needs on a continuous year after year basis. The needs can change drastically and require a new approach tomorrow, so to try to foresee needs is near impossible, e.g. re campus situations a few years back, we knew it would grow, so we could plan for it, but not all situations are that predictable." (State Police)
4) Q. "How many times have you evaluated something and the evaluation has been ignored because the other party has already made up his mind and the evaluation is a formality?"
   A. There needs to be a better explanation to the men about what was involved in the purchase of an item, i.e., an explanation of only one thing was gotten instead of something else.

Q. How often does this happen?
A. It is not very exceptional.
Q. Why is it happening?
A. Purchasing procedures - other influences - people who are not qualified to evaluate a product. I realize you need control over purchasing, but there are times that you save money on cost but endanger personnel by this, and so you hear it all as a big joke on the road (i.e., from officers in the field). For example, an item is decided upon and it is brought to L.E. personnel and they are impressed. Then you go into the purchasing process with x number of companies bidding and the low bid gets it. So you have an item that does not work right and it is not what you have showed them. So there is another P.R. (public relations) problem. You look bad and the trooper is demoralized and says: "I got conned again." So the troopers look for their own equipment and you have unauthorized use of equipment because he wants to protect himself and it takes a long time to rectify this." (State Police)

5) "We can make recommendations and these can be valid, but the bidding process can negate it all, e.g., we found _____ had superior equipment, but we got _____ because they bid low to get their foot in the door." (City, 50+ officers)
6) "There is usually very little flexibility in obtaining new equipment because it must go through a long process. Policeman (who needs equipment) - Lieutenant - Captain - Inspector - Chief - Budget Director - final decision. The decision is left to people in high positions. However, they are not cops and don't always realize the need for certain equipment." (City, one of 52 largest)

TABLE 45

CONSIDERATIONS WITH RESPECT TO PURCHASING

Type of User	No. of Users	No. of Users Resp.	No. of Cases*	Bids Requested Yes	Bids Requested No	Specs Need Approval Yes	Specs Need Approval No	Purchasing Alter? Yes	Purchasing Alter? No
State Police	7	2	3	2		2	1		3
City, 50+ Officers	11	6	8	6	2	3	2	4	3
City, 52 Largest Cities (By Population)	16	9	14	11	2	7	2	1	6
Totals	34	17	25	18	6	13	4	5	12

* Cases refer to individual equipment acquisition situations

Analysis of Findings

The above quotations probably indicate only the most glaring instances of problems encountered in the purchasing procedure. More intensive analysis in L.E. agencies of different sizes would serve to highlight those other ineffective aspects of the purchasing process to which users have grown accustomed and/or find it difficult to pinpoint and articulate. Among the significant dysfunctional aspects of current purchasing procedures noted above are the following:

1) No purchase from 'sole source' (see 1) above)
2) Slow reimbursement procedure (see 2) above)
3) Obtaining approval on a budget line item (see 3) above)
4) Perfunctory evaluation process (see 3) above)
5) "Influences" on the purchasing process (see 3) above)
6) Unqualified personnel making equipment evaluations (see 3) above)
7) Low bid as single acquisition criterion (see 3) and 5) above)
8) Purchasing of unauthorized equipment by individual officers (see 3) above)
9) Length of purchasing process (see 6) above)
10) Final decisions made by persons not familiar with the situation (see 6) above)

Admittedly, this is a very limited sample of users who noted ineffective procedures in the purchasing process. This is precisely the point: if so many problems can be noted in so few instances, it is a reasonable presumption to assume that more would be revealed under similar circumstances, i.e., interviewer-interviewee rapport, and articulate and candid interviewees. Finally, many of the interviewees did not have intimate knowledge of purchasing procedures and could only comment on their overall functioning. This limitation need not exist in a more intensive examination of the purchasing function.

The findings in the above table are very limited, but they are sufficient to indicate the general tendency to require bids and approval on specifications, and for purchasing not to alter specifications. However, there are sufficient exceptions to these tendencies to warrant more intensive investigation of purchasing procedures and their impact on the acquisition of innovative equipment, especially in the case of purchasing department alterations of specifications to meet procedural standards.

Policy Implications

The ten dysfunctional aspects of purchasing procedures noted above all have implications for the type of innovative equipment acquired and rate of acquisition. For example, how does a small firm with a new idea get it approved for use when there is a 'sole source' rule? A search for a receptive client is immediately made more difficult by such a regulation. On the other hand, the user is clearly in the right in not wanting to acquire a new product which it cannot obtain from an alternate source. Joint purchase agreements without 'sole source' requirements may ease some of the pressures on the manufacturer by providing him with a market, but the problem of protecting the user supplier line remains. Centralized testing may be another answer to gain recognition but not necessarily early acceptance, if the testing period is prolonged. Furthermore, a prolonged testing period may reduce the producer's competitive edge as other manufacturers learn of the product.

Slow reimbursement procedures and a lengthy purchasing process generally are especially hard on small users and any efforts to rely on them as a source of innovative L.E. equipment would have to overcome this obstacle.

A long wait for budget approval to purchase a new item rather obviously slows the process of introducing new L.E. equipment. This is especially important in areas where either the L.E. mission itself or the field of technology on which the equipment is based is changing rapidly.

Perfunctory evaluation processes and 'influences' begin to touch on the very sensitive area of local and state political and economic pressures on the acquisition process as well as producer-user relations. The extent to which federal options are feasible in such situations is open to question. Clearly, at the state and local level, more scrutiny and control is in order. Prior to any action measures, though, the level of accurate knowledge in this area is limited and must be more accurately assessed. This must occur at two levels: 1) a technical-procedural analysis, and 2) an examination of policy making procedures and the participation of local political and community organizations in the acquisition process.

Unqualified personnel making equipment evaluations points again to the need to build new capabilities, especially in planning and the acquisition process. Final decisions being made by persons not familiar with the situation is indicative of a poorly structured decision process. Realignment of decision making authority closer to the technical and administrative personnel involved in using the actual equipment is in order. Just how these changes in personnel and organization structure can be brought about is another matter. When it comes to upgrading user capabilities, it is important to inventory all user deficiencies and start an integrated long term program of upgrading based on the most urgent need, resources available, and the most tractable problem areas likely to yield initial improvement. It is important to recognize that they may not be in those areas most amenable to outside intervention.

The low bid as a single acquisition criterion, while insuring competition, may result in second-rate equipment being purchased since all other criteria are excluded from consideration. Many of the L.E. agencies generally considered to be the most progressive use multiple criteria with cost being a primary but not overriding issue (see sub-issue 4).

Sub-Issue #4: What are the major selection criteria used in acquiring new equipment?

Rationale: It is important to know the major factors users consider in acquiring new equipment. Knowledge of these factors and their ranking will give some notion of how to approach the various markets to increase the rate of acceptance of innovative equipment.

TABLE 46

PURCHASING CRITERIA

Type of Firm	Product Selection Criteria*												
	Cost of Equipment	Reputation of Supplier	Expected Results from Use of Equipment	Performance Stds. for Equipment	Testimony from Others	Public Visibility of Product	Budgetary Constraints	Training in Use	P.D.s Currently Using	Test Results	Total Cases Cited	Users Not Responding	Total Users
1. State Police	6	6	7	4	2	2	2	3	2	2	36		7
7. City, 50+ Officers	10	10	11	6	6	1	3	1	2		50	1	8
9. City, 52 Largest	18	15	17	13	11	8	9	6	7	4	108	2	16
12. Prisons	1		2	2	2	4	4	2	1		18	1	4
13. Special Agencies, Govt.	2	2	2	2	1		2				11		3
14. Private Associations, Agencies**	3	2	3	1	2		1				12		2
Totals	40	35	42	28	24	15	21	12	12	6	235	4	44

(30 Responding)

* Users may have cited more than one product with associated selection criteria

** Includes data from intermediary agencies

Analysis of Findings

The above findings show a wide range of selection criteria for new L.E. equipment. Cost alone is not a predominant criterion, nor even the most cited

in the agencies contacted. The combined weight of 'reputation of the supplier' (35), 'testimony of others' (24), and 'P.D.'s currently using' (12), or 30.2% (71 out of 235 factors cited), are indicative of a heavy reliance on a word-of-mouth or referral network. This contrasts with almost equal reliance on information received first-hand such as 'expected results from use of equipment' (42),'performance standards for equipment' (28), and 'test results' (6), or 32.3% (75 out of 235 factors cited).

The low emphasis on 'public visibility' (15) and 'budgeting constraints' (21), is rather surprising in view of the emphasis placed on these factors by some interviewees in discussing other issues. Also of interest is the low emphasis on 'training in use' (12).

Policy Implications

The wide range of equipment criteria indicates a more complex decision process than would a simplistic emphasis on cost alone. The existence of the strong referral network again emphasizes the need to insure that the information in the system is correct. This, in turn, relates to the need for impartial testing services and the dissemination of results to L.E. agencies in a usable form.

Sub-Issue #5: What is the role of key user personnel in the acquisition process?

Rationale: Roles of key personnel as well as external influences may vary by different types of user. Knowing these will shed some understanding on how programs to build or utilize current capabilities should be undertaken.

TABLE 47

INFLUENCES ON USER IN ACQUISITION PROCESS

	Amount of Influence on Acquisition Process														
	Administrative Staff			Technical Staff			Purchasing			Local Politics			Local Environment		
Type of User	Lo	Med	Hi	Lo	Med	Hi	Lo	Med	Hi	Lo	Med	Hi	Lo	Med	Hi
State Police, Cty and Sheriffs		1	3	1	2	3	2	1	3	1		1	1		2
City, 50+ Officers		3	7		3	6	5	2	2	4	1	5	4	3	2
City, 52 Largest	1		11	1		8	5	1	1	3		2	1	4	2
Total	1	4	21	2	5	17	12	4	1	8	1	8	6	7	6

Analysis of Findings

As expected, there is a high amount of influence in the acquisition process by the administrative (21 out of 26 cases) and technical staff (17 out of 24 cases). The low amount of influence indicated for the purchasing department (12 out of 17) is rather surprising in view of the many comments about the major role it supposedly plays in controlling the acquisition process.

The mixed reactions to the influence of local politics and the local environment, i.e., split almost evenly between low and high amounts of influence in both cases, may imply two very different types of acquisition process. One of these could be primarily technically oriented and administratively controlled; the other, regardless of its technical orientation, dominated by political and external influences.

Policy Implications

In the latter case, policy options are more difficult to formulate and programs are more difficult to implement and evaluate, since the amount and type of 'influences' are not easily determined. Studies of these influences are not easily undertaken due to the sensitive areas under scrutiny. Funding agencies are especially susceptible to criticism for interfering in local situations. Local leadership is essential in undertaking such studies and insuring cooperation during the study.

Sub-Issue #6: To what extent does user cooperation exist in the acquisition process?

Rationale: User cooperation is one means of increasing the utilization of innovative equipment. Knowing the types and extent of cooperation, as well as the barriers to cooperation are prerequisites to developing policies in this area.

TABLE 48 JOINT PURCHASING ARRANGEMENTS

Type of User	No. of Users	Does Cooperative Arrangement Exist? Yes	No	No response	Type of Joint Purchasing Arrangement and Related Comments
State Police	7	0	4	3	- Could (i.e., have a cooperative arrangement, but don't know of any) - None, State L.E. planning agency is talking about this, i.e., loaning equipment
County and Sheriffs	2	0	0	2	
City, 50+ Officers, Remote or nucleus	8	3	2	3	- For automobiles in the capitol city region
City, 50+ Officers, Suburb or Satellite	3	1	2	0	- Vehicles, through state; radios, share with other P.D.s; tactical, stockpile with other.
City, 52 Largest Cities (By Population)	16	8	6	2	- Joint purchase of heliocopter with city sheriff, district fire department, and metropolitan area hospital - Voice I.D. - Any agency can enter into contracts - joint city purchasing - large - Arrangement with county for transceivers - (Through) Department of Public Properties - Computer usage, metro squad - Purchasing department (makes) joint purchases for all (departments)
Courts	2	0	0	2	
Prisons	4	0	2	2	
Special Agencies - Governmental	3	0	0	3	
Private Associations, Agencies, or Depts.	2	2	0	0	
Total	47	14	16	17	

Table 49 Incentives to Cooperate on Equipment Introduction and Utilization

Type of User	Incentive to Cooperate with Other Organizations in the Introduction and Utilization of New L.E. Equipment
State Police	- Written agreement with county sheriff in large metropolitan area - Buy and loan sophisticated equipment
City, 50+ Officers,	- Narcotics situations are highly mobile and widespread geographically; i.e., situations that affect us are not limited to local area in terms of surveillance
City, 52 Largest Cities (By Population)	- Cooperation in return - Borrow and loan equipment
Special Agencies - Governmental	- The L.E. job is so big we need all the help we can get. - We are cooperating totally with other organizations in the introduction and utilization of this product. We allow other agencies to borrow our equipment. (Reciprocity as an incentive is a reasonable inference from this statement.)

Table 50 Specific Problems in Cooperating

Type of User	Specific Problems Encountered in Cooperating
State Police	- Need personnel for using expensive equipment. Main problem is communications and a command center. - Equipment costs too much and is soon outdated.
City, 50+ Officers, Remote or Nucleus	- Never loaned equipment due to cost. Manpower may be a problem because (it is) best to have person from other area work with you because (it's) his problem, too. Need rapport and awareness of each other. Otherwise, no problem. - Innovative ideas are not followed through; rate of crime reduction is not in proportion to crime rate; reduce panic, increase valid use of equipment.
City, 52 Largest Cities (By Population)	- I do see us all going our own way even though we do try to keep each other informed.
Special Agencies - Governmental	- Each L.E. agency guards its own prerogatives.

Table 51 Perceived Opportunities for Cooperation in Acquisition

Type of User	Perceived Opportunities for Cooperation in Equipment Acquisition
State Police	- Maybe a centralized fund, so when you need something and can justify it by your research, (you can get it). We have no such funds, the Bureau of the Budget prohibits this.
City, 50+ Officers, Remote or Nucleus	- Why not have a central agency to receive ideas? - Bugging (opportunity according to specific case.
City, 52 Largest Cities (By Population)	- Communication cooperation on a project by project basis. (There is) no money in the budget for activities like that.
Special Agencies - Governmental	- Patrolling borders. Dog teams with local L.E. agencies.

Miscellaneous Findings

Other organizations with which the interviewee's organization was cooperating in the introduction and utilization of new equipment were only identified in four instances. These are as follows:

- The _____ Police Department and L.E. agencies in surrounding cities (a nucleus city with over 50 officers). Also the State Bureau of Criminal Intelligence.
- The national guard and the marines
- The FBI
- Other police departments

The only response indicative of some mechanism or arrangement for cooperation on the introduction and utilization of L.E. equipment was as follows:

Personal and informal. Other areas are aware of what we do. May have formal arrangement in a specific situation.

Two firms responded to the inquiry regarding the implications of cooperative arrangements among L.E. agencies for the introduction and utilization of equipment. These are as follows:

- Data processing terminals across borders
- Cooperation in testing of products like radios in training Police Departments

TABLE 52 COMMUNICATION BETWEEN POLICE DEPARTMENTS

Type of Users	No. of Firms	No. of Resp.	Organizations in Communication Network
State Police	7	6	Professional Societies; IACP; Sheriffs' organizations; Local and other state police organizations; salesmen identify P.D.s, then call other P.D.s with new ideas; FDA; FBI; APCO
			IACP, American Association of Motor Vehicle Registration, Southern Police Institute, FBI National Academy
			A suburban association of P.D.s in a large metro area, State Board of P.D.s
			State Training Officer's Association, IACP Convention, New England Chiefs of Police, Committee on Criminal Justice seminars, Governors Highway Safety Coordination Director, safety officers (state level organizations), at/during civil disturbances; state and municipal training programs
City, 50+ Officers Remote or Nucleus	8	7	Laboratories utilized by other P.D.s and business, telephones for information on a regional basis, other P.D.s on a national basis, county sheriffs
			Area P.D.s, National Guard, Federal Narcotics
			Contact any P.D. using equipment of interest; salesmen and L.E. associations identify users; local and county L.E. organization; FBI; IRS; Federal Narcotics; police chiefs in 50 largest cities; Search Conference (project to collect and store criminal history information); member of USAC cities, a group funded by federal agencies to develop IMIS (Integrated Municipal Information Systems); a larger nearby metropolitan P.D.; steering committee for state criminal justice information system
			LEAA; area police chiefs; APCO; (interviewee comment: LEAA requirement that equipment be evaluated, possibility of other states getting after favorable evaluation). Example: state financed through LEAA with a few P.D.s on trial basis, as mobile printers, to see if good statewide.
			Rely heavily on other P.D.s, 75% of new products via sources in other P.D.s, 20% via manufacturers, and 5% official sources such as IACP, LEAA.
			City L.E. Council, Tri-county Council
			A nearby larger metropolitan P.D.

(Table continued on following page.)

TABLE 52 (CONTINUED)

Type of Users	No. of Firms	No. of Resp.	Organizations in Communication Network
City, 50+ Officers, Suburb or Satellite	3	3	Local P.D.s
			Regional police chiefs meetings; Metropolitan Area County Criminal Justice Commission; Suburban area police chiefs
			17 local communities in portion of county; police department chiefs in state
City, 52 Largest Cities (By Population)	16	7	Police Chiefs' Associations; Sheriff's Association; world wide communication (with L.E. agencies)
			State patrol; Board of Investigation
			Several of the largest metropolitan police departments
			One other large metropolitan P.D. regularly and another occasionally
			Several of the largest metropolitan P.D.s and local county public safety organization
			A state technical university; "all" L.E. organizations in the state; the National Academy
			State Patrol; Suburban police
			All local and state sheriffs and police departments' organizations

Analysis of Findings

These findings, taken together, while indicating the limited amount of user cooperation in the acquisition process, show a variety of possibilities for cooperation in the few cases cited (see Table 48 above). Few incentives to cooperate in the introduction and utilization of new L.E. equipment. Only three L.E. agencies cited the "advantage of joint purchasing" or "exchange of equipment", and only two "help or cooperation in return". One police department mentioned the nature of the L.E. task, i.e., narcotics situations which are highly mobile and geographically widespread, as an incentive to cooperate and in this case it was to accomplish the L.E. mission not necessarily to acquire equipment (see Table 49 above).

The key problem cited as being encountered in the user cooperation during acquisition may be the perceived need for each L.E. agency to "guard its own prerogatives". Two agencies cited the often overlooked problem of the need for personnel to utilize specialized equipment, it simply is not enough to consider exchanges of equipment alone, especially when there is a wide gap in the capabilities of the cooperating agencies (see Table 50 above).

L.E. agencies perceived only two opportunities to cooperate in equipment, i.e., bugging and border patrols, while two mentioned the possibility of centralized funding and one L.E. agency saw the possibility of cooperating on a project basis. Such a limited perception of opportunities very likely stems from a basic lack of interest in cooperative arrangements (see table 51 above.) The lack of response to the balance of questionnaire item as shown in the miscellaneous findings above also seems to indicate a lack of interest in extensive user cooperation.

Communication to exchange information in the acquisition process is another matter, and a wide variety of agencies and associations are contacted in this regard. Apparently, cooperation of this type is acceptable and encouraged.

Policy Implications

User cooperation was considered sufficiently important to justify a separate analysis (see section 5: Cooperation Between Users) and therefore few comments are necessary at this point. Most important, the increasing cost and sophistication of L.E. equipment places severe limitations on what all but the largest L.E. agencies can afford. If new equipment is to be widely distributed

and utilized the full potential of cooperative arrangements must be explored, yet from the above findings it is evident that, except for exchanging information, cooperation in the acquisition process is an extremely limited practice. The primary need is for an accurate determination of the barriers to as well as opportunities and mechanisms for cooperation.

Sub-Issue #7: Problems Encountered in the Acquisition Process

Rationale: Problems which impede the acquisition process must be identified in order to formulate policies and programs to deal with them. While interviewee responses are often superficial and do not necessarily reflect the fundamental issue, they provide a starting point for analysis.

TABLE 53

PROBLEMS IN L.E. EQUIPMENT ACQUISITION

Type of User	Problems Encountered in Acquiring L.E. Equipment
State Police	- Equipment is purchased centrally, not by district - Need careful specifications - Austerity, (resulting in) borrowing equipment and personnel to use it - State purchasing does not want to have a sole source - Austerity; we have state funds, so we don't qualify for federal funds
City, 50+ Officers, Remote or Nucleus	- Public opinion - Budget; the transfer of funds via City Council; the chief must justify to the City Controller and Board of Public Works - Have had no help from the foundations
City, 50+ Officers, Suburb and Satellite	- Cost of equipment - Budget from City Council

(Continued on following page)

TABLE 53 (CONTINUED)

Type of User	Problems Encountered in Acquiring L.E. Equipment
City, 50 Largest Cities (By Population)	- City politics in purchasing - Unqualified salesmen - Lack of adequate training programs provided by vendor (should be extensive and part of cost of equipment). - Equipment provided for L.E. market for which L.E. agencies have no money - Company fear of federal laws against use of equipment (i.e., bugging) - Purchasing of unnecessary equipment - Lack of vendor knowledge of L.E. market (even when it is their only market) - Needs approval of Commissioner's Board - (The future) will be more difficult - Lack of funds - Extensive testing - Reliability of equipment - Political jealousy - P.D. communication
Special Agencies - Governmental	- Producer may be approved but often merchandise is inferior because producer gets contracts based on very low bidding. - No flexibility in our budget procedure to obtain new or improved equipment; a lot of lip service; justify the need and plead the case.

Analysis of Findings and Policy Implications

The above list of findings must be further analysed as to their incidence and importance. At this point, they are all potentially important and serve to illustrate the many potential pitfalls in the acquisition process. The policy implications of these problems are covered in other sections of this analysis. They are listed at this point for informational purposes.

Areas Requiring Further Research

1) Study of the effectiveness of purchasing function in various types of L.E. agencies with emphasis on the effect of the purchasing procedures and/or personnel on the type of equipment acquired, the rate of acquisition, the bidding process, and the allocation of funds.
2) Analysis of recurrent equipment evaluation procedures in various types and sizes of L.E. agencies.
3) Identification of the most effective equipment evaluation procedures.
4) The organization of an equipment evaluation unit in an L.E. agency.
5) Analysis of the basic information requirements of such a unit.
6) The development of training procedures and manpower development for such units.
7) The potential for cooperation, joint activities or separate agencies to evaluate L.E. equipment and make the results known to interested users.
8) Analysis of the communications networks utilized by L.E. agencies in the acquisition process with emphasis on the cost and effectiveness of various types of contact and interaction with organizations, government agencies, and associations.
9) The identification of primary incentives, regulations and funding arrangements which stimulate the most effective equipment purchase and utilization patterns.

Illustrative Policy Options

1) Equipment evaluation and testing center

Centers on a national, regional, and state level, or some combination thereof can be developed to provide 1) adherence to a uniform set of performance standards by L.E. equipment producers; 2) utilization of a variety of user selection criteria instead of relying on the ad hoc and serendipitous evaluation procedures now utilized on a user by user basis; 3) dissemination of evaluation results to interested users; 4) participation of users and/or user representatives in the evaluation process; 5) training in evaluation techniques; 6)liaison with federal and private laboratories and firms conducting R&D on or producing L.E. equipment.

2) Training programs in equipment analysis and evaluation

In place of, or in conjunction with (1) above, design, sponsor and conduct training programs for user personnel in order to build up in-house capabilities in equipment analysis and evaluation.

3) Dissemination of information on equipment evaluation

Provide a centralized clearinghouse function to collect and disseminate information conducted in individual L.E. agencies. These results may be based on funded (see 4 below) evaluations or privately conducted evaluations submitted as part of a cooperative program with users.

4) Fund equipment evaluation in major equipment categories

This will tend to assure more uniform evaluation procedures through what, in effect, become model programs. These should be conducted on some decentralized basis insuring equitable participation of users in all parts of the country.

5) Provide an initial producer test market

This can be done by purchasing an initial economic order quantity of selected equipment and distributing it among L.E. agencies for further test and evaluation in a variety of situations.

8. Installation Utilization, Maintenance, & Assessment

General Statement of Issue

This issue focuses upon what happens to an innovative piece of equipment after it has been purchased by a user. Not all users find that newly acquired equipment measures up to expectations. Both equipment dependability and the ability and willingness of the actual users are explored as issues likely to have a determining impact upon effective utilization of innovations.

Some of the questions examined include user capability (user level of technical preparedness to utilize innovative equipment properly), extensiveness of user resistance to change as a threat to effective utilization and the seriousness of equipment maintenance as an obstacle to optional equipment implementation.

Sub-Issues

1) Is utilization a serious problem?
2) What role do producers have in the implementation and utilization of products they have sold?
3) To what extent have user of innovative equipment in law enforcement experienced problems with maintenance?
4) What is the assessment of product utilization?

Sub-Issue 1: Is improper utilization a serious problem?

Experience with other R&D systems and knowledge of the organizational behavior literature regarding problems typically associated with the implementation of innovative changes both suggested that effective utilization might be an important issue. The results from the interview sample indicated that neither producers nor users are strongly concerned about the possibility that law enforcement agencies might frequently fail to take full advantage of the potential that is provided through the acquisition of innovative equipment.

Not one user agency acknowledged an instance in which use of a new piece of equipment had to be abandoned totally because of unacceptable utilization. Producers were also unable to recall an instance in which one of their products had been unacceptably used by representatives of law enforcement. One should stress the fact that when user ability and willingness was divorced from the context of "their product," some producers did become more critical of the utilization capability of persons in law enforcement. Nine percent of all producers contacted agreed that it is senseless to worry about the adequacy of equipment available to members of law enforcement as long as users are so generally unable to make effective use of the technology currently existing. This vocal minority of producers firmly believe that it is inappropriate to question the state of the art since users lack the skills and knowledge necessary to take advantage of the R&D that is now available.

The following table indicates those reasons that are identified as largely responsible for poor utilization of the innovative equipment presently on the market.

Thus producers feel that when utilization does occur, the source of the problem lies with the user. More specifically, the attitudinal resistance of the actual users, the opinions of administration, and the current skill level of users were identified as the primary determinations of those utilization problems that do develop.

In contrast, of those users (12 per cent) who acknowledged experiencing some operational problems, 75% blamed the producers - citing faulty equipment. Most users who did admit to internal reasons for ineffective utilization mentioned ability rather than willingness as the problem. The lack of ability was either due to inadequate training or a poor understanding and insufficient information. Of the ten types of equipment, difficulties were more typically experienced with respect to the technologically sophisticated types of equipment.

TABLE 54
Causes of Improper Utilization of Innovative Equipment
(As Perceived by Producers)

percentage of producers indicating that it is a major cause of poor utilization	attitudes of actual users	opinion of top administration	user skills	trainability of users	participation of actual users in planning & acquisition	politics	public opinion	union interference	false competition
	30%	14%	16%	6%	9%	3%	3%	0	3%

Voice I.D. was that equipment type for which utilization was most limited. Law enforcement agencies do not typically have capable specialists prior to acquisition of a voice identification spectrograph, and, given the lengthy duration of training (two to three years of training and apprenticeship according to existing standards), it is quite some time, subsequent to acquisition, before a law enforcement agency can enjoy maximum utilization of its equipment for both investigation and courtroom testimony. This is because of the research which has emphasized that the Voice I.D. equipment is only as good as the specialist operating the system. It should be added, however, that most users are aware of this utilization lag prior to purchase.

Attitudinal resistance to change was identified as a problem affecting utilization of body armor. Many owners of such equipment do not actually wear the protective device once available simply because they do not want to. They may not want to be bothered, feel overconfident (do not really need it), or simply complained about lack of comfort. Whatever the explanation, many of the rank and file in law enforcement do not utilize this simple piece of equipment because of an attitudinal unwillingness. The same problem is likely to occur with nonlethal weapons. In this instance, officers may refuse to use those weapons since they may feel that this may threaten their personal safety. Ineffective utilization (or no utilization of purchased nonlethal weapons) has not been established since attitudinal resistance has typically been a deterrent to acquisition up to now.

Quotations

Producers

"I could write a book about this, equipment is more sophisticatied than the user. . . too often they go in for gimmickery."

- "Policemen need to be better educated so as to have a greater impact and acceptance."

- "Many times our product (body armor) remains unused. George Wallace had one inside his car when he was shot."

- "The gun is supposed to be placed in our holster from the top. Many officers try to enter the gun from the break front."

- "I've seen equipment bought that men on the street do not want or need."

Users

- "More field equipment is not the answer. Presently there is an underutilization of equipment purchased. People are not trained to use it."

- "There was a problem with training. This was our fault. Most officers were unfamiliar with portability We had to provide additional training because of frequency mixups."

- "The antennas keep breaking off in the car wash. Also a component in the vehicle locator signpost system would be destroyed each time the phone company tested their lines."

- "Yes - we experienced a problem of personnel preparation. We needed better training before the vehicle locators could be used properly."

- "Large personnel problem because there is a two-year lag to get your personnel trained in Voice I.D.

- "We need better training programs."

Policy Options

While most producers and most law enforcement agencies do not apparently appear very concerned about the problem of effectively utilizing innovative equipment, this should not be interpreted as meaning that there is no need to consider policy options. For one thing, the seriousness of the problem might be underestimated because of a natural hesitancy on the part of both producers and users to acknowledge unsuccessful experiences for which they were responsible to a third party. Moreover, even if the problem is accurately perceived; policy options are sensible because there exists a small but consistant number of both producers and users who feel there is a need for improvement, and this is one area in which the positive effects of policy changes can be readily predicted.

(1) Training opportunities need to be developed in order to prepare the actual users for operation of the more complex types of innovative equipment that are on the market. Otherwise, chaos typically occurs following implementation until the users haye had sufficient on-the-job experience and feedback.

(2) Administrators need to be better educated on methods for the introduction of change in order to more effectively avoid the occurrence of resistance to change on the part of the actual users.

(3) Better standards need to be developed so that users can determine which products and models can be most effectively utilized given their agency's specific needs and environmental constraints. (also more accurate expectations about results of products now available.)

Sub-Issue 2: What role do producers have in the implementation and utilization of products they have sold?

This sub-issue is concerned with the extent to which the producers involve themselves in the domain of effective utilization of their product line by users and also with the question of whether some

redifinition of their actions with regard to utilization would be appropriate.

Written Assistance

Most of the assistance provided by producers to aid in implementation and utilization of innovative equipment is in the form of written manuals. The most common examples of this passive approach are service manuals and instruction manuals. With the exception of producers of rather basic equipment, like holsters, this type of assistance appears to be the normal mode of helping the user both avoid difficulties and also handle complications that do develop.

Personal Assistance

Ten per cent of the producers contacted indicated that representatives of their firms personally instructed purchasers on equipment use. Twenty-seven (mostly producers of complex and sophisticated equipment) of the producers provided extensive equipment servicing, realizing that difficulties will develop and that the law enforcement agencies lack the technical capability to make adjustments, modifications, and repairs. This technical service is typically made available for a very limited duration (one year or less).

Some manufacturers of voice identification spectrographs also provide training programs to help prepare the users' operators of the system.

Overall, eighteen per cent of all users indicated that producers had participated in the effort to introduce the innovative equipment and utilize it effectively. Most respondents appear to be relatively satisfied with the quality of assistance provided with the exception of Voice I.D. training which is apparently too short and superficial to be truly adequate as training. In contrast, many users that have not received producer assistance have experienced disruptive problems at the early stages of utilization. While most are not serious, they are annoying and also have generated negative feelings among operators of the equipment and produced non-utilization periods due to need for repair.

While not a major issue, many of these users would benefit quite a bit from greater producer assistance.

Policy Options

1. Make producers aware of the need users have for greater technical assistance during the initial implementation period. NILECJ should be conscious of the need for this service to be built in to the cost of sales by producers.
2. Make users more aware of the problems that might develop so that they know to request preventive assistance rather than requiring disruptive emergency assistance.

Sub-Issue 3: To what extent have users of innovative equipment in law enforcement experienced problems with maintenance?

This particular issue was not explored in great depth since it was not anticipated as a major problem. In terms of availability, a large proportion of the users do indicated that service and maintenance assistance is provided by the producer of the equipment. However, this does not mean maintenance is not an issue. Users have the following complaints about maintenance.

(1) Innovative equipment breaks down far more frequently than anticipated. This is annoying, disruptive, and attributed largely to shoddy workmanship.
(2) Maintenance frequently requires technical expertise generally not available internally.
(3) Repairs are often time consuming (equipment must be sent back to manufacturer) and also expensive.
(4) Often the difficulties are due to problems of making equipment adaptable when it turns out (after purchase) that certain conditions hinder the operability of the equipment (applicable primarily to vehicle locators, transceivers, low light, and other high technology products)

Twenty-two per cent of all users contacted acknowledged having problems with maintenance of recently acquired innovative equipment. The nature of the bidding process (purchaser taking lowest offer), the absence of strong standards, and an inherent lack of experience with an innovative piece of equipment all have the effect of minimizing the consideration given to maintenance when purchasing. In addition to the maintenance problems which occur because a law enforcement agency made a poor selection decision when purchasing there is, no doubt, typically more maintenance problems associated with innovative equipment than would be expected as reasonable with respect to established products. Whatever the actual cause, most users did not anticipate the rate of problems they have been experiencing and do not like the headaches required to correct the malfunctions that develop.

Quotations

"A slow pull of the trigger causes a malfunction. We sent the first 12 guns back and also the shells. They sent us new ones and we had the same problems."

"We have problems of leakage with the shells. They also lose their potency after three years."

"The sound spectrograph is currently under repair at considerable expense.

"We have problems cleaning the vests."

"Radios difficult to work and don't function properly in some areas of the city."

"When the device is attached to a boat the salt water eats the battery alive."

Policy Options

(1) Educate users to give maintenance greater consideration prior to purchase.

(2) Make results of previous users more readily available so those agencies considering acquisition will be better aware both of unreliable product models and also of operating conditions which create maintenance problems.

(3) Fund studies to help identify those instances where the training of internal maintenance personnel becomes a viable alternative to dependence upon factory specialists to correct malfunctions.

Sub-Issue 4: What is the assessment of product utilization?

In order to really know whether a new piece of equipment is being utilized effectively and is actually fulfilling its purpose for law enforcement, some kind of agency assessment is necessary.

Forty-eight per cent of all respondents indicated that they had carried out an evaluation of the innovative equipment they had purchased.

For Purchases of Innovative Equipment

48%	Performed an assessment
14%	No assessment
38%	No answer

While the initial data appear favorable, this is not really the case. Many of the law enforcement representatives who did not respond to this question were unable to do for some of the following reasons: a) because they were not at the agency during initial utilization, b) because they were not involved in this aspect of the agency's law enforcement operation, c) because they could not remember whether a formal evaluation had been performed. These people would most likely be aware of the existance of any assessment and of the main thrust of the results. Thus, the inability to respond frequently reflects the

fact that no assessment had been conducted.

In addition, it appears that while roughly half of the users did an evaluation, the term evaluation is defined very loosely by many people in law enforcement.

Of the Agencies Who Did an Assessment

Those who do an evaluation as as standard procedure	9%
Those who use results strictly strictly for internal purposes	50%
Those required to make evaluation as condition of grant	12%

Most evidence suggests that the quality of user assessments are questionable. With the exception of those large users who do evaluations as a standard policy and those users who are required to do an evaluation as a funding regulation, most assessments are informal, unsophisticated, and remain unreported externally. All in all, over roughly twenty per cent of all users involved with innovative equipment in law enforcement have made assessments which are even minimally acceptable as criteria for determining the impact of the purchase.

This situation is undesireable for several reasons. The first reason is that agencies may be investing large amounts of money in expensive equipment and not really know whether the outcomes that are provided as a result of the acquisition really justify the investment of time and money that was necessary to enable purchase. Thus, the department is denied feedback regarding the extent to which being innovative pays off. A second problem is that the low frequency of good evaluations and the tendency to keep results inhouse means that communication of highly significant information about innovations is severely limited within law enforcement. If a new piece of equipment has produced really good results, it is upsetting that the user may not be aware of the extent of the benefits and that it is

not disseminating these results so that other users who might have a need for this type of product can become more quickly aware of its existance and of actual outcomes that have been experienced. Similarly, if a new product fails to fulfill its expectations (whether because of misrepresentation, poor dependability, difficult operation, limited applicability, or some other cause) a user should know this and could then reassess the process by which ideas are evaluated and acquired internally. Also the publicity could prevent other users from making the same mistakes and errors.

Quotations:

- "Evaluation is informal only. No official standard procedures .. our supervisor ask us how it works . . . what he does with the information I don't know."

- "Evaluation is informal, re. how many times the equipment was helpful and how well it works. It is not a required evaluation."

- "Yes, we have a formal evaluation (log) of usage."

- "We don't do any evaluation."

- "No true test for evaluation."

- "We do test evaluation of samples before purchase."

- "Evaluation not formal."

"Evaluation was required by grant proposal and is also a normal department procedure."

"Yes we did an evaluation. Required by LEAA."

"We use a questionnaire evaluation for new equipment."

Policy Options

1. Users need training in order to learn the value of a proper evaluation of an innovative change as well as to acquire the skills necessary to conduct an effort.
2. LEAA should make public and readily accessible the results of evaluations it requires.

1.3.2 The Analysis of Products

Data was collected and analysed on all ten product areas selected These are:

1. Body Armor
2. Holsters-Utility belts
3. Low-light Photography and Surveillance
4. Non-lethal Weapons
5. Portable Transceivers
6. Vehicle Locators
7. Voice I.D.
8. Weapons Detection
9. Building Design
10. Court Recording Equipment

We have not included in these reports the specific company information on prices, models, volumes sold, etc. which we obtained to protect sensitive, potentially confidential information. Where feasible, alternative methods were used to present "sanetized" non-company identified information.

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* Analyses presented simultaneously with that of "architectural design" in section 9.

Equipment Item Analysis

1. Body Armor

Introduction

Body armor basically breaks down into two classes, hard and soft armor. The hard armor uses steel plates, etc. and soft or flexible armor utilizes ballistic nylon or the new Kevlar 29 fabric. Users and producers interviewed dealt with both types of armor. Where it is important to differentiate between types of armor this will be pointed out.

Many statistics are available concerning the increase in police deaths and thus the importance of body armor grows. Instead of the bulky hard armor being pulled out for a few special situations there is a shift towards flexible, lightweight armor which can be worn comfortably by the policeman at all times in all situations. The soft armor may have its limitations as to what it can defeat, so the hard armor must be used in those situations which require it.

The users included in this analysis are those which have body armor, whether they use it or not. Of the interviews analyzed, 22 have body armor, 3 are still considering body armor, and 1 user has not considered body armor. Having body armor could mean the department bought and has one or two pieces of hard armor or that it has bought soft armor for the entire force, or just that individuals within the department own body armor.

The producers included here are producers of either hard or soft armor. The number of producers of body armor we identified were 19, and 15 of these were interviewed by us. We should note that many companies are listed as body armor producers but on investigation these turn out not to be actual manufacturers, but rather distributors or retail outlets.

History

The history of present day body armor starts in the military in World War II. The original product was flak jackets. Next in Korea a vest was made of glass and resin (a Doron vest). Then an '11-57' vest which was also made of glass but with a different resin combination. Out of this came the '56 grade' vest which is similar to some of the hard vests today. Body armor was used by police departments shortly after the Korean conflict. The

use of fabrics enabling soft, flexible body armor started with ballistic armor nylon developed in the early 1960's and has progressed to the development of Kevlar 29 fairly recently by Du Pont, which is twice as strong and half as heavy as ballistic nylon.

Most producers said they entered this market because they recognized the need for such equipment in law enforcement while only a couple of companies had experience in the military. A few companies spun off of already existing body armor manufacturers.

Analysis of Producers

Table no.55 shows that there are two medium companies producing body armor and the others are either small or tiny. The largest company has only .05% of their sales in law enforcement. Thus it seems that at least for those producers which we interviewed, producers of body armor are mainly small companies with sales volumes of less than one million dollars.

The table also shows that only one of these companies' main products is body armor. It is significant that this one company is one of the major sellers and producers of soft armor in the country.

There seems to be no pattern to how attractive the producer sees the law enforcement market, while there is only one producer who feels the law enforcement market is not competitive.

Willingness to do R&D is hard to analyze because of the many different reasons for the producers' response. Some aren't willing because of previous bad experiences while one producer is satisfied with his position and doesn't feel R&D would pay off. Those who are willing to conduct R&D often add stipulations indicating real hesitancy concerning R&D. Over all this does seem to be the case with producers of body armor - they are quite reluctant to do their own R&D.

No significant changes are mentioned as to producers' future plans with the one exception, the introduction of a new fabric which should cut down indentation to one-quarter of an inch.

Producers of body armor said without exception that the current body armor is adequate but is not being adequately used. Quite a few users interviewed did not feel this was the case and this points up a significant problem in the utilization of body armor.

CONTINUED

2 OF 4

TABLE 55 Body Armor Producers*

Company Size	Main Product	Amount of Law Enforcement Sales	L.E.Market is/is not Attractive	L.E. Market is/is not competitive	Producer is/ is not willing to do R & D	Future Plans with regard to body Armor	Available equipment not used or inadequate
Medium	Uniforms	primarily in L.E.	is not	is	is	improvement-new fabris	not used
Medium	Fabric Related	very little approx. 1 million	N.D.	N.D.	N.D.	N.D.	not used
Tiny	Hard armor for all uses	primarily in L.E.	is	is	is	might go into flexible armor	not used
Tiny	Armor for Planes	discontinued L.E. effort	is not	is	is not	N.D.	not used
Tiny	Uniforms	primarily in L.E.	is	is	is not	N.D.	N.D.
Tiny	Bullet-Resistant Vehicles	" "	is	is not	is	improvement new materials	not used
Tiny	Uniforms	" "	is not	is	is	general improvement	not used
Small	Seat Belts	approx 10% in L.E.	is	is	is	no major changes	N.D.
Tiny	Bullet-Proof shields in police cars	primarily in L.E.	is not	is	is	new fabric to cut down indention to 1/4"	not used
Tiny	Hard Armor for all uses	approx. 50% in L. E.	is not	N.D.	is not	no changes planned	N.D.
Small	body armor-flexible vests	practically all in L.E.	is	is	is not	expand production sales	not used

* Four Producers are not included because their responses were not specific to the data included on this table.

Analysis of Users

Along with the data presented in table no. 56 data was also collected from individual policemen of 24 different law enforcement agencies (mainly police departments) and the following is a tabulation of whether or not the agency has body armor compared with the agency classified via the user typology which is used in this report.

User has body armor		User has no body armor	
# of occurences	User typology Number *	# of occurences	User typology Number *
0	1	0	1
1	2	0	2
0	3	2	3
0	4	0	4
0	5	0	4
3	6	2	5
3	7	4	6
4	8	2	7
1	9	1	8
0	10-14	0	10-14

Using this data along with that in table no. 56 it seems that the larger users predominate and it is rare for a small user to have body armor. Several possible reasons for this are the greater incidence of crime in the major cities, the greater availability of funds in a large police department and the greater technical expertise or R&D capabilities of the large law enforcement agencies.

Product Use

The majority of users who have body armor have a limited number of units for special purposes. The armor is used in tactical units, riot units, bomb squads and the like. The specific use depends on the law enforcement agency and the department within the agency. A bomb unit uses hard armor while the investigative division would use soft under cover vests. A number of the users interviewed have never used the body armor they possess and it is quite outdated. Producers indicate that a great part of their sales come from individual policemen and this concurs with the information from users. These sales are for the most part the soft, flexible armor made of ballistic nylon or Kevlar 29. There seems to be a change taking place from the idea of having armor just for special situations to having armor for use all the time in all situations. This is indicated by several large police depart-

*see for typology descriptions

Table 56 Body Armor Users

Type of i.e. agency	Region	# Sworn Officers	Budget (in millions)	Amount Spent last year on innovative equipment	General Budgeting Condition	Classification User Typology *
P.D.	West	1958	N.D.	N.D.	Austerity	9
P.D.	Mid-West	2230	37	1,050,000	Austerity	9
Sheriff	West	523	N.D.	750,000	Stable	2
Prison	West	400	N.D.	2,000	Austerity	12
P.D.	South	390	8	35,000	Stable	7
P.D.	East	402	5.4	very little	Austerity	7
P.D.	East	262	N.D.	N.D.	N.D.	8
S.P.	East	900	17.3	500,000	Austerity	1
P.D.	Mid-West	142	2.84	30,000	Stable	8
S.P.	East	1140	26	very little	Austerity	1
P.D.	Mid-West	420	8.2	160,000	Austerity	7
P.D.	Mid-West	1300	23	none	Stable	9
P.D.	South	646	11	N.D.	N.D.	9
P.D.	Mid-West	5500	160	10,000,000	Stable	9
S.P.	Mid-West	100	N.D.	N.D.	N.D.	1
P.D.	Mid-West	216	3.4	75,000	Austerity	7
P.D.	West	7200	150	250,000	Stable	9
Sheriff	West	5500	150	none	N.D.	2
P.D.	Mid-West	670	10.2	none	Austerity	9
S.P.	East	850	18	N.D.	Austerity	1
P.D.	Mid-West	841	18	1,200,000	Stable	9
S.P.	Mid-West	1756	40	6,000	Austerity	1

* See for typology descriptions

ments which are considering purchasing large quantities of soft armor for their patrolmen. For the most part though this change has not taken place as yet.

The quality of usage of body armor seems to be lacking in several respects. The biggest problem seems to be that the armor is just not used when the users have it. The officers don't have it available to them or they don't have the time to put it on or they just neglect to put it on. Another major problem is the incorrect use of armor. The officer using the armor must be aware of what the specifications of the armor are. At least one producer puts information on which guns the vest will stop right on the label of the vest so the officer is sure to know.

The requirements for body armor are not agreed upon by producers and users and many have no basis for judgement since the requirements or standards developed are not sufficiently made known to either party. The following requirements for soft armor for everyday use comes from a user opinion survey done by the Mitre Corporation. (1)

"1. The garment must be able to afford protection against a handgun up to .38 caliber. The extent of this protection is such that an officer shot by such a weapon will not lose conciousness, will not suffer permanent damage and will, at most, sustain a severe bruise.
2. The garment shall be in the form of an undershirt or short sleeve shirt.
3. The garment shall be inconspicuous such that to the casual observer, it would not be apparent that the officer was protected.
4. The cost of the garment shall be in the $40-$50 range.
5. The garment must be neat and wrinkle free and appear like the garment it replaces.
6. The garment must be comfortable when worn continuously for eight hours in both winter and summer conditions. In particular, the garment must provide adequate ventilation for 100% humidity and temperatures in the 90°F range and should cause no greater discomfort than the garment it replaces.
7. The garment shall cause no noticeable loss of mobility when worn.
8. The garment shall protect the chest, abdomen, back and groin. The last may require that the garment is configured in more than one piece.

(1) See: Protective Garments for Police; Preliminary User Opinion Survey; The Mitre Corporation; May 25, 1973 and for more detailed requirements see: Detailed Operational Requirements for Protective Garments for Law Enforcement Agencies; The Mitre Corporation; October 19, 1973.

9. The garment shall be easy to clean and launder and not have its wear life shortened by normal cleaning.
10. The garment shall be easy to put on and remove.
11. The garment shall be manufactured in several sizes for better fitting."

Most users are looking for armor which meets these specifications, especially those planning on making a major purchase of armor for the department. Many of these same users are not going ahead since they feel there is nothing on the market which meets these standards. Some feeling from producers as indicated in table no. 55 is that of little progress in meeting these goals if they know of them at all. Also, some of the producers who are aware of these requirements simply don't see these as the proper standards. Thus it seems a kind of stalemate has formed which is hurting the utilization of body armor in law enforcement.

Policy Implications

- Provide funds (possibly in joint ventures) for research (and perhaps more important development and commercialization) in body armor to selected producers of body armor. This could be a good forum for large company/small company cooperation.
- Develop a means of information transfer from user agencies to producers in order to elicit cooperation on the development of standards.
- Provide funds for information centers enabling the small user without R&D capabilities to obtain relevant information on equipment cheaply and quickly.
- Assist in the publicizing of user experiences with body armor.

Product Market

Body armor today is used primarily in the law enforcement market exclusive of military, use. Sales outside law enforcement range from one to five percent depending on the producer. The law enforcement market is extremely important to the producers of body armor and they couldn't exist without it.

In contrast most companies which produce body armor could survive without it easily. Table no.55 shows that only one company's main product is body armor and without it the company wouldn't continue. The other companies

though, show another major product which brings in the bulk of revenues and producers indicate that body armor is not a vital part of their business.

Changes in State of the Art

Some of the early history of body armor was covered in the previous section on history. Going into the 60's some of the standard materials for body armor were glass-reinforced plastic, ballistic nylon, polycarbonate resin, inserts of steel and ceramic-glass reinforced plastic laminate. These latter materials are for the higher threat weapons and little has changed in this area. Some weight reductions have occured but in this area a 3% reduction is a lot. Also some cutting changes have occured to shape and fit the armor to the user more effectively but on the whole hard body armor is changing very slowly if at all and producers and users concur on this. In the area of soft armor the biggest breakthrough is Kevlar-29. This fabric developed by DuPont a few years ago while in search for a new tire cord can be readily woven into ballistic cloth, is much stronger than nylon and yet lighter than nylon. This caused a sizeable advance in soft armor enabling lighter armor which could stand up to higher threats. After this no significant changes have taken place in body armor until now when a producer claims to have developed a vest which will cut down indentation to 1/4". This development was in the testing stage when the producer was interviewed. In soft armor the state of the art seems to be changing slowly to moderately. This is an area where NILECJ's ESIP program has made a significant contribution to the field.

Policy Implications

Continue to support research for the development of new ballistic fabrics.

Issue: Acquisition

The mechanisms and arrangements for acquisition of body armor seem to be quite informal and unstructured in the decision to acquire process. A number of users made the decision to acquire after a policeman was killed, while other users started the acquisition process on little more than one individual's recommendation. The approval and purchasing procedures

are quite formalized. Six of the eleven producers indicated in table 55 that they cooperated with users in the testing of their armor. Two others did their own testing in labs and two others used an independent testing firm. Two users worked with this same independent testing firm. Approximately one half of the users indicated they undertook formal testing of body armor and approximately half of these indicated they were helped by the producer in their testing. There also seemed to be a tendency for the smaller users to depend on or look towards the results of the larger users' testing, and they then make their decisions on the basis of these results.

The major problems brought out in the acquisition process by both producers and users was in the area of evaluation. The concern is for the availability of information concerning evaluation of products and the quality of this information. A central pool of information on the performance of products was mentioned so that the users, especially the smaller ones, could more easily get relevant data to help in their decisions to acquire. Concerning the quality of this information, both producers and users knocked the present handling of evaluation via Police Weapons Center certification. It was felt that they are not discriminating enough and it was mentioned that a good evaluation function should resemble more of the Consumer Reports type of material. Both parties want a source of reliable information on what products exist and their quality.

Policy Implications

Creation of a National Clearinghouse for information.

Develop an agency which will provide unbiased information on product information.

Issue: Funding and Budgeting

Of the 22 users considered here, only 2 purchased body armor with outside funds. No producer interviewed received outside funds for product R&D. Some users purchased armor out of their regular budgets and thus bought a little at a time, while other larger agencies got special appropriations from the city council, etc. to purchase body armor (this happened only days after a policeman was killed).

Policy Implications

Provide funds for R&D to the producers of body armor.

Provide funds or loans for the purchase of body armor by user agencies.

Issue: Information Transfer

As discussed earlier in the section on product use the communication between producer and user is lacking. One area which was cited as effective was the IACP conference. Users commented on how much new equipment they got exposed to at the show when normally they wouldn't even know it existed. Communication between users is usually an informal process which includes many of the area law enforcement agencies.

Bibliography

Literature From Files Dealing at Least in Part with Body Armor

British Police Research Bulletin, No. 18, Winter 1971

British Police Research Bulletin, No. 19, Spring 1972

British Police Research Bulletin, No. 15, July 1970

British Police Research Bulletin, No. 10, April 1969

British Police Research Bulletin, No. 8, October 1968

Law Enforcement Standards Program
"Project Plans for Fiscal Year 1973 of the Law Enforcement Standards Laboratory"; National Bureau of Standards; December 1972.

Law Enforcement Standards Program
"Ballistic Resistance of Police Body Armor"; National Bureau of Standards; March 1972.

LEAA Police Equipment Survey of 1972
Volume VI: Body Armor and Confiscated Weapons; National Bureau of Standards; October 1973.

Equipment Systems Improvement Division Standards and Guidelines Program; Progress Report of the Law Enforcement Standards Laboratory; National Bureau of Standards; May 1974.

Riot Control: Analysis and Catalog
National Technical Information Service; David W. Samuels, et.al.; October 1969.

Law Enforcement Standards Laboratory
Progress Report for January 1973; National Bureau of Standards

Law Enforcement Standards Laboratory
Projects Proposed for Fiscal Year 1974; National Bureau of Standards; May 2, 1973.

Law Enforcement Standards Laboratory
Semi-Annual Report -- September 1972; National Bureau of Standards.

The Police Weapons Center
"Ambush Attacks - A Risk Reduction Manual for Police"; IACP - 1974.

Preliminary Problem Areas for the Equipment Systems Improvement Program; The Mitre Corporation; October 15, 1972.

Protective Garments for Police; Preliminary User Opinion Survey; The Mitre Corporation; May 25, 1973.

Detailed Operational Requirements for Protective Garments for Law Enforcement Agencies; The Mitre Corporation; October 19, 1973.

Soft Body Armor
An Interim Report on the State of the Art; National Institute for Law Enforcement and Criminal Justice.

Data Package for the Industry/User Symposium on Lightweight Body Armor; The Aerospace Corporation; September 1974.

Annual Progress Report - Fiscal Year 1974
Equipment Systems Improvement Program; Law Enforcement Development Group; The Aerospace Corporation; August 1974.

Monthly Progress Report
Equipment Systems Improvement Program; Law Enforcement Development Group; The Aerospace Corporation; September 1973.

Annual Operating Plan - Fiscal Year 1974
Equipment Systems Improvement Program; Law Enforcement Development Group; The Aerospace Corporation; June 1973.

Annual Progress Report - Fiscal Year 1973
Equipment Systems Improvement Program; Law Enforcement Development Group; The Aerospace Corporation; July 1973.

Annual Operating Plan - Fiscal Year 1975
Equipment Systems Improvement Program; Law Enforcement Development Group; The Aerospace Corporation; January 1974.

LEAA Police Equipment Survey of 1972
Volume I: The Need for Standards --Priorities for Police Equipment; National Bureau of Standards; July 1973.

Equipment Item Analysis

2. Holsters-Utility Belts

Introduction

Some clarification is in order concerning what equipment is being considered here. Holsters need no real explanation, while the term utility belts may. In this study what is basically meant by a utility belt is a belt on which an officer can carry much of his needed equipment. This includes his gun, as well as equipment such as ammunition, hand-cuffs, night stick, keys, flashlight, portable tranceiver, etc. As can be seen from the list above the need for an efficient and space saving system for officers to carry their equipment while maintaining both comfort and mobility is sorely needed. In this study a belt with permanent straps or hooks for carrying some of these different objects was considered a utility belt as was a belt with snap-on attachments to serve the same purpose. When appropriate holsters and utility belts will be considered separately, but for the most part they will be considered together in the context of this report.

There were 13 user interviews in our sample which dealt significantly with holsters-utility belts. Of course all police departments have these but their response towards having utility-belts varied due to the various meanings which the individuals had concerning utility belts. This in itself may be significant. This analysis includes eight producer interviews - the number known is 17.

History

Holsters are a traditional product with a long and mostly obscure history. Some manufacturers have been in the business for close to 100 years. The shape of the holster has changed with different shapes and sizes of the guns they're made to hold. Utility belts originated from the gun belts which previously held only bullets and a holster and were adapted to hold more of the necessary equipment which is needed in modern law enforcement.

Analysis of Producers

This table shows all the producers but one to be either in the small or tiny size category. The large producers' main product is hand guns and is into many varied law enforcement fields of which holsers-utility belts is one. All the others, which basically concentrate on holsters-utility belts, are either in the small or tiny range. Also seen in this table is that these

companies depend heavily on law enforcement and they could not survive without this market.

All producers felt the law enforcement market was an attractive one to do business in while only one producer felt that the law enforcement market was not competitive. There seems to be no pattern here except as one would expect, all the firms that feel the law enforcement market is attractive are primarily law enforcement oriented.

Generally the producers are not willing to conduct any R&D programs. Reasons by producers included that R&D wasn't critical, needed or profitable in this area. It is interesting to note that the three affirmative responses concerning R&D came from the three biggest firms in our sample. And, in more than one case size was noted as the reason for no R&D.

Not a single significant improvement in the state of the art is mentioned in the future plans section of the table. This lack of progress in the holster-utility belt area will be dealt with in a later section on changes in state of the art.

Analysis of Users

The data in this shows an abundance of large user agencies, but of course in the case of holster-utility belts this is misleading. Practically all users employ holsters-utility belts the only difference being in the extend of their use with special agencies not utilizing holsters-utility belts to the degree which police departments do. In a survey conducted of individual policemen from 24 different police departments they all indicated they used holsters-utility belts.

Product Use

Every police department included in this interview naturally indicated that all officers in their department used holsters-utility belts. In one prison interviewed all their guards had holsters but they had only a limited number of utility belts which were issued in an emergency so that guards could carry extra amminition.

It seems the majority of utility-belts users employ are the kind which use clips to add attachments. Many of these users indicate that this is unsatisfactory and one possible solution which they mentioned is that of miniaturization, especially in the area of portable transceivers.

TABLE 58 HOLSTER-UTILITY BELT USERS

Type of L.E. Agency	Region	# Sworn Officers	Budget (in millions)	Amount Spent last year on innovative equipment	General Budgeting Condition	Classification User Typology*
P.D.	Midwest	420	8.2	160,000	Austerity	7
P.D.	Midwest	381	6	N.D.	Stable	7
Prison	Midwest	224	8	none	Austerity	12
P.D.	Midwest	1,300	23	none	Stable	9
P.D.	Midwest	5,500	160	10,000,000	Stable	9
P.D.	Midwest	142	2.84	30,000	Stable	8
P.D.	South	390	8	35,000	Stable	7
P.D.	South	646	11	N.D.	N.D.	9
P.D.	Midwest	841	18	1,200,000	Stable	9
P.D.	Midwest	2,230	37	1,050,000	Austerity	9
P.D.	West	1,958	N.D.	N.D.	Austerity	9
Sheriff	West	523	N.D.	750,000	Stable	2
Prison	West	400	N.D.	2,000	Austerity	12

* see table 1 for user typology

Concerning product requirements most producers felt that what was currently on the market met the needs of users and offered no specific requirements. Users did have some specific responses in the area of product requirements. A couple of users indicated that a system made up of two belts, one for trousers and the other for the officer's gun, etc., was found to be too bulky and their use was discontinued in these departments. In general users felt that a utility belt should carry all the officer's necessary weapons and articles and the belt should be comfortable, long wearing and not impede the officer's mobility. A holster must carry the gun whether the officer is sitting, standing, or walking, and again should be comfortable, long wearing, and low priced. A few departments require a front release holster but this is not a universal requirement.

Data on replacement is quite varied. A few departments plan on a product life of 8 to 9 years. A couple of police departments have had their holster-utility belts for approximately twenty years and two more can't remember when they purchased their present equipment since it's been so long.

Policy Implications

Investigate alternative methods of improving the system which exists for policemen carrying their necessary equipment comfortably and without lack of mobility such as miniaturization and possibly allocating funds toward these ends.

Develop a means of information transfer from user agencies to producers in order to better communicate user needs and to elicit cooperation on the development of standards.

Product Market

All producers of holsters-utility belts sell primarily to the law enforcement market. The sporting goods market makes up the rest of the sales volume. As seen in table 57 sales in law enforcement range from 70 to 99 percent. The law enforcement market is vital to these producers and they could not exist without it and all but two companies interviewed depend primarily on their sales of holsters-utility belts. Holsters-utility belts are just minor portions of the business of these other two producers and they could easily survive without this product. Thus it seems that the producers of holsters-utility belts are dominated by firms which specialize in this product and depend primarily on it for their existence.

Changes in State of the Art

Only one real major change has taken place in the state of the art of holsters-utility belts; this has been the break-front holster. This innovation came about in response to the problem of having the policemen's gun taken away during a fight and being used against him. Since the gun doesn't come out in the normal way this problem has been overcome. Some minor changes such as new cases for different pieces of police equipment have been made. In England two minor innovations have taken place, rhinestone reflective belts and horizontal radio pouches on belts.(1) Users and producers both agree that significant changes in the state of the art are at a standstill. As is seen in table number there is little R&D activity planned and no significant changes seen in the future. The prospects for some movement in the state of the art are poor. A potential gap may lie in the development of utility belts specially designed for female police.

Policy Implication

Stimulate R&D in this product area by providing funds for joint R&D programs, i.e. between users and producers.

Issue: Acquisition

There seems to be no pattern in the acquisition process for users. A few agencies conducted a program of writing specifications and researching the existing models to choose an appropriate model for use by their department. Most departments give their policemen an allowance and they purchase their own holsters-utility belts. Some departments have restrictions on what can be bought but most leave it all up to the preferences of the individual policemen. Two police departments could give no real data on the acquisition process since their holster-utility belts were there before anyone presently in the department was there.

The method of testing by users was fairly consistent. Field testing was done by a few officers and the opinions and reactions of the participating policemen were solicited to form the evaluation of the products and action was taken on this basis. Nearly all producers indicated that they did enlist the cooperation of users in testing their product.

Both producers and users indicated that they have a problem in identifying

(1) See: British Police Research Bulletin, No. 13, January 1970 and No. 21, Spring, 1973.

the performance specifications for holsters-utility belts. Producers don't seem to be as concerned with this problem as users who need this information to make an effective decision to acquire. There seems to be general lack of concern in the decision to acquire process for holsters-utility belts.

Policy Implication

Create product standards which are available and consistent for the use of both producers and users.

Issue: Funding and Budgeting

None of the users indicated use of outside funds in the purchase of holsters-utility belts. Also no funds were made available to any producers for product R&D. For those agencies which do not have their policemen buy their own there is sometimes a problem in obtaining the large number of holsters-utility belts at one time which are required and the units have to be bought in installments. This can occur for two reasons, lack of funds by the user agency, or the lack of size and production capability by the producer.

Policy Implication

Provide funds for R&D to the producers of holsters-utility belts to help lower costs.

Issue: Information Transfer

Information transfer seems to be practically non-existent between producers and users. Brochures, ads, and trade shows are the only links mentioned. Generally there seems to be a lack of interest or any acknowledgement of the functions and problems of holsters-utility belts. This most likely stems from the feeling of both users and producers that holsters-utility belts play an insignificant role in the law enforcement effort. This becomes apparent when looking at the bibliography and seeing that only five references are listed and they all originate in Great Britain.

Policy Implication

Stimulate interest in the field of holsters-utility belts and publications concerning the improvement of the state of the art.

Bibliography

Literature from Files Dealing at Least in Part with Holsters-Utility Belts

British Police Research Bulletin, No. 8, October 1968
British Police Research Bulletin, No. 11, July 1969
British Police Research Bulletin, No. 13, January 1970
British Police Research Bulletin, No. 21, Spring 1973
British Police Research Bulletin, No. 22, Autumn 1973

Equipment Item Analysis

3. Low Light Photography and Surveillance

Introduction

Low light equipment development and sale to/usage by L.E. agencies can only be understood in the context of:

1) development for military usage;

2) the simultaneous occurrence in a specific time-period (late 1960's) of both availability of equipment (DOD declassification) and a high degree of awareness of a strong and urgent need (surveillance re. the increase in narcotics usage and in national unrest during the Vietnam wartime period).

With respect to users (except as otherwise noted), the analysis here presented is limited to users actually having low light equipment.

Number of producers:	Number of users interviewed:
a) Known - 15	18
b) Interviewed - 9 (11) (1)	

History

Low light equipment history must be traced from the development/usage of infra-red devices (active low light) for night viewing during W.W. II to DOD efforts to develop passive low light equipment during the Vietnam conflict, with subsequent declassification of passive low light by the DOD sometime in the late 1960's,(2) declassification thus occurring at a time when users had high awareness of night vision capability needs.

Producers interviewed(3) gave the following reasons for entering the L.E. low light market:

5 had a prior history regarding military night vision equipment

2 said they "saw a need"

3 noted potential market/sales considerations as the primary consideration (these did not have a prior history with the military)

Further, two producer companies had a person in their employment who had previously been with a large company which had begun work on low light equipment for L.E. but which had left the low light market.

(1) We interviewed two companies who produce night vision-related but not low light equipment.

(2) Manufacturers gave differing dates for the year of declassification.

(3) Additionally, equipment brochures were reviewed, including some of producers who were not interviewed.

Analysis of Producers

The nine low light companies interviewed are dissimilar as to size. The two night vision-related companies interviewed were also dissimilar as to size: one is large and one is tiny. (These two companies are not included in Table No.59).

Sales volumes of the nine low light companies interviewed ranged from $500,000 to $4,000,000. However, of the four large companies:

-- low light divisions ranged from tiny to medium size;

-- three had few or no low light sales (and have left/are leaving, the low light or L.E. market);

-- one finds the L.E. low light market attractive.

Thus company size does not correlate with a company's seeing either the L.E. market in general or the L.E. low light market in particular as being "attractive" or "not attractive". Indeed, only 3 of the low light manufacturers interviewed see the L.E. market in general as an "attractive" market. As would be expected, only these 3 manufacturers are willing to invest in L.E. R&D or have any plans for "general improvement" of their equipment.

With 3 exceptions, the main products of low light equipment producers are either (a) night vision equipment (including low light) or (b) low light-related equipment (CCTU, photography equipment, etc.). Of these 3 exceptions (all large companies).

-- the two which are neither low light/night vision nor L.E. oriented have decided to leave the L.E. and/or low light markets

-- the one which is L.E. oriented is a major seller of L.E. low light equipment

We can hypothesize:

A main product line related either to low light equipment or to the L.E. market is a prerequisite (but not a guarantee) for a successful marketing of low light equipment within the L.E. market.

Question:

Is this prerequisite common to:

- all L.E. equipment items?... or
- all medium technology L.E. equipment items?...or
- all L.E. equipment items with only periodic usage?...or
- all medium technology L.E. equipment items having only periodic usage?

TABLE 59 PRODUCERS OF LOW LIGHT EQUIPMENT

Companies	Company Size	Main Product	LE market is/is not attractive	LE market is/is not competitive	is/is not willing to do LE R&D	Future Plans	Available equipment is not used or inadequate
A	tiny	night vision	is	is	is	general improvement	N.D.
B	1 (division) 3 (company) tiny	night vision	is	is	is	general improvement	not used
F	tiny	LL-related	is not	is not	is not	may leave LE market	not used
C	small	night vision	is not	is not	is not	none	not used
D	small	LL-related	N.D.	N.D.	N.D.	N.D.	not used
G	large	L.E. equipment	is	is	is	general improvement	not used
E	small (large company) (tiny division)	not LL or LE related	is not	N.D.	not applicable	is out of LE market	not used
H	large	N.D.	is not	N.D.	is not	phase out LL	not used
I	medium (large company) (small division)	not LL or LE related	is not	N.D.	is not	is out of LL market	-------

All manufacturers (2 = N.R.) felt currently available low light equipment is adequate but is not being fully utilized in L.E. However, a number of users indicated inadequacy of equipment. Further, since potential usages of low light in L.E. appear not to have been fully explored yet, adequacy of currently available equipment cannot be completely determined at this time.

Analysis of Users

There is no interaction between acquisition of low light equipment and the user characteristics presented in this table. While all but two users did indicate sharing of equipment (N.D.), only three indicated such sharing as a factor in acquisition (via LEAA, or user as a repository).

Ways Used

The function of low light equipment is to increase surveillance capabilities under light conditions too low for observation and/or recording (camera, video). Additionally, it facilitates the covert aspect of surveillance (a camera/CCTV may be fixed and operated without personnel present; image magnification properties allow greater distance between officer and those being watched). When low light was first introduced (c. 1969), it was used primarily for two types of surveillance: (a) narcotic investigations and (b) surveillance of "radical" groups under either riot or non-riot conditions. As an illustration of the latter, one user rushed purchase of a fixed-type low light viewer to detect night-time snipers under conditions of national publicity.(1) Currently, main uses of low light are (a) narcotics investigations and (b) general investigative surveillance. The above usages are periodic (as cf. to portable transceivers, which are in continuous usage). Additionally, isolated cases were found of different and more continuous uses: helicopter traffic control; obtaining evidence in drunk driving cases.

The purpose of low light equipment usage is:

a) investigative
   1) observation
   2) identification
b) evidenciary
c) emergency

(1) The user indicated the national publicity was a major factor in the user's ability to obtain emergency appropriation for low light acquisition.

TABLE 60

USERS OF LOW LIGHT EQUIPMENT

Typology	# Sworn Officers	Budget (in millions)	Amt. spent in last year on innovative equipment	General budget condition	Joint purchasing	Sharing of Equipment
8	142	2.84	30,000 of 121,000 (federal)	Moderate	Yes	Yes
8	262	N.D.	N.D.	N.D.	N.D.	N.D.
7	319	4.0	28,000 of 350,000 (federal)	Thin	None	Yes
7	328	8.2	100,000	Austerity	Yes	Yes
7	381	6	Some	N.D.	N.D.	Yes
7	390	8	At least 35,000	Stable	None	Yes
7	505	8.5	Insignificant	N.D.	Yes	Yes (repository)
2	523	N.D.	Some	N.D.	None	Yes
9	640	14	None	Austerity	Yes	Yes- via LEAA
9	(943) (including civilians)	18	35,000 of 1.5 million (federal)	Austerity	N.D.	Yes- mutual aid pact
1	1,000	20	None; have in past	N.D.	Yes	Yes
9	(1,409) (including civilians)	16.2	None	N.D.	Yes	Yes
9	1,300	23 (20=salary)	None since 1970	N.D.	Regional via LEAA	Regional via LEAA
9	1,600	N.D.	(Did get low light)	N.D.	N.D.	N.D.
1	1,756	40	5 - 6000	Austerity	None	Yes
9	1,958	N.D.	Not sure	Low	No	Yes
9	N.D.	N.D.	N.D.	N.D.	N.D.	Yes- with personnel
9	7,200	150	More than 250,000 or federal grants	Low	No	Occasionally

Evidenciary usage (videotaping) was mentioned by only two users interviewed, while investigative usage was mentioned by all users. Only one study[1] of low light equipment noted emergency usage ("search and rescue plus disaster recovery under night-time operations".)

Illustrative Policy Options:

Determine potential usage of equipment other than general investigative, with particular attention regarding (a) continuous as. cf. periodic usage, and (b) trouble-related usage.

Issue: The Producer R,D&E Process

The context for the R,D&E process varied among producers according to following characteristics:

-- producer had contract with DOD;
-- producer manufactures night vision equipment;
-- producer manufactures L.E.-related equipment;
-- producer saw a potential need/market;
-- producer employed person who had previously worked for another (large) company after the latter had left the low light field.

As indicated in Table No. 59. only three of the producers interviewed are currently willing to do L.E. R&D, and these saw the state of art (SOA) as changing only moderately ("continuing improvement").

Of the nine producers commenting on the rate of change in technology regarding low light equipment:

-- 2 said no significant changes
-- 3 said continuing improvement of SOA
-- 1 said radically

Analysis of the above, along with analysis of producer brochures and the Newton P.D. study, would indicate that the SOA regarding current usage (as cf. potential usage) is changing slowing to moderately, i.e., general improvement of SOA.

Finally we may note that a lack of identified need/usage of low light equipment other than for general investigative surveillance (with a corresponding limiting of market potential) probably has a dampening effect on the extent of producer low light R,D&E.

(1) Quinn, William F., Chief of Police, Newton, Mass. "Study of Techniques for Using Night Vision Equipment."

Issue: Law Enforcement Markets

This study is concerned with whether the L.E. market is a primary or a subsidiary market for producers of L.E. equipment. With only two exceptions, the L.E. market is a subsidiary market for producers of L.E. low light equipment. That is, either:

1) low light is not a company's main product line; or

2) where low light is a company's main product line, the L.E. market is not the major market.

Six of the nine low light producers do not see the L.E. market as "attractive". Three of these "gave up" on the low light L.E. market (and thus the L.E. market in general). A fourth "may leave the L.E. market", even though its main product line is low light-related. A fifth has "no future plans" re. L.E. low light.

Of the four producers "giving up" in the L.E. low light market:

a) 3 noted lack of sales

b) 2 noted lack of capabilities for selling in the L.E. market (both large companies whose sales personnel/strategies are oriented to what they see as a "different type of market").

c) A producer whose main product is low light-related sees the L.E. market as too small.

d) One large producer noted that while they did make sales, the quantity X profit margin was miniscule in comparison to the company as a whole.

Users clearly indicated that cost is a major market constraint. Only two users purchased low light from their own budgets. One user which had neither local budget nor federal funds obtained low light equipment through trade-in of other equipment. A few users obtained surplus military low light at no cost, but they indicated dissatisfaction with the equipment. Thus, most users either purchased low light through federal grants or did not purchase low light. However, comparison with L.E. user purchases of other equipment of similar cost (e.g., portable transceivers) indicates that cost-effectiveness rather than cost alone may be the major consideration. That is, low light (in cf. to transceivers) has generally been used in limited, isolated ways, as cf. more varied and/or continuous usages. Nonetheless, relative low light cost has been a factor; i.e., producers of the relatively more expensive equipment reported problems in selling their equipment.

The L.E. low light equipment market initially developed under the simultaneous conditions in the late 1960's of

a) emerging availability of low light equipment, and

b) a period of national unrest, violence, and high drug usage, all of which seemed to heighten L.E. awareness of the need for improved surveillance capabilities under conditions of low light.

The current L.E. low light market differs from the initial market in at least the following respects:

a) The equipment is no longer completely "new" to L.E., though it may be to individual L.E. agencies.

b) There is not the context of as strong a degree of national unrest and violence -- and a major portion of current national unrest is Watergate-related; i.e., there is a developing "anti-surveillance" attitude.

c) According to one study(1), there is an increasing intentionality of larger users to acquire low light equipment -- but only as an initial, not as a supplemental, acquisition.

In both the initial and current L.E. low light marketing periods, usage is limited and periodic in nature.

We may conclude:

a) There will not likely be the influx of new producers that there was initially.

b) The L.E. low light market will continue to be a relatively small market unless more extensive and/or continuous usages are developed.

Illustrative Policy Options

1) Analyze cost-effectiveness of low light equipment in relation to potential usages.

2) Encourage cooperative purchasing/usage.

3) Develop regional equipment centers.

(1) Eldreth, Bunten, and Klaus, "LEAA Police Equipment Survey of 1972: Volume IV: Alarms, Security Equipment, Surveillance Equipment". Final report, July 1971 - October 1973. NBSIR 73-213.

Issue: Information Transfer

Of the functional specialists of user agencies having low light:

-- more indicated that they learned of low light through magazines and meetings (8) than from salesmen (2); but

-- when shown a list of low light producers, they indicated a familiarity with only one or two producers and a general unawareness of the remaining producers on the list; and

-- testing of low light equipment prior to purchase was generally limited to only one or two producers.

Further, users indicated equipment inadequacies (e.g., sudden light/bright light controls) while producer brochures and the Newton P.D. study indicated equipment adequacy. However, this contradiction may be due to different time-period perspectives; users buying early model equipment without problem-resolution controls and producer brochures reflecting later models of equipment.

Finally, a few users (technical specialists) indicated that they were aware of low light because of their experience in Vietnam.

Issue: Need Identification

Instances were found of both (a) users determining a need and searching for equipment and (b) users; awareness of equipment leading to identification of usage. The overall pattern is mixed. This is to be expected since, as had been noted, the availability of equipment and a strong increase in need occurred in the same historical time period (late 1960's).

Issue: Cooperation Between Users

As can be seen in Table No.60 , most low light users reported having shared their equipment with other users. In all instances, the lending user also sent along their own personnel to operate the equipment. Users noted: (a) a degree of training needed to operate low light effectively; and (b) concern over potential damage to equipment by untrained personnel. Two interviewees also felt that "people take better care of something that is theirs".

Illustrative Policy Options

1) Develop regional equipment centers.
2) Encourage cooperative purchase/usage.
3) Provide training in equipment usage.

Issue: Funding and Budgeting

Most users either bought low light through federal grants or did not obtain low light. There were isolated exceptions, the most notable being the obtaining at no cost of surplus military equipment -- with which users expressed dissatisfaction. As we have noted the constraint factor here may be cost-effectiveness rather than merely cost considerations.

No low light specific problems regarding funding/budgeting processes were noted.

Policy Implications

1) Determine potential usages of low light.
2) Encourage cooperative purchase/usage.
3) Establish regional equipment center.

Issue: The Equipment Acquisition Process

A. Only one user did not test low light prior to purchase and only one user lab tested low light. Contrarily, all but one user field tested low light. "Field testing" ranged from salesman-aided demonstrations (e.g., from an office window) to loan of equipment over a period of time to one (unusual, emergency purchase) testing of low light "under fire". The only pattern that emerged regarding testing methodology and criteria was an informal "when I try it, how much better can I see at night?" Thus testing methodology and criteria were highly individualistic. Further, as already noted, (a) perceived usage potential is generally limited to periodic surveillance functions, and (b) awareness of producers considered for testing is also limited. Thus, adequacy of testing methodology and criteria may be open to question, though we can probably assume a certain degree of "pragmatic" or "experiential" adequacy.

Policy Implications

1) Determine potential usages of low light equipment.
2) Develop guidelines for testing in relation to potential usages.
3) Provide consultant aid for testing.

B. Generally, users noted either that there were no specifications or that specifications were a general report on equipment and performance.

C. Other than three users noting that there was no bidding process involved, no low light specific characteristics of the bidding process were noted. However, one producer noted an instance where his company made a non-bid offer of $1,000, but when bidding was required made a $1,300 bid which was accepted as the low bid.

D. Generally, both top administrative personnel and functional specialists were actively involved in the acquisition process.

Issue: Installation, Utilization, Maintenance, and Assessment

Both producers and users generally indicated favorable reception of low light equipment. However producers and users had some differing opinions as to adequacy of equipment utilization and as to adequacy of the equipment itself.

Four producers stated that L.E. personnel lacked technical capability to use low light adequately, while only one producer felt there were no usage problems (of course, this leaves four producers who simply did not comment on adequacy of usage). Conversely, users said:

a) they had good results from usage; or

b) equipment usage does require training, but that this can be provided adequately; or

c) usage problems are associated with equipment inadequacy.

Additionally two users did indicate that use of borrowed equipment could result in mishandling of equipment.

The extent to which users do, in fact, lack technical capability for low light usage depends on which type of low light equipment is being considered. For simple surveillance (scopes), minimal training is needed. For photographic and CCTV equipment, more technical capability is needed -- and therefore probably more training.

Users did indicate perceived equipment problems both for military surplus low light (not adaptable for L.E. needs) and commercial products (a variety of isolated reports with no clear pattern except regarding (a) size and (b) problems regarding sudden increases and/or light level of light brightness, e.g. auto lights). Interestingly, producer brochures (and the Newton P.D. study regarding scopes) indicated that current equipment could and/or does resolve the problems mentioned by users. This difference of perception may be due to differing time contexts; i.e., user acquisition of first generation equipment and producer brochures reflecting second generation equipment.

Some of the desirable equipment capabilities/specifications which were mentioned were total darkness capability; day-night/bright light automatic adjustment; simultaneous audio-visual; small size and weight. With the exception of "total darkness" capability, desired equipment features appear to be either in existence or within producer capabilities to develop.

One user noted that legal constraints regarding evidenciary usage of low light have not yet been determined.

Favorable user reaction plus clear user awareness of need regarding narcotic investigations and surveillance under conditions of unrest would indicate there is not a significant "resistance to change" factor in low light acquisition and utilization.

Both producers and users indicated that maintenance is limited to batteries, taking care of lens, and keeping a camera in adjustment.

Evaluation by users of low light equipment is (a) generally limited to one or two producers prior to acquisition and (b) informal regarding actual utilization.

Illustrative Policy Options

Develop vehicles for (a) evaluating product capabilities; (b) disseminating information to users re. product capabilities; (c) disseminating information to producers regarding product capability needs; (d) providing user training as needed.

Bibliography

Aerospace Corporation, "Equipment Systems Improvement Program-Development," prepared by LEAA, LE Development Group, Contract No. F04701-72-C-0073, 30 March, 1973.

Eldreth, J.L., E.D. Bunten, and P.A. Klaus, "LEAA Equipment Survey of 1972: Volume IV: Adamss, Security Equipment, Surveillance Equipment." Technical Analysis Division, Institute for Applied Technology, National Bureau of Standards, Final Report, July 1971-October, 1973.

I.A.C.P., The Police Weapons Center Data Service - Bulletin.

Vol. LXXII, No. 4, Oct., 1972.
Vol. LXXII, No. 9, March, 1973.
Vol. LXXIII, No. 1, July, 1973.
Vol. LXXIV, No. 8, Feb., 1974

Law and Order, May, 1974 Law Enforcement Standards Laboratory, "Security Systems", Semi-Annual Report, Sept., 1972.

Law Enforcement Standards Program, "Simplified Procedures for Evaluating the Image Quality of Objective Lenses for Night Vision Devices," LESP-RPT-0304.00, Nov., 1973.

_____, "Survey of Image Quality Criteria for Passive Night Vision Devices," LESP-RPT-0301.00, Time, 1973.

_____, "Test Procedures for Night Vision Devices," LESP-RPT-0302.00, May, 1973.

National Technical Information Service, U.S. Department of Commerce, "Riot Control: Analysis and Catalog, "Final Report," Technical Report No. 60-14.

Police Research Bulletin, published by Home Office, Police Research and Planning Branch.

No. 1, Jan., 1967, "Night Vision for Police Use."
No. 5, Jan., 1968, "Binoculars"
No. 7, July, 1968, "Television-2"
No. 14, April, 1970, "Aids to Surveillance"
No. 22, Jan., 1968, "Binoculars".

Quinn, William F., Chief of Police, Newton, Mass., "Study of Techniques for Using Night Vision Equipment," Grant Aware No. NI70-065-PG-5.

Equipment Item Analysis

4. Non-Lethal Weapons

Introduction

The category of non-lethal weapons was included in the study because it was felt that it would be useful to investigate the development and diffusion of an innovation of relatively (in this case medium) low technology which had to be developed "from scratch," i.e. there was no readily-transferrable technology from another sector. It also seemed to represent an equipment type for which the need was formulated not internally by the user (L.E. agency) but externally by the public.

The planned concentration was on non-lethal weapons, excluding the chemical and/or gas type devices. In the process of the study, it became apparent that both users and producers found this to be both a difficult and artificial distinction The interviews proceeded on the basis of the original distinction, but respondents persistently commented on both the chemical and the non-chemical types of devices. The analysis has tried to accomodate this situation by distinguishing between the adoption status of the two types of non-lethal weapons.

The label "non-lethal" has been amended in some cases to "less-than-lethal," apparently in response to some instances of fatalities resulting from their use. It is unclear what distinction is intended since less-than-lethal, in fact, implies non-lethal. In the interest of parsimonious consistency, the label "non-lethal" is used here.

History

Demand for the use of non-lethal weapons developed during the period of civil disturbances in the late 1960's. In general, the demand was formulated and expressed external to the L.E. agencies, mostly in public criticisms of actual or potential L.E. agency use of excessive force in handling public disturbances. In reaction to this publicly expressed need, several devices were conceptualized and/or developed.

This category of newly-developed devices included tranquilizer dart guns, bean-bag projectiles, dye-maker guns, soft pellet or projectiles guns, and electric shockers.

L.E. agencies considered the newly-developed devices to be in a non-lethal category of weapons which already included batons, billy clubs, and chemical agents. Therefore, as perceived by users, the newly-developed devices did not comprise a new category of weapons but rather new entries into an already established category of weapons.

The development of non-lethal weapons has proceeded along three fairly distinct lines of technology; kinetic or impact type devices, chemical type devices and electrical type devices. There are also a few devices utilizing miscellaneous technologies such as hyperdermic darts, water cannons, and net or cocoon devices.

The area of non-lethal weaponry is also becoming more discriminating between weapons intended for control of crowds and those intended for control of individuals. Clearly, certain devices have application in only one of these two areas. For example, hyperdermic darts are intended for use against individuals. On the other hand, chemical agents are being applied in both areas, the distinction being made in the type of delivery system used. The gas cannister or pepperfog machine is appropriate for crowd control which the chemical propellant cannister is appropriate for use against individuals.

As analysis will substantiate, there has not developed within L.E. agencies an overwhelming demand for non-lethal weapons. This view is generally supported by the low level of need for standards for non-lethal weapons expressed by police departments in the LEAA Police Equipment Survey of 1972.[1] Many departments felt the items did not apply to them and only two percent of the departments indicated a

(1) LEAA Police Equipment Survey of 1972, Vol I: The Need for Standards--Priorities for Police Equipment, prepared for NILECJ, LEAA, by National Bureau of Standards, Technical Analysis Division July, 1973, pp. 41-44.

high priority for needs for standards. This in spite of the rapid development and introduction of some very novel products.

The decline of civil disturbances has minimized the publicly expressed need for non-lethal crowd control devices. There still remains some public expression of a need for individual control devices in cases of apprehension or in penal institutions. But this need has not been forcefully articulated by the user agencies.

Analysis of Producers

The characteristics of producers shown in Table (61) provide for some interesting comparisons, particularly regarding the following:

- reputation in L.E.
- opportunity identification process
- attractiveness of L.E. as a market
- competitiveness of L.E. as a market
- plans for this product

There is a dichotomy of companies in terms of their reputation and experience in L.E. - three companies are new and three are well established in the L.E. market. This dichotomy, which holds fairly well across the other pertinent characteristics, is used as the basis for the following analyses.

Companies well established in the L.E. market indicated a cautious process of opportunity identification, i.e., the market is researched to confirm a suspected opportunity. Companies new to the L.E. market entered the market either on impulse (no market research) or in response to a request from L.E. It should also be noted that the three new companies in L.E. are already established in non L.E. market areas, so they are not unfamiliar with marketing processes in general.

Well established companies identified the L.E. market as both attractive and competitive. New companies found the market unattractive and non-competitive with one exception (one company found the market attractive but non-competitive).

Well established companies mostly plan to continue to develop and market the product. (one such company has discontinued production of

Table 61 Producers of Non-Lethal Weapons

Size	Main Market	Reputation in L.E.	Opportunity ID Process	L.E. Mrkt Attractive?	L.E. Mrkt Competitive?	Avail Equip. Not Used or Inadequate	Willing to Do L.E. R/D	Plans for This Product?
T	Non L.E.	New	Presumed Used	Yes	No	Inadequate	Yes	Raise $ More R/D
S	Non L.E.	New	L.E. Prod	No	No	Not Used	No	Have Left L.E.
T	Non L.E.	New	Presumed Used	No	No	Not Used	No	Phase out L.E. Activity
L	L.E. Related	Old	Market Researched	Yes	Very	Uncertain	Yes in General	Phase out Product
L	L.E. Related	Old	Market Researched	Yes	Very	NR	Yes in General	More R/D +Mrkt Penetrating
S	L.E. Related	Old	Market Researched	Yes	Very	Neither Both Adequate and used	Yes-but not always able ($)	More develop. of Product and Market

the product). New companies have either already left the market or are just now getting into it.

Two general conclusions can be derived. First, companies new to the L.E. market have a decidedly different impression of the market than do well established companies. Since each of these companies have experience in other market areas, it can be construed to mean that L.E. is, indeed, a specialized market area. Analysis of Table (61)does not permit explication of this specialization but the conclusion leads to the implication that companies entering the L.E. market can expect to encounter circumstances they had not anticipated.

Second, there is a relationship between the type of product produced and plans for the product. In each case of discontinuation of the product, the product was an adaptation of a lethal weapon, i.e., a "non-lethal" projectile for either a shot gun or hand gun. It isn't clearly established that the type of product is casually related to learning the market, but there is reason to suspect that more intensive market research would have predicted the lack of acceptance of these products by L.E. agencies.

Policy Implications

As mentioned above, there is reason to suspect that companies with experience in other markets will encounter anticipated circumstances when entering the L.E. market. This implication is of particular interest in discussing the one new company (Table 61) that finds the L.E. market attractive and not competitive and plans to continue R&D and fund raising. This company can be considered to be so new to the market that it has not yet encountered the ideosyncracies of the market which drove the other two new companies out. For NILECJ, it is important to note that this company plans more product research, not market research. In order to reduce the probability that this company will also eventually leave the market it would seem helpful for NILECJ (or a similar agency) to be able to help the company identify for itself (and others attracted to the market) the idiosyncracies of the L.E. market so that market strategies can be planned appropriately.

The second implication for intervention in the market, using this same company as an example, is at the point of financing R&D. This particular company (for example) has sufficient entrepreneural enthusiasm to be willing to continue product research but lacks the financial resources. It would seem adviseable for NILECJ to intervene by assisting such an entrepreneur to identify sources of financing (SBA?) rather than by appropriating the product idea and directly funding product research in a government laboratory. The element of entrepreneurship, vitally important for bringing an innovation into the market, should be encouraged and reserved, not diluted or discouraged.

Analysis of Users

The L.E. agencies included in the following analyses are those that supplied responses to interviewers' questions regarding non-lethal weapons. The classification of non-lethal weapons was intended to exclude chemical agents or tear gas, but it became obvious that many users had difficulty making the distinction. Many user responses contained comments about chemical agents and/or tear gas so the analyses include comments, but in a separate context, i.e., there are two classifications of users' adoption status of non-lethal weapons - adoption of chemical or gas only, and adoption in general (including weapons other than chemical or gas).

Twenty four L.E. agencies are included in the analyses, distributed across the user typology as follows:

# 1	State Police	5
# 2	Sheriff Departments	1
#7-8	City Police Departments	7
# 9	Largest City Police Department	8
# 12	Prisons	3

Two #14 agencies (private agencies) are excluded from the analysis because the characteristics used in the analysis have different connotations and implications in private organizations.

Analyses were attempted to find characteristics common to user agencies with different classifications of involvement with non-lethal weapons referred to as "user adoptive status." User adoptive status" includes the

Table 62

User Adoption Status - Importance of Innovative Equipment

Importance of Innovative Equip	Rejected	Not Considered	Adopted	Adopted Chemical Only	Total
Very Important	1		1		2
Discriminating (import. some areas)	2	2	4	5	13
Not very Import.	1		1	1	3
NR Uncertain	2	1		3	6
Totals	6	3	6	9	24

Table 63

User Adoption Status - Internal Evaluation Capability

Internal Evaluation Capability	Rejected	Not Considered	Adopted	Adopted Chemical Only	Total
Separate Function	2	2	2	1	7
Staff Expertise	3			2	5
Little or None	1	1	1	6	9
NR			3		3
Totals	6	3	6	9	24

following classifications of user agency involvement with non-lethal weapons:

a. Rejected

b. Presently considering

c. Did not consider

d. Adopted - including other than chemical or tear gas

e. Adopted - chemical or tear gas only

The following agency characteristics were found not to be related to user adoptive status:

a) Amount spent on innovative equipment last year

b) General budget conditions

c) Use of external funds

Analysis yields potentially important conclusions when user adoptive status is compared to agency's reported importance of innovative equipment to L.E. and agency's capability for internal evaluation of innovative equipment use.

Table (62) shows the relationships between user adoptive status and reported importance of innovative equipment to L.E. First it is important to realize that of the 24 users included in the analysis, 13 were discriminating in reporting the importance of innovative equipment, i.e., the responses clearly indicated that innovative equipment was important in L.E. only in specific functions or at specific levels. A feeling of general importance was reported only by two users. It is next important to realize that of the 13 discriminating users, nine adopted non-lethal weapons of some nature (five adopted chemical and/or gas only, four adopted other types of non-lethal as well). A tentative conclusion could be drawn indicating that those agencies that have a discriminant opinion of the importance of innovative equipment consider some type of non-lethal capability to be important. However, the same discriminating agencies appear not to regard other than chemical or gas non-lethal devices as worthy of adoption- only four of the 13 agencies reported adoption of such devices. In fact, only six of the 24 reporting agencies reported adopting such devices, and the six does not include police departments of any metropolitan areas but rather includes three State Police agencies,

one Sheriff's Department, and two prisons. On the other hand, the 15 agencies rejecting non-chemical or gas devices, (six "rejected," nine "adopted chemical only") includes five city and seven largest city Police Departments. It should not be inferred from this that an agency reporting a discriminating opinion of the importance of innovative equipment also has the internal capability for equipment evaluation. That characteristic of user agencies is shown in Table (63) and is discussed below.

Table (63) shows the relationship between user adoption status and internal evaluation capability. Internal evaluation capability refers to the reported source of technical expertise within the user agency used for technical evaluation of innovative equipment. In general, two such sources were reported; the individual expertise of staff or department personnel, or a separate functional unit, usually referred to as Planning and Research or some variant. It should be pointed out the existence of such a separate functional unit does not imply that the technical evaluation was performed by such a unit. There were many instances where such a separate unit existed but the reports indicated clearly that equipment evaluation was not included in the activities of the unit. As used in Table(63), "Separate Function" reflects that the response clearly indicated that a separate function existed and technically evaluated innovative equipment.

Referring to Table(63), it can be seen that only 12 of the 24 agencies being analyzed here reported any internal capability for technical evaluation, seven relying on a separate function and five relying on staff expertise. Further, it can be seen that, of the 15 agencies reporting adoption of some kind of non-lethal device (last two columns), only five reported any internal capability for technical evaluation. Apparently, non-lethal devices are perceived as being of sufficiently low technology not to require technical expertise for evaluation. However, if that premise is sound, then an increase in technical evaluation capability should result in an even more definite adoption status. If the usefulness, effectiveness, etc. of non-lethal devices are obvious to agencies without internal evaluation capability, then greater capability should result in an even more definite trend

toward adoption or rejection. Such is not the case, however. Those agencies reporting a separate function for evaluation also show an almost even distribution across the adoption status scale. Does this indicate that evaluation capability can determine more reasons for adoption or rejection than are felt by other agencies, thus making the issue more ambivalent? Or does it raise a question as to whether a separate function is really a more advanced capability for evaluation, as is presumed here?

If the latter question can be legitimately raised, then the form and substance of internal evaluation capability in L.E. agencies should be studied.

Implications

There do not seem to be any major implications arising from conclusions regarding user characteristics and their adoption status of non-lethal devices.

An implication of some lesser importance may derive from the findings that only agencies other than metropolitan police departments reported adopting non-chemical non-lethal devices. Does this indicate that these other agencies (State Police, Sheriff's Dept. and Prisons), in fact, have a distinctly different requirement for such devices? Or does it indicate that these agencies are more susceptible to "gimmickery" in their equipment area?

Another implication concerns the apparent rejection of non-chemical non-lethal devices by L.E. agencies in general. If, in fact, the devices are as ineffective, unreliable, and unnecessary as the agencies reported, then the agencies must be given credit for being discriminating customers, even though non-lethal devices do not require extensive internal capability for evaluation. One could hopefully conclude that the agencies want to be discriminating and would be for other types of equipment if the necessary internal evaluation capability was provided.

Bibliography

Additional Projects Fiscal Year 1974, Report No. ATR-74 (7901)-2, prepared for NILECJ, LEAA by The Aerospace Corporation, Law Enforcement Development Group, August, 1973.

Annual Progress Report Fiscal Year 1974, Report No. ATR-75(7903)-1, prepared for NILECJ, LEAA by the the Aerospace Corporation, Law Enforcement Development Group, August, 1974

Candidate Equipment Projects Fiscal Year 1974, Report No. TOR-0073(3640)-3, prepared for NILECJ, LEAA by the Aerospace Corporation, Law Enforcement Development Group, March, 1973.

Crockett, Thompson, Police Chemical Agents Manual, Washington, D.C.: International Association of Chiefs of Police, 1969.

LEAA Police Equipment Survey of 1972, Vol. I: The Need For Standards . . . Priorities for Police Equipment, prepared for NILECJ, LEAA by National Bureau of Standards, Technical Analysis Division, July, 1973

Samuals, David, Donald Egner, Donald Campbell, Riot Control: Analysis and Control, Technical Report No. 69-14, National Technical Information Service, Springfield, Va., October, 1969.

Equipment Item Analysis

5. Portable Transceivers

Introduction

The portable transceiver has become a fairly common item in the communications networks of the modern police department. These transceivers are designed with their own power supplies and antennas for completely independent operation. The size and weight is such that it can be carried by field personnel and provide him with a link to the rest of the force.

The portable transceiver is vital in coordinating the efforts of police and providing assurance to the lone patrolman or a policeman away from his car.

Different combinations of speaker and microphone placement exist within portable transceivers. Sometimes they are both contained in the unit's case while other times an earphone device is employed. Recently attachments have been developed where the microphone and speaker are in the helmet of the officer thus allowing for hands-free operation. All of these variations are considered portable transceivers in the context of this report.

Included in this report is the analysis of eighteen producer interviews. A total of twenty-two producers of portable transceivers were known. Thirty-three users of portable transceivers were interviewed and the analysis of this data is also contained within the report.

History

The history of portable transceivers may be traced back to the field portable communication equipment of World War II (and, if desired, further back into the total history of radio communication). While the World War II equipment technically met the basic requirement of portability, it was quite large and heavy -- i.e., it was not truly "hand-held". Thus, in the 1950's & 1960's, truly "hand-held" equipment was developed with the introduction of printed circuits, transistors, and miracle plastics.

The total history of transceiver development is too complex for detailed review here. However, we may note:

1 - Early models, the "hand-held" were relatively large and cumbersome and consisted of two separate units for receiving and transmitting.

2 - Basic considerations in transceiver development have been: need/market, size, weight, performance, power, power source, usage requirements (i.e., hand-held/headset; antennae; cords), inter-connection with other communication systems (i.e., mobile repeaters), and, of course, related R&D.

Analysis of Producers

Size of producers:

Tiny - 3
Small - 8
Medium - 2
Large - 5

As can be seen from Table no. 64, the size of producer does not correlate with:

-- L.E. or L.E.+ market orientation (all but 3 are L.E.+)
-- type of main product (eleven are communication or communication related products)
-- perceptions reported by producers that the L.E. market is competitive (11 said "very"; 1 said "yes"; only 1 said "no")
-- future plans (although one firm leaving the L.E. market is large and the "growth plans" for the large producers are minimal relative to the company as a whole)

Contrarily, with respect to market and R&D considerations, there are some strong size correlations.

1. Perception of L.E. market attractiveness:
   -- large producers: 4 said "no"; only 1 said "yes"
   -- tiny to medium producers: only 2 said "no"
2. Producer willingness to invest in L.E. R&D:
   -- large producers: 3 said"no" or hesitant, and 2 gave unclear or uncertain answers

Table 64 Producers of Portable Transceivers

Producer Size	L.E. or L.E.+	Main Product	L.E. Market Is/Is Not Attractive	Competitive	Producer Is/Is Not Willing to Invest in L.E. R. & D.	Future Plans
Tiny	L.E.	Communication (transceiver)	Yes	Very	Very	Add Public Market
Tiny	L.E.+	Communication (attachments)	Yes	Very	Yes--if had funds	Improve
Small	L.E.+	Communication (transceiver)	Yes	Very	Not Do R. & D.	Improve
Small	L.E.+	Transceiver Related	Yes	N.D.	Yes--as is feasible	Develop/Test
Small	L.E.+	Indirectly Related	No	No	Not at all	Growth
Tiny	L.E.	Communication	Yes	Very	Lack Capability	Improve
Small	L.E.+	Communication	Hope so	Very	Hard to Separate	Growth
Medium	L.E.+	N.D.	N.D.	N.D.	No	N.D.
Medium	L.E.+	Electronics	Very	Very	No	Growth
Small	L.E.+	Communication	Very	Very	No	Growth
Small	No L.E.	Electronics and Communication	Do Not Know	Very	Not at all	Public Market Only
Small	L.E.+	Public Safety Products	Yes	Very	As Needed	Growth
Large	L.E.+	N.D.	No	N.D.	No	Leave L.E. Market
Large	L.E.+	Communication	Yes	Very	Hard to Answer	Improve
Large	L.E.+	Communication	No	Very	Answer Unclear	N.D.
Large	L.E.+	Communication Related	No	Yes	No	Growth, Cut Costs
Large	L.E.+	Electronics	No	N.D.	Hesitant.	Growth
Small	L.E.+	Electronics	No	N.D.	No	Leave L.E. Market

-- medium producers: 2 said "no".

-- small and tiny producers: mixed responses plus noting low level of capabilities.

Future plans of most producers (10) consisted of improving sales ("growth") or modest product improvement. Only one producer specifically mentioned developing/testing products.

The most striking findings are:

(1) Most producers (15) are L.E. & other markets, and main products are primarily communications-related (11).

(2) Nearly all describe the L.E. market as competitive (12).

(3) There is an inverse correlation between producer size and willingness to invest in R&D.

(4) Size correlates only with L.E. R&D willingness and with perceptions of L.E. market attractiveness; but

(5) size only partially correlates with future plans.

(6) Only one producer indicated new product development.

It should be recognized that point (2) above represents the perceptions of the companies in the market as they report them. Some external observers and some users have described this market as being non competitive, due to the large share of the market held by one (or two) of the market leaders would indeed be subject to considerable competitive pressure and the leaders would be unlikely to report a non-competitive situation. Thus the finding holds - that from the perspective of most producers - they find the market competitive, and act in accordance.

Analysis of Users

The number of users interviewed by our typology was:

Typology Number	No. of Users Interviewed
1	6
2	1
7	7
8	3
9	13
12	2
13	1

Product Use

Portable transceivers are used to enable officers on the force to have the capability of communicating with each other officer as often as required, i.e. even when he is away from his car. The portable transceiver makes the officer more mobile and thus more effective. Attachments allowing hands-free operation are especially useful in large crowd or riot situations, for policemen on motorcycles, and in undercover operations. The use to which a police department puts its portable transceivers depends a great deal on the number they have. If they have enough for their entire force then the uses first described are applicable. If the department has only a few transceivers then they are usually used for special situations such as a small undercover operation or security for a visiting dignitary. A considerable number of users are between having just a few units and having enough units for the entire force. These forces are usually in the building stage with regard to their number of portable transceivers and are hoping to make the transceiver a vital part of their overall communication system in the near future. In these cases the units are usually used just for those officers on foot patrol or for special large crowd or riot situations. Within the departments the largest users are the patrol divisions, or for special situations it is the tactical squad. Transceivers are also used outside of police departments in law enforcement. Customs officers use their units for communication between officers and to their supervisors. In prisons the portables are used to locate and communicate with guards in an emergency such as an inmate riot.

A number of producers and users alike felt that the quality of usage was not what it could be in many instances and that the primary reason for this was a lack of personnel training. It is felt that the policemen are not informed of the functions the transceiver is to serve and how it is to fit into the overall system. More importantly they are not clear on how the introduction of the new device affects them, and more specifically their job, its functions and responsibilities. Policemen are often unaware of the specific benefits the change is supposed to bring about. Also, information concerning the limitations of the product and its use in different environments is not effectively communi-

cated to the individual user. The quality of usage is also hurt due to the usually long time span between the first purchases and the last which leads to a problem or compatability to existing equipment with the varied portable transceivers.

Users and producers seem to be in agreement for the most part on the requirements for portable transceivers but these requirements are usually quite vague and lack specificity. The portable transceiver should have a reasonable price, good maintainability (modular circuits help here), reliability, durability, fairly small and light, reliable and efficient power source, and high performance (range, quality of sound, etc.). Very few specifics were mentioned, however the weight requirement was quantified generally to around 20-26 ounces. Earlier in this section use of portable transceivers in prisons was mentioned and this requires some additional factors. When actuated, the device would provide for rapid location identification. The transceivers should be easy to actuate when needed in stressful situations and should also have zero false alarms. (For more information on this system and its reguirements[1]). The products currently on the market meet each of these requirements in a limited sense, some products satisfy the requirements more than others. No product currently being sold meets all these requirements to the degree which the users would like though steps are being taken in the right direction.

A picture of who the users of portable transceivers are and how they breakdown can be given by referring to a survey done by the LEAA in 1972[2].

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(1) Emergency Communications Within a Correctional Institution; A.S. Distler, M.J. Spahn; October 22, 1973.

(2) LEAA Police Equipment Survey of 1972; Vol. II: Communications Equipment and Supplies; National Bureau of Standards; July 1973.

In one section of that study a breakdown is given of the departments which used portable transceivers within their survey. The table follows below:

Department Type:	Departments Using Portable Radio % Dept. Type
50 largest	100
State	100
City (50+) (officers)	99
City (10-49)	90
Township	70
County	62
City (1-9)	53
All Departments	81

As would be expected portable transceiver use is dominated by larger users. Data from the interviews supported this and reasons mentioned to explain this included the greater need and funds in the larger departments; but the reason mentioned most often and given the most weight was the greater expertise which the larger departments had and thus the greater amount of successful acquisition and utilization.

There isn't very much data on replacement of portable transceivers. For the data collected it seems seven years is a reasonable replacement date. This figure is difficult to be sure of since most police departments bought their transceivers between two and four years ago. Replacement of parts is a more important issue presently. Some users said that the greater availability of replacement parts by the larger manufacturers

was a major reason in deciding to purchase from them as opposed to the smaller manufacturers.

Policy Implications

Provide funds or loans to smaller users to enable them to purchase portable transceivers.

Set up regional centers where law enforcement agencies could borrow experts to aid them in systems design and implementation.

Provide assistance to law enforcement agencies to add personnel knowledgeable on equipment.

Provide training on equipment selection and utilization.

Product Market

Portable transceivers are not unique to law enforcement. Other markets which utilize these products are: utilities, common carriers, businesses, taxi-cabs, service men, pick-up and delivery services and fire departments. The law enforcement market is very important to the sales of portable transceivers. Whether the law enforcement market for portable transceivers is important to the company depends upon that company's product and market emphasis. There is also disagreement between firms whether it is economical to sell transceivers only to the law enforcement market but the majority seem to feel that without the other markets they would not continue producing portable transceivers.

The market while divided between 22 producers is dominated by several large firms, and most particularly one has a very important share of the market. Considerable differences of opinion were encountered as to the consequences of market distribution. Many users and others involved in law enforcement are of the opinion that a near monopoly situation exists, that products are over-priced and are of less than possible quality and performance (i.e., size, power, etc.) than is possible given the state of the art in electronics. Others, including many users, believe that they are receiving excellent service, good products and fair prices. It is clear that one of the important factors

contributing to the success of the leading producer is the very extensive sales and service network which they have established across the country. This gives them a significant competitive edge and provides an important service that at least in part compensates for the in-house technical capability weakness to be found in many L.E. agencies. Others see in this an unnecessary and expensive addition to required cost of sales and distribution, a cost to be born by the user. This has lead some to recommend programs aimed at stimulating and actually creating more big company competition for the leader. This has included specifice funding of R&D aimed at producing a new, state of the art, transceiver.

Policy Implications

At present there is too much disagreement as to what is going on in this market place and what are the costs and benefits being derived, for firm policy directions to be set - despite present federal attempts to do just that. Specific study of this market must be undertaken - beyond that possible in this study. Some tentative implications are:

1. There is a need to increase user capability and power in the market place - through cooperative purchase mechanisms.
2. If constraint of trade exists to the detriment of users (and this is not yet established and may not exist) then direct legal actions should be considered.
3. Efforts to stimulate competition, if undertaken, should recognize the existence of a number of smaller producers in the field who might have a useful role to play - especially at the commercialization stage.

Changes in State of the Art

When this product was first introduced it was quite bulky and inefficient, as indicated in the history section, and then with the advent of solid state engineering the modern development of the portable transceiver began. The following is a list of some of the changes that have taken place: Battery chargers in cars so the transceiver can do double

duty; Increased miniturization for better handling and storing on belt; Heavy duty and waterlight models; More powerful units (increased range); Multi-channel selection capability; Mobile repeater so an officer can get out of his car and still contact the base station; Scrambler feature; Personnel locator which determines the officers location for the base station upon activation by the officer (refer to product use section concerning prisons); Bone conduction microphones making possible devices for hands - free operation such as in a helmet. The dates on many of these changes can only be given within a range. Most of the changes first mentioned occured in the early 1960's while the repeater, scrambler, and personnel locator features have occured more recently. The hands-free devices were started in the middle 60's and the transceiver completely contained within the helmet is still in the prototype stage. User and producers have different views on the rate of change in the state of the art but their general view is that it is changing at a fairly fast pace.

The federally funded transceiver R&D program was aimed at producing a state of the art jump - in terms of the size/weight/power/price dimensions. While a transceiver has been developed the degree to which this does indeed represent such a shift is far from clear or established. Significant problems of commercialization of this product also remain to be solved.

Policy Implications

Continue to fund R&D projects in portable transceivers. Specific goals for that research preferably contributed to by the relevant users will be required.

Issue: Acquisition

Nearly all the producers interviewed indicated that they cooperated with users in the testing of their product. Testing by users was mostly informal field testing with few users doing any lab tests.

A major problem brought up by both users and producers was the users ability to write up specifications. There seem to be many experiences of departments writing specifications but since they didn't have

any real level of expertise they didn't get what they actually wanted and their communications system suffered. It seems that the state of the art in communications technology has surpassed the capabilities of many police departments such that they can no longer effectively design their communications system. It's not always a problem of a lack of expertise, but rather a failure to involve the proper people in the department with the acquisition decision. Thus they may have the expertise but fail to utilize it. Several users mentioned the importance of involving as many people as they could in the acquisition process of those that are buying, using, or maintaining the equipment and they feel this has contributed to the success of their decisions. In the area of specifications, several producers commented on the need for generic specifications. Users often write their specifications in terms of another company's product and this means that firms must research that company's product and this is especially difficult for the smaller producer.

The biggest and most controversial question is that of standards. There seems to be no pattern to those who favor federal standards and those who do not. Those who favor standards feel that it would make it easier on the producer through less customizing to users orders, it would reduce product costs by increasing economies of scale, it would help competition by allowing more input from the smaller and foreign firms, and increase the decision effectiveness of the user. Those on the other side believe that standardization is impractical, it won't result in economies of scale, the standards won't effectively represent what the users need, i.e., the standards will have insufficient user input, the standards will lead to an inferior product, and the introduction of industry-wide standards will restrict innovation. If standards are adopted the feeling is that they should be written so that they can be understood and utilized by all the users. And beyond standards, guidelines must be established to help users choose the most appropriate transceiver for a particular user in a particular situation (urban, rural, climate, etc.). Various standards seem to be used for testing

quite a bit. Standards mentioned were those of: the F.C.C. (Federal Communications Commission), the E.I.A. (Electronics Industries Association), APCO (Associated Public Safety Communications Officers), and U.L. (Underwriter's Laboratory).

The lack of a central depository for information on what is available and test results was brought up by several users and producers. The need for such a central source of trustworthy information is especially important in this product area due to its technical complexity and the apparent lack of expertise shown by the users.

There seems to be quite a bit of domination in this product area. Most users look only at what the "big three" offer and feel the rest of the firms are inferior or fly by night operations. Marketing as we noted seems to play an important role in this dominance among other things. The large sales forces and varied outlets were mentioned several times as considerations in the acquisition process.

One last point in this section is the use of leasing or lease-purchase arrangements. A couple of users have gone this route and it has proven quite successful. They are able to obtain a large number of portable transceivers quickly and thus have an effective communications system within a relatively short period of time. That this method is not used more often, especially in smaller users, is surprising.

Policy Implications

Provide training to users to increase their knowledge on technically complex pieces of equipment.

Set up regional equipment centers where law enforcement agencies can borrow equipment and more important, expertise.

Create product standards at user's level of understanding.

Create a National Clearinghouse for information.

Provide information on the availability of leasing and lease-purchase arrangements.

Issue: Funding and Budgeting

Approximately one-fourth of the users interviewed received some LEAA funds for their purchase of portable transceivers. A few of the producers received LEAA funds for portable transceiver R&D. The effect

of LEAA monies has a mixed reaction. Some producers feel it attracted firms into the industry which later failed and thus caused an inefficient use of resources. Other producers felt the funds were misguided and were not given to those with the proper expertise (the producers saying this did not get any funds from LEAA). The positive comments were that LEAA funds did lead to greater and faster development and more innovation. One last interesting set of comments on LEAA funding said that the LEAA gives money for product development but doesn't always accurately anticipate user needs. Industry on the other hand does product development to make a profit and thus for them to go ahead with a product the need must definitely be present. LEAA money tends to force development where it may not be appropriate. Rather than providing funds for general, unspecified development, LEAA should wait and let firms find the areas that need development and then enter in with their funds to speed and facilitate the development.

Policy Implications

Be more selective and goal oriented (user's goals) in the allocation of funds for R&D.

Issue: Information Transfer

Information transfer between users tends to be very informal and area oriented. This communication does not seem sufficient to provide useful information on product experiences and test results. Communication between producers and users isn't strong yet an example of some effective communication is the development of the hands-free transceivers which was a need communicated by users. Many producers felt that being known and having a large sales force and a large advertising campaign were vitally important for a large share of the market. Producer's marketing effort was discussed in the acquisition section.

Policy Implications

Create a National Clearinghouse for information.

Promote the flow of information from users to producers.

Bibliography

Literature From the Files Dealing at Least in Part with Portable Transceivers

British Police Research Bulletin, No. 5, January 1968.

LEAA Police Equipment Survey of 1972; Volume II: Communications Equipment and Supplies; National Bureau of Standards; July 1973.

Law and Order, Vol. 22, No. 9, September 1974.

Law and Order, Vol. 22, No. 2, February 1974.

Law and Order, Vol. 22, No. 3, March 1974.

Police Chief, Vol. 41, No. 6, June 1974.

Police Chief, Vol. 41, No. 5, May 1974.

Police Chief, Vol. 41, No. 4, April 1974.

Communications, February 1974.

Riot Control: Analysis and Catalog; National Technical Information Service; David W. Samuels, et.al.; October 1969.

Law Enforcement Standards Laboratory Projects Proposed for Fiscal Year 1974; May 2, 1973.

Annual Progress Report - Fiscal Year 1973 Equipment Systems Improvement Program; Law Enforcement Development Group; The Aerospace Corporation; July 1973.

Law Enforcement Standards Laboratory Progress Report for January 1973; National Bureau of Standards

Law Enforcement Standards Laboratory Semi-Annual Report -- September 1972; National Bureau of Standards.

Equipment Systems Improvement Division Standards and Guidelines Program; Progress Report of the Law Enforcement Standards Laboratory; National Bureau of Standards; May 1974.

Equipment Systems Improvement Division Standards and Guidelines Program; Progress Report of the Law Enforcement Standards Laboratory; National Bureau of Standards; June 1974.

A Study of the Tactical Communications System of the Rochester Police Bureau, Rochester, New York; Final Report Phase 1; August 1969.

Law Enforcement Standards Program Projuct Plans for Fiscal Year 1973 of the Law Enforcement Standards Laboratory; National Bureau of Standards; December 1972.

Annual Progress Report - Fiscal Year 1974 Equipment Systems Improvement Program; Law Enforcement Development Group; The Aerospace Corporation; August 1974.

Police Telecommunication Systems Prepared by IIT Research Institute; June 1971.
Technical Terms and Definitions Used with Law Enforcement Communications Equipment (Radio Antennas, Transmitters, and Receivers) Frank M. Greene; National Bureau of Standards; December 1, 1971.
Police National Advisory Commission on Criminal Justice Standards and Goals; January, 1973.
A Study of Transmission Times and Messages Characterizing the Radio Communications System of the Miami Police Department; The Mitre Corporation; August 23, 1973.
Equipment Systems Improvement Program Analysis Group Functions; The Mitre Corporation; December 1, 1972.
Los Angeles ESIP Field Site Input for Fiscal Year 1974; Development Group Activities; The Mitre Corporation; July 2, 1973.
Preliminary Problem Areas for the Equipment Systems Improvement Program; The Mitre Corporation; October 15, 1972.
Emergency Communications Within a Correctional Institution; A.S. Distler, M.J. Spahn; October 22, 1973.
Task Force Report: Science and Technology The Institute for Defense Analyses; 1967.
LEAA Police Equipment Survey of 1972; Volume I: The Need for Standards -- Priorities for Police Equipment; National Bureau of Standards; July 1973.

Equipment Item Analysis

6. Vehicle Locators

Introduction

Within the equipment typology used in this study, vehicle locators are an anomaly in that they are not discrete pieces of equipment but rather were specially selected because they are systems, generally referred to as Automatic Vehicle Monitoring (AVM) systems. AVM has been subjected to much critical analysis and evaluation in the 10 years or so that it has existed as a viable concept. Conferences, symposiums, feasibility studies, simulations, -- all these types of activities have over the past few years been directed toward the concept of AVM. The concept has attracted the attention of several different government agencies, many professional associations, and many universities.

Basically, projected AVM benefits for L.E. are related to the increased effectiveness of managing the patrol function, in the form of reduced response time for emergencies. Much of the justification for AVM is related to this benefit. Reduced response time is projected to result in 1) more efficient use of present men and patrol cars and 2) reduced need for additional men and patrol cars. Additional benefits have been projected for AVM systems by proposing that the system include other municipal emergency vehicles and perhaps certain commercial vehicles (trucks, cabs, etc.).

In spite of the intensive scrutiny, AVM is still considered only a potentially powerful innovation for L.E. Very few police departments have made a commitment to acquiring AVM.

Product

There are three general technological approaches being developed in the field of AVM; radio location techniques, proximity techniques, and dead-reckoning methods. Each approach has advantages and disadvantages and some developers are attempting to minimize the disadvantages by combining approaches. At this time, no technique seems to have emerged as superior for general application. The situation is reminiscent of the color TV industry before the emergence of the current technology as dominant.

Cost/effectiveness is the predominant reason given for non-adoption of AVM. In fact, cost alone is given as the reason for not even considering

the concept by some L.E. agencies. It seems apparent that adoption of the innovation will result from 1) reducing cost, and/or 2) increasing the L.E. agency's ability to understand and to argue for its effectiveness before funding agencies (state, city, etc.). At least one medium sized police department has apparently succeeded in reducing cost by designing, developing, installing, and implementing its own AVM system using local expertise, funds, and entrepreneurship. Its achievements have been officially recognized at a national L.E. association.

LEAA is currently funding a pilot installation of a more costly AVM system in a large police department. This pilot test should result in an impact on the effectiveness factor in the cost/effectiveness impediment. If the results are as expected, effectiveness of AVM should be more easily understood and capable of being argued for.

Analysis of Producers

The number of producers represented in Table 65 does not permit conclusive comparative analysis regarding vehicle locator systems, but some observations may be made.

It appears from the sample that the opportunity to market vehicle locators is attracting medium or large companies with electronic expertise. Of the companies represented, only 1 has a well established reputation in L.E., indicating that this opportunity seems to be attracting new entries to the L.E. market. It must be quickly pointed out, however, that the market for vehicle locators is not well developed and is still being researched by the producers. In fact, 1 of the companies in Table 65 has already discontinued its involvement in vehicle locators.

The producers shown in Table 65 should be researched as individual case studies. However, such research would require extensive information regarding each company's strategies for analysis and penetration of the market. Such proprietary information has either not been available or cannot be discussed without endangering confidentiality.

Policy Implications

The unsettled state of the market for vehicle locators has implications for intervention in this market. First, the amount of technical research and exchange of information regarding the technical aspects make it clear that a sufficient amount of technical expertise has been attracted to the area.

TABLE 65

PRODUCERS OF VEHICLE LOCATORS

Size	Main Technology	Main Market	Reputation in L.E.	Opport. ID Process	L.E. Market Attractive?	L.E. Market Competitive?	Avail. Equip. Not Used or Inadequate	Willing to Do L.E. R/D	Plans for This Product
Large	Many-varied	Non L.E.	New	L.E.-Producer	Undecided	Yes	Inadequate	Minimal	Develop & Market
Large	Electronics	Non L.E.	Well Estab-lished	Market Researched	Least at-tractive of current markets	Yes	Not Used	Yes	Develop & Market
Large	Electronics	Non L.E.	New	Presumed need	No	No response	Not used	No	Discontinued
Medium	Electronics	Non L.E.	New	Market Researched	Undecided	No	Not used (probably)	Undecided	Market Analysis

This would indicate that intervention in the form of technical research is neither necessary nor desirable. Any technical research supported by NILECJ intervention will very likely be perceived by producers as competitive rather than stimulative.

The needs of the market are in the area of "sorting out" the available technicological approaches relative to the needs and capabilities of potential users. Intervention at this point should be in the area of support for conferences, publications, and pilot studies to explicate the cost/effectiveness of the various approaches taken by various producers to vehicle locator systems. A pilot program such as is being conducted at St. Louis will help identify the appropriateness of that technological approach to that user situation. Various conferences have already been held, further helping in this respect. A comprehensive publication detailing the approaches, uses, advantages, disadvantages, and costs would further help stabilize the potential market for producers.

Analysis of Users

Sixteen user agencies indicated that they had reacted in some way to vehicle locator technology. The responses from these 16 were tabulated for the categories shown in Table 66.

No conclusions can be drawn from analyzing the categories of "user typology", "amount spent last year on innovative equipment", "general budget conditions", and "use of external funds", because of the lack of variance in these categories.

Analysis of the other 3 categories in Table 66 does, however, allow for conclusions. Table 67 comparing "reported importance of innovative equipment" to "reaction to vehicle locators", allows a few conclusions.

The ambivalent or ambiguous reaction ("still considering") seems not to be strongly related to any specific attitude toward the importance of innovative equipment.

Of those agencies reporting rejection of the innovation of vehicle locators, 4 of the 6 indicated thay viewed innovative equipment as being important in selected areas of L.E. (All 6 rejections were reported as being for cost/effectiveness reasons.) This could be an indication that these user agencies are quite discriminating in identifying their equipment needs. More likely, though, the explanation is related to the general concept that vehicle locator systems are very expensive and require considerable effort

TABLE 66

TABULATION OF RESPONSES FOR VEHICLE LOCATORS

User Typology		Amount Spent Last Year On Innov. Equipment		General Budget Conditions	Use of External Funds	
#1	- 1	$0	- 7	No variance	Actively Pursue	- 14
#7-8	- 7	$1/50,000	- 3	(all were tight,	Willing, Unable	- 1
#9	- 8	$50,000/900,000	- 2	lean, or austere)	Unwilling	- 1
		$1 million +	- 2			
		No Response	- 2			

Internal Capability for Evaluation (Equip. R/D)		Reported Importance of Innovative Equipment to L.E.		Reaction to Vehicle Locator	
Separate functions	- 6	Very	- 3	Rejected	- 6
Staff expertise (Dept. or Div. Heads, etc.)	- 5	Selectively Important	- 7	Still Considering	- 7
None (or little)	- 5	Not Very	- 2	Adopted	- 2
		NR/Uncertain	- 4		

and analysis to justify. This conclusion is born out by analysis of Table 68 below.

Nothing conclusive can be said about those agencies having adopted vehicle locators since there were only 2 such instances.

TABLE 67

REACTION TO VEHICLE LOCATORS

Reported Importance of Innovative Equipment	Rejected	Still Considering	Adopted
Generally important		2	1
Selectively important	4	2	1
Not very	1	1	
NR/Uncertain	1	3	
Totals	6	8	2

TABLE 68

REACTION TO VEHICLE LOCATORS

Internal Capability for Evaluation	Rejected	Still Considering	Adopted
Separate function	2	2	2
Staff expertise (Dept. hds., Division commanders, etc.)		5	
None (or very little)	5		

Table 68 compares "reaction to vehicle locators" to "internal capability for evaluation". Of the 3 categories of capability shown, it is implied that the establishment of a separate function for equipment analysis is clearly a more effective capability than is relying on the individual expertise of staff members, or than none at all. However, there were reported cases of separate "research and planning" functions (or some similar title) being established where it was also reported that, in fact, equipment analysis was not within the scope of that function. Such cases were tabulated as having none or little internal capability.

Table 68 shows that in 5 of the 7 cases, the agencies reported little or no internal capability for evaluation. If this conclusion can be substantiated by more intensive investigation, the implications are clear for policies directed toward improving the internal capability of L.E. agencies for evaluation.

Also of interest is the high (relatively) number of agencies using staff expertise for evaluation that are "still considering" vehicle locators. Does this indicate that such agencies are cautious in evaluation -- or just unprepared for evaluation and, therefore, ambivalent.

Perhaps it is stretching the data in Table 68 too far, but it is interesting to note that as agencies become more capable of evaluation (separate function), they also become more discriminating in their reaction (2 incidents in each category).

Issue Analysis

No issue analysis was attempted on the basis of only 2 reported incidents of use of vehicle locator systems.

Policy Implications

From the users' viewpoint, what is needed in the area of vehicle locators is not more technological research, but rather more clarification of the two elements in the cost/effectiveness ratio, relative to the different technological approaches available.

User agencies must be better able to evaluate their own needs and potential for vehicle locators. Such evaluation may require more sophisticated appraisal than is possible without in-house competence for either technical or performance evaluation. The evaluation could take place outside the user agency and be supplied to it. It then becomes problematical as to whether the user agency would be receptive to such evaluation but, on the

assumption that some receptivity would exist, such external evaluation should be pursued, preferably by a technically competent organization enjoying credibility in L.E. (for example, the Associated Public Service Communication Officers).

Improvement of in-house capability for self-evaluation should also be pursued along the lines of improving effectiveness of Planning and Research Units and local-regional conferences and seminars.

Bibliography

Annual Operating Plan Fiscal Year 1975, Report No. ATR-74(7901) - 3, El Segundo, Calif.: The Aerospace Corp., January 1974.

Candidate Equipment Projects Fiscal Year 1974, Report No. TOR-0073(3640) - 3 El Segundo, Calif.: The Aerospace Corp., March, 1973. (controlled access)

Doering, Robert D. "Feasibility Study: Automatic Vehicle Locator System - Orlando Police Department", Proceedings 1974 Carnahan and International Crime Countermeasures Conference, Office of Research and Engineering, University of Kentucky, Lexington, Kentucky, April 1974.

Freeny, Charles C. and Otto A. Reichardt, "An Economic AVM System", Proceedings 1974 Carnahan and International Crime Countermeasures Conference, Office of Research and Engineering, University of Kentucky, Lexington, Kentucky, April 1974.

Furth, Richard G. "A Magnetic Array Proximity AVM System", Proceedings 1974 Carnahan and International Crime Countermeasures Conference, Office of Research and Engineering, University of Kentucky, Lexington, Kentucky, April 1974.

Hansen, George R. "AVM - Is There a System for Your City?", Proceedings 1974 Carnahan and International Crime Countermeasures Conference, Office of Research and Engineering, University of Kentucky, Lexington, Kentucky, April 1974.

Opportunities for Improving Productivity in Police Services, Advisory Group on Productivity in Law Enforcement, National Commission on Productivity, Washington, D.C., 1973.

Riter, Stephen "AVM - Current Trends and Requirements", Proceedings 1974 Carnahan and International Crime Countermeasures Conference, Office of Research and Engineering, University of Kentucky, Lexington, Kentucky, April 1974.

Riter, Stephen, Proceedings of a Conference on Automatic Vehicle Monitoring, Center for Urban Program, Texas A&M University, College Station, Texas, February, 1973.

Stobart, C. R. "A Sign Post Aided Dead Reckoning System for Automatic Vehicle Monitoring (AVM)", Proceedings 1974 Carnahan and International Crime Countermeasures Conference, Office of Research and Engineering, University of Kentucky, Lexington, Kentucky, April 1974.

Urban Vehicle Monitoring - Technology, Economics, and Public Policy, Department of Housing and Urban Development, Washington, D.C., May, 1972.

Equipment Item Analysis
Voice Identification

Introduction

Voice I.D. is one of the more technologically sophisticated and controversial types of innovative equipment to have been developed for law enforcement use in recent years. The principle behind the concept of voice identification is very similar to that of fingerprinting. Every person has a unique voice which is distinguishable from all other persons and which can supposedly be identifiable regardless of attempts at personal disguise such as whispering, muffling, holding one's nose, or even ventriloquisms and impression mimicing. These identifications are achieved through the use of "voiceprints", graphic displays of the voice produced by a machine called a spectrograph. This spectrograph (which consists of a magnetic recording device, a variable electronic filter, a paper carrying drum, and an electric stylus that produces the voice print on the paper provided on the rotating drum) records the amplitude, frequency bands, and time duration of words recorded on tape. A comparison of voice prints permits a skilled analyst to determine whether a particular individual actually uttered some taped communication when the actual identity of the speaker is unknown.

The concept of voice spectrography was developed by Bell Telephone Laboratories in the 1940's previously for the purposes of speech therapy. The specific application of this research to the area of speaker recognition using voiceprints was requested by representatives of a law enforcement agencies in 1960 following a sudden rash of telephoned bomb threats. One of the original scientists spent several years creating such a system. It is important to note while Bell Labs was willing to support and fund the developmental research, they had no intention of producing the equipment for law enforcement once it was developed. While the technology was created with a minimal input from law enforcement, the innovation could have conceivably died at birth for lack of an interested producer.

Product Market

The developing scientist, with the approval of Bell Labs., left his research position to establish his own production company to service law enforcement in 1966. Despite having a market for the product, this first effort ended in bankruptcy in 1973. At present three companies are manufacturing spectrography.

The typical equipment cost approximately $7,000 without options. One of the larger companies views law enforcement as a very unattractive market, concentrating most sales efforts on medicine and speech therapy. Most R&D refinements are also directed at these non-law enforcement markets. The second large manufacturer, while more positive about the L.E. market, also views an enterprise dealing solely with this one market as impossible. At present 65% of all their sales are to non-L.E. users. Manufacturers of voice I.D. spectrographs, on a whole, have not had an easy time. If the product was not also applicable for other use in other fields, production of the voice I.D. might never have succeeded under the free enterprise system.

Product Use

With few exceptions acquisition of spectrographs has appeal to limited types of law enforcement agencies: primarily made up of large urban police departments, some state police, and by some large government agencies. Large size appears to be a necessary condition both in terms of felt need and ability to afford the necessary equipment and personnel. Only six law enforcement agencies interviewed as part of this project actually owned voice I.D. equipment. Unlike most other types of equipment, a distinctive feature with voice I.D. is that many law enforcement agencies will avail themselves of existing equipment when needed, even though they may not own or desire to own such equipment themselves. This sharing is reinforced by the willingness of current users to act as consultants and technical assistants. This willingness to cooperate exists largely out of a defensive desire on the part of current experts to assist others in order to prevent the widespread use of inexperienced analysts and operators which might hurt the growing legitimacy of voice I.D. both as an investigative device and as admissable of court room evidence. In our sample of users we find 5 law enforcement agencies who have no voice I.D. equipment but they indicated that they have sought voice I.D. assistance in the past. Those agencies which own equipment indicate numerous instances in which they have been called upon to help in investigations or to interpret and to provide expert court room testimony.

Law Enforcement Response to Voice I.D. (Number of Users 47)

Purchased Spectrographs	11%
Considered But Haven't Purchased	17%
Have Not Considered	72%

Issue: Acquisition

Many users find the cost prohibitive. A basic spectrograph costs in excess of $7,000. In addition, a skilled operator is needed so that a user must also be able to afford the costs of training and retaining capable personnel. A second reason why users have decided not to invest in a spectrograph is the belief that the frequency of need and seriousness of crime generally requiring voice I.D. does not justify the expense. In addition to insufficient funds and insufficient need, two other areas were examined as possible reasons for not acquiring the equipment.

The actual acquisition of the equipment has not been a problem. There are comparable products available from a limited number of producers and the experts in Michigan readily provide information, consulting, and guidelines to assist in the selection and acquisition process.

In contrast, most purchasers have found that the period between decision to purchase and acquisition can be quite lengthy. In some cases it takes four years to get administrative approval, acquire federal money to finance the venture, and to choose, order and have the equipment delivered.

Policy Options

1) Set up regional centers where voice I.D. equipment and experts can be borrowed.
2) Provide training in equipment use.
3) Promote sharing and joint purchase.

Issue: Cooperation

Voice I.D., as previously mentioned, is quite distinctive in the sense that law enforcement agencies who operate spectrographs have been very willing to provide assistance to other agencies who find they need the use of voice identification equipment and specialists in conjunction with specific cases. There is little incentive for smaller users to invest in the purchase of equipment and the lengthy training period when services are readily available elsewhere at the present time. This sharing is apparently quite healthy and an effective way of wasting funds through unnecessary duplication of facilities within a regional area.

Policy Option

1.) Disseminate information on these examples of cooperation.

Issue: Legal Constraints

Several users have been cautious about the use of voice identification because of legal problems that exist regarding both the collection of voice prints (when the persons involved are unaware of the taping process) and the acceptance of voiceprint analysis as admissable evidence in courts of law.

While the use of voice I.D. is generally found to be acceptable, there have been instances in some states where judges have refused to accept the testimony of voice print experts and also when appeals have found the use of such testimony to be inappropriate.

Issue: Funding and Budgeting

While federal funding was neither needed nor used for the development of voice I.D., most current users contacted indicated that federal funds were necessary in order to make purchases possible. The seven thousand dollar equipment cost plus training costs made entry into the field of voice identification prohibitive without federal support.

In addition, federal funding served several other functions pertaining to voice I.D. With the assistance of several support institutions, the Michigan State Police was able to do extensive research on voice identification using Dept. of Justice funds. This research had the effect of more strongly establishing the concept of voice I.D. in law enforcement, validating the method developed by Kersta in Bell Labs., generating standards for use in training, performance and evaluation, and in other ways helping to establish, structure, and substantiate the use of voiceprints and the spectrograph in law enforcement.

Policy Options

1) Provide funds for regional (shared) acquisition of voice I.D. equipment.
2) Provide funds to develop better training program model.

TABLE 69 Reasons for not Purchasing Voice I.D. Equipment

Number who considered but didn't purchase	Reasons			
	Insufficient Need	Insufficient Money	External Availability of Equipment	Courtroom Uncertainty
9	33%	22%	55%	45%

Issue: Information Transfer

Given the limited demand for the product, the marketing and diffusion process is limited. Typically most publicity and information comes through the users. Michigan State Police is the gatekeeper. Most users rely on the advise of the M.S.P. regarding what to buy, who to buy it from, how to prepare operators, etc. Otherwise the information comes to a user from a mediatory user who already has benefited from Michigan State advice. Generally negotiations with purchasers are initiated and handled using M.S.P. guidelines. In an attempt to legitimate voice identification as a legitimate law enforcement device, representatives of The Department of Michigan State Police and Michigan State University do much more to publicize and sell the product than do the manufacturers.

Policy Options

1) Help support the information dissemination efforts of MSP and others.
2) Encourage colleges with criminal justice curriculum to provide exposure to voice I.D.

Issue: Training and Utilization

The mere acquisition of a spectrograph is insufficient for effective use of voice identification. The consensus is that the main factor is the man who uses the system. The 1972 report on Voice Identification Research stresses that, "The application of voice identification techniques presupposes the use of examiners who are educated, well trained and experienced" (p. 16).

The training includes a B.S. or extensive college level background in speech science (phonetic, acoustics, speech, audiology, physical science), training in the preparation of tape recordings and voiceprints, a training program in voice spectrograph identification requiring completion of high standards of accuracy, and a two year apprenticeship.

At present there is an attempt to create a university based training program to replace a two week program provided by the producers.

Romig and Hennesay have argued that "An identification technique is only as good as the individuals who perform the identification task." To meet the need, they advocate stringent qualifying requirements and an effective training program.

An International Association For Voice Identification has been founded to develop voice I.D. experts. The association insists that the previously mentioned training standards are met in order to protect the reputation of voice I.D. experts in court. There is considerable concern that use of the spectrograph without extensive training would seriously affect the skill of the operator and damage the extent to which voice I.D. is respected and accepted by law enforcement and particularly in courts of law. Law enforcement agencies have to face the fact that they can not be immediately prepared to operate a voice I.D. system - that technology and needs exceed current skills and capabilities.

Policy Options

1) Provide grants to help development of training programs.
2) Set up regional centers where the few experts can be concentrated.

Issue: Maintenance and Performance

Spectrographs have not been without problems. More than half of the agencies which operate voice identification programs report repeated maintenance problems. A recurring complaint is that the machines are poorly put together and require constant attention by technicians to keep them operating. Thus, once a spectrograph has been bought, agencies are faced with both personnel problems (training of experts) and technical problems (keeping the machine functioning properly).

Policy Options

1) Support research to improve product maintainability.
2) Encourage higher standards to eliminate poor quality control.

Summary: Distinctive Features of I.D. Equipment

In summary, the following features tend to make the R&D process regarding this innovation different from those typically experienced in law enforcement.

1) Considerable sharing of existing facilities (quite willingly).
2) Extensive need for training if equipment is to be utilized properly.
3) Strong dominance and influence over law enforcement users contemplating adoption by a limited number of experts (at The Michigan State Police and Michigan State University).

4) Major publicity and exposure provided by persons in law enforcement concerned with legitimacy rather than by producers themselves.

5) Considerable influence of legal constraints on willingness of law enforcement agencies to get involved with the innovative technique.

Summary of Most Appropriate Policy Options

1) Improved training programs for preparation of voice I.D. specialists.

2) An equipment center approach to make voice I.D. more readily accessible to small users in law enforcement who may periodically have a need for such a technique but cannot afford their own equipment.

3) Increased federal funding.

Bibliography

Kersta, L., Voiceprint Identification description prepared by Base Ten Systems, Inc., New Jersey.

Nash, E., Voice Identification by the Voiceprint Method, Michigan State Police.

Tosi, O. et.al., "Experiment on Voice Identification", The Journal of the Acousteral Society of America, 51:6 1972. 2030-2043.

Voice Identification Research, LEAA Report PR 72-1. 1972.

Romig, C. and Hennessy, J., "The Legal Dilemma of Voiceprint Identification", The Police Chief, June 1971, 44-48.

Romig, C. and Hennessy, J., "Voiceprint Identification As a Law Enforcement Tool", Law & Order, July, 1971, 37-44.

Equipment Item Analysis

8. Weapons Detection

Introduction

The weapons detection devices considered here are primarily of three types: walk through detectors, hand-held detectors for metal on the body, and buried metal evidence detectors. Users were interviewed however which utilized acoustic sensor devices and X-ray equipment though this analysis will deal primarily with the three types of detection devices mentioned previously. Basically these devices are designed to detect the presence of metal in excess of a certain amount. In the case of the buried metal evidence detectors these are designed to detect metal under dirt, snow, cement, and even water. Metal detectors in general are of two types: active and passive. An active detector generates an electromagnetic field which will respond to any type of metal, while a passive detector does not generate such a field and can detect only ferrous metals.

The walk-thru detectors are used primarily at airports, entrances to courtrooms, lock-ups, and prisons. The hand-held detector is used in place of the walk-thru detector in many of the situations above as well as being used by male officers to search for weapons on women and is used in some cases while on patrol to search suspects.

The buried metal evidence detector is fairly self-explanatory; it is used in many cases to look for spent cartridges and weapons which may be obscured or buried. The acoustic sensor device and X-ray equipment are used primarily for bomb detection.

For the users analysed concerning weapon detectors, there were 11 users currently using detectors, 3 which were still considering acquisition, 2 which considered detectors but decided against purchase, 8 users which have never considered obtaining weapons detectors, and one which did utilize detectors but has discontinued use.

The producers included in this analysis are those which manufacture either of the three types of weapons detectors listed at the beginning of this section. These producers number 12 - the number of weapons detector producers known is 17.

History

The origin of the walk-thru detector for use in law enforcement is due primarily to the outbreak of airplane hijackings and the efforts made to control these occurences of violence. The logical extension of its use for detection of weapons on those entering courts, prisons and other public buildings was not long in coming. The need for buried metal evidence detectors originated with public utilities and the military. The detector's function there was to locate pipes and mines respectively. It seems in many cases the application of this device in the law enforcement effort occured by chance. A person in a position to utilize this detector would happen to know of a man in his department who used one for treasure hunting or he knew of a public utility company which might lend him the detector. Hand-held detectors became important when shakedowns or friskings were undesirable. The case of a man frisking a woman was mentioned earlier. Another important case is the shakedowns of prisoners in correctional institutions. There is a manpower problem, an effectiveness problem, as well as a problem of conflict between the guard and inmate, all of which are largely alleviated by substituting the hand-held detectors for the function of frisking the prisoners.

Analysis of Producers

The first column of table no. 70 shows only three companies which could be classified outside of the tiny or small category. Column three of table 70 shows only one firm primarily in the law enforcement market, for which we have data on sales volume, and this sales volume is extremely small. Thus it seems from the data obtained in the first three columns of table no. producers of weapons detectors are small or tiny companies, and few give much emphasis to their production of weapons detection equipment.

There seems to be no pattern of how the producers perceive the law enforcement market. The responses are split between an attractive or unattractive market. Both firms with small and large sales in law enforcement find the market attractive while the same is true for the unattractive response. Concerning the competitive nature of the law enforcement market there is only one firm, from which we have data, that perceives the market as non-competitive. This seems to agree with the preceding data which shows that this company is primarily in the law enforcement market and its main product

TABLE 70 WEAPONS DETECTION PRODUCERS

Company Size	Main Product	Amount of Law Enforcement Sales	L.E. Market is/is not attractive	L.E. Market is/is not competitive	Producer is/is not willing to do R&D	Future Plans wit regards to weapons detectio
Medium	Electronic Kits	Extremely small	Unattractive	N.D.	Unwilling	No major changes
Small	Recording Equipment	Small	Unattractive	N.D.	Unwilling	No major changes
Small	Detection Equipment	Primarily in L.E.	Unattractive	Non-competitive	Unwilling	No major changes
Tiny	Pipe and Leak Detectors	Approximately 10%	Unattractive	N.D.	Unwilling	No major changes
Small	Seat Belts	Approximately 10%	Attractive	Competitive	Willing	No major changes
Tiny	Magnetic Testing Equipment	Small	Attractive	Competitive	Unwilling	No major changes
Medium	Micro-Wave Tubes	Small	Attractive	N.D.	Unwilling	N.D.
Tiny	Door and Gate Operators	Very small	Unattractive	N.D.	Unwilling	No major changes
Tiny	Magnotometers	N.D.	Attractive	Competitive	N.D.	N.D.
Medium	Electronic Protection Systems	Very small	Unattractive	Competitive	N.D.	N.D.
Tiny	Non-Lethal Weapons	Primarily in L.E.	Attractive	Competitive	Willing	N.D.
Tiny	Electronic Devices	Primarily in L.E.	Attractive	Competitive	Willing	No major changes

is detection equipment. This may be significant since this is the only producer which exhibits that combination and is the only one which feels the market is not competitive.

For the most part producers are not willing to do R&D and this is shown not only in the sixth column but also in the last column where, "no major changes", is the only response given in reference to the future plans with regard to weapons detectors.

Analysis of Users

The data in table no.71 shows a high proportion of large police departments. Also shown in this table of users of weapons detectors are three prisons and three state police departments. The greater number of prisons in this product area is to be expected due to the abundant opportunities presented for this product by these agencies. On the whole the data shows that large users predominate in the utilization of weapons detection devices and small users of this product are quite rare. Some possible reasons for this are the greater amount of funds available to large departments, the greater flow of information on innocation equipment, and the more sophisticated R&D programs which usually characterize the large law enforcement agencies and are rarely found in the small agencies.

Product Use

This analysis of product use must take into consideration the different types of detectors which were mentioned in the introduction. The walk-thru detectors are used in all three prisons in this analysis to check incoming and outgoing guests as well as the inmates when moving from the yard to the cell, etc. A few of the police departments have walk-thru detectors also and these are used mainly in the lock-ups to check prisoners for weapons when moving in or out of the cell area. The hand-held frisking device is used in all three prisons as well. These detectors are used by guards to frisk inmates in an area which is not serviced by the walk-thru detector and to check incoming and outgoing materials. These same detectors are used by most of the police departments listed. Their function there includes use for frisking the opposite sex, and use on patrol by officers to search a suspect before taking him in the back seat of the police car. The buried metal evidence detectors

TABLE 71 WEAPONS DETECTION USERS

Type of L.E. Agency	Region	# Sworn Officers	Budget (in millions)	Amount Spent last year on innovative equipment	General Budgeting Condition	Classification User Typology*
P.D.	Midwest	381	6	N.D.	Stable	7
P.D.	West	175	N.D.	very little	Stable	8
Prison	Midwest	224	8	none	Austerity	12
P.D.	Midwest	5,500	160	10,000,000	Stable	9
P.D.	East	402	5.4	very little	Austerity	7
S.P.	East	900	17.3	500,000	Austerity	1
P.D.	Midwest	142	2.84	30,000	Stable	8
Prison	West	550	N.D.	5,000	Stable	12
P.D.	West	1,958	N.D.	N.D.	Austerity	9
S.P.	East	850	18	N.D.	Austerity	1
Prison	West	400	N.D.	2,000	Austerity	12
S.P.	Midwest	1,000	25	none	Austerity	1
P.D.	Midwest	420	8.2	160,000	Austerity	7
P.D.	Midwest	1,300	23	none	Stable	9

* see table 1 for user typology

are used primarily by the detective divisions within the police departments. They are used not only to locate discarded weapons but also to search for spent cartridges. This last function seems to be especially valuable to users. One police department utilizes an acoustic sensor device used in bomb detection and two other police departments interviewed use X-ray devices which are used to check packages, letters, etc.

The problem encountered in usage is basically one of personnel training. The products aren't overly complex but levels must be set and meters read and some training is needed and this is usually more than the user gets. The producers are little help in this area and the users are often left with only an instruction manual which often times is not sufficient. The problem with training becomes more acute as the complexity of the product increases. More problems are encountered with the buried metal evidence detectors, X-ray devices, and acoustic sensor devices and thus the use of these products is often severely limited due to the very few officers who can effectively utilize the detector. Another problem which was indicated by some of the large police departments was the inability of small users to use the weapons detection equipment. The large users are approached by the smaller police departments for the purpose of borrowing the needed equipment. The lending of the equipment is usually possible but the lending of the expertise often is not and thus the small departments frequently are unable to utilize the equipment which they need.

One set of detailed requirements for walk-through detectors was found.(1) In general it is found that detection of metal objects and false alarm rates are inversely related, i.e., one can be improved, but only at the expense of the other. Work is being done on discrimination logic which would involve some detection of shapes, etc., so that detection sensitivity can be improved while holding the false alarm rate down. Another innovation said to be needed in this area is a detection device which would be able to scan and handle detection for large crowds. It seems that users feel quite a bit of innovation is needed in this area but this contrasts significantly with the proposed actions of the producers as indicated in Table 71.

(1) Law Enforcement Standards Program "Walk-Through Metal Detectors for Use for Weapons Detection", National Bureau of Standards; September, 1973

Policy Implications

Stimulate R&D of weapons detection devices by providing funds to selected producers which would work in conjunction with some of the users who would help communicate their needs in this area.

Set up Regional Equipment Centers where large and small users alike could borrow equipment as well as the needed expertise in the area of concern.

Provide training on equipment selection and utilization.

Create product standards at the user level of understanding and provide the necessary information dissemination to make these effective (i.e., make them known to all users).

Product Market

The case in general here is that law enforcement is a small portion of the companies' overall business and weapons detectors are even a smaller portion of that segment. Within this section concerned with weapons detection the main markets include airlines, industry, and law enforcement. The airline market doesn't seem too promising from now on since it is fairly well saturated. Applications in industry to stop employees from stealing, etc. are not that numerous, though the buried evidence detector does find the majority of its market in public utilities, locating pipes. Within law enforcement, producers see courts and prisons as superior markets for their products as opposed to police departments.

It seems that most companies could survive without producing weapons detection equipment and they receive no great gains for continuing production. This may in part explain the overall lack of R&D activity in the industry.

Changes in State of the Art

The most basic change which has taken place in the field of weapons detection was mentioned earlier in the introduction, i.e., the change from passive to active detectors. This change enabled detection of non-ferrous as well as ferrous metals and in the case that only ferrous metals were to be detected the active detectors could easily be altered for this. Another innovation was the hand-held frisking device itself. This serves basically the same purpose as the walk-thru detectors but with the added dimension of mobility. Work is continuing on detectors which distinquish shapes such as barrels of a gun (mentioned earlier

in the product use section as discrimination logic). This should be a significant improvement in the effectiveness of weapons detectors. The literature points out many possibilities for research in weapons detection equipment and significant changes in its state of the art. Unfortunately this research is not taking place and the best that can be said is that the state of the art in this area is changing slowly.

Policy Implications

Stimulate R&D in weapons detectors by providing support in the form of funds for laboratory work and publications and also by communicating opportunities and user needs to the R&D activity.

Issue: Acquisition

The acquisition process for most users was quite informal. Quite a few users borrowed detectors before they decided to actually purchase one. Users borrowed from individuals in their own departments, public utilities, and other users. Three users acquired weapons detectors due to emergencies, either a barrage of threats or an actual death which could have been prevented. Testing and other evaluation of the product before purchase seemed to be lacking. Users said that price was the biggest factor in choosing a specific model and they often did not give sufficient consideration to the features of the different models. These observations are supported by the producers. They feel the users are too cost conscious and this sometimes leads to obtaining an inferior product or one which does not do the job which was desired. Producers have had feedback that indicates users do not understand all of the features of the product and misinterpret its function thus leading to dissatisfaction. The problem is not that testing procedures and product requirements don't exist(1) but that users are unaware of their existence and availability.

Policy Implications

Creation of a National Clearinghouse for information.

Provide assistance to law enforcement agencies to add personnel knowledgeable on equipment.

(1) Law Enforcement Standards Program "Walk-Through Metal Detectors for Use for Weapons Detection", National Bureau of Standards; September, 1973

Issue: Funding and Budgeting

Getting funds is the biggest drawback cited by users in obtaining weapons detection equipment. Only two users indicated funding from outside sources was used in the purchase of weapons detection devices, one with state and one with federal monies. No producer interviewed received outside help in their R&D effort and more than one producer indicated that they feel they could conduct a very important and rewarding program of R&D in weapons detection if the money were available.

Policy Implications

Provide funds for R&D to the producers of weapons detection equipment.

Provide funds or loans for the purchase of weapons detectors by user agencies.

Promote cooperative arrangements for equipment acquisition between law enforcement agencies.

Issue: Information Transfer

Generally information transfer in this area of weapons detection is quite poor. A few users expressed their distrust for the manufacturers and thus do not look for this information. Most users try to get the bulk of their information from other users but very often find this fairly difficult. The creation of a central depository for product information was mentioned by users as a possible solution to their problem. The consequences of this lack of effective information transfer were mentioned earlier in the acquisition section.

Policy Implications

Create a National Clearinghouse for information in order to improve the information transfer between user agencies.

Bibliography

Literature From Files Dealing at Least in Part with Weapons Detection

Detection of Contraband Weapons Within a Correctional Institution; A. S. Dister, M. J. Spahn; November 20, 1973.

Weapons Detector Field Test Plan; The Mitre Corporation; January 9, 1973

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3 OF 4

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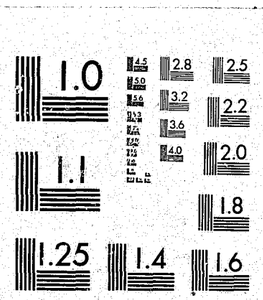

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CENTER FOR THE INTERDISCIPLINARY STUDY OF SCIENCE AND TECHNOLOGY

AND

GRADUATE SCHOOL OF MANAGEMENT

NORTHWESTERN UNIVERSITY

Evanston, Illinois 60201

Report to

National Institute for Law Enforcement

and Criminal Justice

Studies and Action Programs on the Law Enforcement Equipment R&D System: Evaluative Study of the Equipment Systems Improvement Program

NILECJ Grant No. 74-NI-99-0004-G

Michael Radnor

Principal Investigator

January 31, 1975

35015

Volume I Introduction and Overview

Volume II The Research Program

Volume III Recommendations for Further NILECJ Research

Volume IV Appendices

VOLUME II The Research Program

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TABLES

TABLES (continued)

TABLES (continued)

FIGURES

II. THE RESEARCH PROGRAM

1.1 The Exploratory Pilot Study

The study was initiated in November, 1973 in response to an initial request for proposals from NILECJ for an evaluation of E.S.I.P. It was our conviction at the time that neither the data base nor the clarity of perspective or goals for E.S.I.P. were sufficiently well established for a meaningful evaluation to be made. What was first required was a more fundamental examination of the whole R&D system for law enforcement equipment from producers to users. The results of such systematic study could then provide the basis for a grounded process of evaluation and formulation of policy options. This concept was accepted by NILECJ and we undertook the study to achieve this objective.

Our thinking was based on the expertise we had developed over many years in numerous studies in the general area of R&D systems and R&D management. Our initial task was to become familiar with the world of law enforcement equipment -- products, sources, users, media and functions. Using our general knowledge of the nature of R&D, innovation and markets and in consultation with a number of people experienced in law enforcement we formulated, during the winter of 1973/74, preliminary lists of data sources likely to be productive and of areas for questioning. Extensive questionnaires were designed, a field research team set up that extended across the country, data sites were selected and the exploratory pilot field phase of our research was carried out in the Spring of 1974.

During this first phase of study, we succeeded in familiarizing ourselves with the law enforcement environment and obtained a general perspective on the key issues that were to be investigated in depth in the main empirical phase.

The issue to which we addressed the initial phase of research was the success of the present R&D-manufacturing-marketing system in terms of meeting product needs. Our approach was to develop, based on our prior experience with R&D systems, a list of key steps in the R&D process and then, upon encountering a potential gap in the process, to trace that along the various steps of the system in order to determine the source of the problem. By acquiring an understanding of the mechanics of the system, we were able to identify those elements which served as problem areas.

As a first step in the achievement of this purpose, we established a library of several hundred items consisting of documents, catalogues, brochures and articles related to law enforcement equipment. Among these are various reports of LEAA, NILECJ, Mitre, Aerospace, NBS and ESIP; publications issued by other government agencies, police departments and research institutions; a file of product catalogues and brochures, and an on-going collection of relevant articles. We subscribed to Law and Order and Police Chief and received regular reports from NBS. In addition, we have access to a large number of periodicals, e.g., FBI Bulletin and Association of Public Safety Communications Officers, in the Northwestern University Transportation Center Library. These materials were searched for all information relating to our study.

We also consulted with some twenty persons knowledgeable about equipment, in LEAA, NBS-LESL, the Aerospace and Mitre Corporations, and with experts and R&D specialists in law enforcement agencies and manufacturing companies; and attended conferences and lectures both outside the university and at the Traffic Institute here at Northwestern.

For our survey research, we constructed general questionnaires for users, producers, and distributors of law enforcement equipment that were designed to investigate the R&D process from the state-of-the-art to use in the field. Interviews were administered in 36 selected law enforcement agencies (including metropolitan police departments, state patrols, county police departments, U.S. border patrol and several small town police departments), twelve manufacturing companies, six distributing firms, with additional interviews conducted in federal, and county courts; federal and state prisons; a county jail, coast guard stations, U.S. Customs and a major air line. Interviewees included police chiefs, sheriffs, judges, wardens, technical experts, R&D specialists, security managers, and court clerks.

Many of the indications that materialized in our preliminary data analysis illustrated the expected breakdowns in the R&D system. This analysis revealed that the producers of law enforcement equipment to whom we talked, saw little or no incentive to invest in R&D for law enforcement related products. For some, the law enforcement market was secondary and fragmented and law enforcement equipment often a modification of equipment developed for other markets. Producers felt that the best source of ideas

for new law enforcement products should be the law enforcement agencies themselves, but few ideas had actually originated there. Manufacturers frequently did see the need for a law enforcement government agency to identify, evaluate, specify and test potential products.

Producers seemed, however, to be generally dissatisfied with the role of government agencies in regard to standards and regulations. While they felt the need for more state and federal standards, user agencies -- particularly small police departments exhibited a low awareness of needs for standards. Few user organizations had facilities for testing new equipment, but all indicated a willingness to participate in programs to try out new equipment for manufacturers. Good information on product availability and quality represented a major shortcoming.

In user organizations, innovative equipment was not a budget priority, and awareness of and utilization of external funding sources was minimal. When innovative equipment was purchased, its utilization was often contingent upon the technical skills of the organization. Communication between user organizations -- particularly neighboring units -- while largely informal seemed frequent and regular, but cooperation in the form of joint purchasing and formal equipment sharing arrangements seemed to be rare. While producers believed that innovative equipment could be of great importance to the law enforcement field, users felt that equipment was only of marginal importance.

Recurring suggestions from producers included aggregation of the market, increased technical skill of users and better need identification channels. They were typically of the opinion that most law enforcement users lack the capability necessary to effectively use the products that were currently available.

The initial phase of research culminated at Northwestern on May 6 and 7, 1974 in a workshop attended by ESIP advisory board members and NILECJ-ESIP personnel as well as Northwestern project members from all over the country. The list of attendees is shown in Figure 1. At this conference, results of the data analysis were formally presented and feedback was elicited from all present. From this convergence of thinking from the researchers and experts, the model of the R&D process shown in Figure 2 emerged:

Figure 1. ATTENDEES AT JOINT NORTHWESTERN/NILECJ PROJECT WORKSHOP

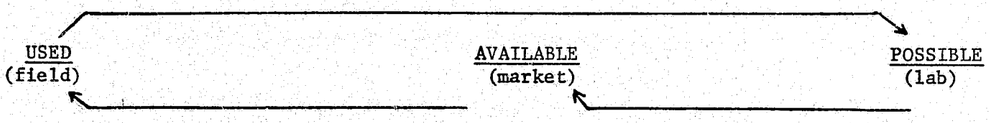
NORTHWESTERN UNIVERSITY May 6-7, 1974

Name	Affiliation	Address
Donald Derning	Chief of Police, Winnetka Police Dept. Immediate Past Pres. IACP	Winnetka, Illinois
J. T. Kochanski	ESIP, NILECJ	Washington, D. C.
Kieth Bergstrom	Miami Police Dept. ESIP Advisory Board	Miami, Florida
George Shollenberger	ESIP, NILECJ	Washington, D. C.
Michael Beller	NILECJ	Washington, D. C.
David Anderson	California Crime Technology Research Foundation, ESIP Advisory Board	Sacramento, California
Earl Young	Illinois Institute of Technology	Chicago, Illinois
Martin Adler	George Washington University	Washington, D. C.
David Tansik	University of Arizona	Tucson, Arizona
Charles Shepherd	Northwestern University	Evanston, Illinois
Glennys Ulshak	Northwestern University	Evanston, Illinois
Ron Goldstein	Northwestern University	Evanston, Illinois
Myron Block	Northwestern University	Evanston, Illinois
Ray Buckley	Northwestern University	Evanston, Illinois
Michael Radnor	Northwestern University	Evanston, Illinois
Bonnie Hoffman	University of Michigan	Ann Arbor, Michigan
Richard Rosenthal	Georgia Institute of Technology	Atlanta, Georgia
Terry Conolly	Georgia Institute of Technology	Atlanta, Georgia
Giorgio Inzerilli	Wharton School, University of Pennsylvania	Philadelphia, Pennsylvania

Figure 2. THREE STAGES OF R&D PROCESS

1. Need identification

problem: lack of communication between users and producers



2. NEED FOR DIFFUSION

problems:

inefficiency of bidding system

ineffective purchasing channels

lack of funds

Lack of standards

insufficient information flow between producers and users and between users and users about what's available

lack of technical skills to utilize innovative equipment

3. NEED FOR R&D

problems:

anticipation of problems in 3.

monopolies

fragmented market

low profit margin

lack of funds

government interference

reluctance to acquire law enforcement image

An important parameter that was noted was the legal constraints on the use of certain types of equipment.

1.2 The Main Empirical Phase

Following the workshop we adopted a slightly new approach toward which to channel our research efforts. Having identified some of the critical policy issues and pinpointed some of the specific problems characterizing the law enforcement equipment R&D system, we were then prepared to focus in detail on the R&D steps involved in a few specific equipment items. In order to do this, we synthesized our list of issues into an initial set of six key areas of potentially important policy implication, which was then expanded into the eight issue areas we finally used -- and the product analysis format that was adopted for the main study.

a) Funding and budgeting
b) Information transfer and dissemination
c) Marketing
d) User receptivity -- later expanded into:
   i Need identification
   ii Acquisition process
   iii Installation, utilization, maintenance and assessment
   iv Cooperation between users.
e) Producer research, development and engineering process
f) State of the art considerations -- later expanded into the total product analysis.

We then, with the active assistance of various law enforcement equipment specialists, selected a number of equipment types which are either currently undergoing innovation or currently in need of innovation. They represent equipment used in a broad range of both law enforcement functions (e.g., patrol, investigation) and equipment types. They include items of high and low technology, various cost and usage ranges, products designed primarily for law enforcement use and those for which law enforcement agencies are only a minor consumer, equipment manufactured primarily by large companies and that produced largely by small ones. The following is a list of these items:

1. Body armor
2. Holster utility belts
3. Low-light photography and surveillance equipment
4. Nonlethal weapons

5. Portable transceivers
6. Vehicle locators
7. Voice identification
8. Weapons detection
9. Building design for courts and prisons
10. Court recording systems.

By conducting a series of in-depth case studies on these ten equipment items, we have been able to zero in on the trends as we studied the barriers, if any, impeding the production, purchase and utilization of specific equipment items.

In addition, decisions were made to extend our interviewing so as to reach the final equipment user levels (e.g., patrolmen) and also to conduct studies in special law enforcement agencies (e.g., private security), in prisons and in courts. The general implication was to work with relatively small samples of organizations but in depth. Table 1 shows the distribution of organizations and personnel we interviewed.

The producer questionnaire consisted of four parts: general company features, corporate law enforcement effort, the background of the product line that was of interest to us, and the history of specific models of our equipment items. The models on which we collected information were 1) the latest, 2) the main selling, and 3) the failures. We traced each model's history from its inception to its sale.

Working in 71 companies, we were able, as can be seen in Table 1, to conduct interviews with most (83) of the approximately 111 past and present manufacturers of our equipment items that we located (some firms made several of our products). In large companies, we interviewed a number of persons, among them division heads, R&D specialists and marketing experts.

The user questionnaire was divided into three parts: agency features, departmental features and an equipment profile. Here we were interested in product models that 1) were in use, 2) had been in use, and 3) had been considered for use. This questionnaire traced the history of each model from need identification through utilization. We interviewed on as many equipment types as was appropriate to each agency.

The 47 user organizations we interviewed included large metropolitan police departments, city and large suburban police departments, some smaller suburban police departments, planning agencies, state and county police departments, several major air lines, and courts and prisons. At user agencies we also

TABLE 1. Distribution of Producers, Users, Intermediary Organizations and Distributors

a) Producers
(i) By Size

Size Category	Company Size	LE Div. Size	Main Study #	Main Study %	Pilot Study #	Pilot Study %	Total #	Total %
I Large	Large		1				1	
	Large	Large	8		2		10	
	Large	Medium	2				2	
	Sub Total		11	15	2	17	13	16
II Medium	Large	Small	5				5	
	Medium		4		1		5	
	Medium	Medium						
	Sub Total		9	12	1	8	10	12
III Small (a)	Large	Tiny	1		1		2	
	Medium	Small	2				2	
	Sub Total (a)		3	4	1	8	4	5
(very) Small (b)	Medium	Tiny	1				1	
	Small		18		1		19	
	Sub Total (b)		19	27	1	8	20	24
	Sub Total		22	31	2	17	24	29
IV Tiny	Small	Tiny	2		1		3	
	Tiny		27		6		33	
	Sub Total		29	42	7	58	36	43
	TOTAL		71	100	12	100	83	100

*Definitions: (No. of Employees)
Large -- more than 2500
Medium - 500 - 2500
Small - less than 500
Tiny - less than 50 people and/or less than one million dollars in sales

(ii) By Concentration on Law Enforcement Products

Main Study

Company Size	L.E. only		L.E. plus other		Have given up Law Enforcement	
	#	%	#	%	#	%
I			11	20		
II			9	16		
III	3	25	16	28	3	100
IV	9	75	20	36		
Total	12	100	56	100	3	100

(iii) By Geographic Region

	South			West			East			Mid-West		
	Main	Pilot	Total	Main	Pilot	Total	Main	Pilot	Total	Main	Pilot	Total
#	10	1	11	18	2	20	23	5	28	20	4	24
%			13			24			34			29

(iv) By Level of People Interviewed

	Main	Pilot	Total	%
Presidents, etc.	18	4	22	21
Vice Presidents	12	2	14	13
Middle Managers	64	6	70	66
Total	94	12	106	100

(v) By Equipment Type

Main Study

Equipment	Producer Size Category I	%	II	%	III	%	IV	%	Total #	%	Total Identified	% Interviewed
Body Armor	1	6	3	30	3	13	8	26	15	19	19	79
Holster-Utility Belts	1	6			3	13	4	13	8	10	17	47
Low-light Surveillance	3	19	1	10	3	13	4	13	11	14	15	73
Non-lethal	2	13			2	8	2	6	6	7	7	86
Portable Transceivers	5	31	2	20	8	33	3	10	18	22	22	82
Vehicle Locators	3	19	1	10					4	5	6	67
Voice I.D.					1	4	1	3	2	2	3	67
Weapon Detection			3	30	3	13	6	19	12	15	17	71
Building Design							3	10	3	4	3	100
Court Recording	1	6			1	4			2	2	2	100
Total **	16		10		24		31		81		111	

*Percentages shown are of the total of companies of that size category in the equipment area.

**Note that totals may be larger than the number of companies of that category - since some firms are in to more than one product area. Some totals reflect interviews with producers of related equipment.

***These particular groups are also listed in section on Intermediary Agencies.

(b) Users

(i) By Size

Typology	Main Study #	%	Pilot Study #	%	T.I. Studies* #	%	Total #	%
1	7	15	2	4	6	10	15	9
2	2	4	9	17	4	6	15	9
3								
4			2	4			2	1
5			1	2	9	15	10	6
6			6	11	10	16	16	10
7	8	17	8	15	21	34	37	23
8	3	7	4	7	7	11	14	8½
9	16	34	3	5	5	8	24	15
10			1	2			1	½
11	2	4	2	4			4	2½
12	4	8	4	7			8	5
13	3	7	10	18			13	8
14	2	4	2	4			4	2½
Total	47	100	54	100	62	100	163	100

*Traffic Institute Studies

The typology used for Users:

1. State Police
2. County and Sheriffs

Small Towns
3. 1-9 officers -- remote or nucleus
4. 1-9 officers -- suburb or sattelite

Towns
5. 10-49 officers -- remote
6. 10-49 officers -- suburb or sattelite

Cities
7. 50+ officers --- remote
8. 50+ officers --- suburb or sattelite

Large Cities
9. 52 largest cities (by population)*
10. Township
11. Courts
12. Prisons
13. Special agencies - Governmental
14. Private associations, agencies, or Depts.

*52 largest were selected because there are 52 cities with populations over 250,000.

(ii) By Person Interviewed

	Main Study	Pilot Study	T.I.*	Total	%
High level	43	30	5	78	30
Lower level	88	25	60	173	68
Other (Specialists)	2	3		5	2
Total	133	58	65	256	100

(iii) By Geographic Region

	South				West				East				Mid-West			
	M	P	T.I.	T	M	P	T.I.	T	M	P	T.I.	T	M	P	T.I.	T
#	6	7	12	25	9	15	3	27	8	19	8	35	24	13	38	75
%				15				17				22				46

M - Main Study
P - Pilot Study
T - Total

*T.I. - Interviews of users conducted at the Northwestern Traffic Institute

(iv) By Equipment Type

TYPOLOGY

	1	2		7	8	9	11	12	13	14	TOTAL
Body Armor	5	2		4	2	8		1			22
Holsters-Utility belts		1		3	1	6		2			13
Low-light Surveillance	2	1		5	2	8					18
Non-lethal	5	1		5	2	8		3		2	26
Portable Transceivers	6	1		7	3	13		2	1		33
Vehicle Locators	1			5	2	8					16
Voice I.D.	3			3	1	6			1	2	16
Weapons Detection	3			3	2	3		3			14
Building Design							2	1			3
Court Recording							2				2

INTERMEDIARY ORGANIZATIONS	
Universities	3
International, National & State Organizations	6
Architects	2
Special Consultants	1
Total	12

DISTRIBUTORS	
Pilot Study	6
Main Study	2
Total	8

interviewed several people; e.g., police chiefs, R&D specialists, equipment specialists, equipment technicians, department heads, patrolmen, judges, clerks, court recorders, building managers, architects, wardens and security managers. 65 users were interviewed at the Traffic Institute.

The typology we used to identify user organizations makes use of the typology used by NBS in its 1972 Police Equipment Survey, which was:

Description	# of Depts.
State Police	50
County Police and Sheriffs	3137
City 1-9 officers	5486
City 10-49 officers	1985
City 50 officers (excluding 50 largest cities)	554
City 50 largest (by population)	50
Townships	1574

The NBS typology was odified in 2 ways:

1) It was expanded to include additional types of law enforcement agencies, specifically, Courts, Prisons, Special Agencies, and private agencies.
2) It was expanded by adding a sub-categorization of three city classifications to distinguish between suburban (or sattelite) cities and remote (or nucleus) cities. This classification refers to the relative degree of dependence or influence of a P.D. on neighboring municipalities.
   This classification is based on the city's relationship to its surrounding municipalities, which is derived from examination of a map of the area.

The typical interview lasted approximately one and one half hours. This was generally sufficient to cover most of the items in both producer and user questionnaires. However, in some cases time did not permit every single item being dealt with. Also, in some cases, not every item turned out to be of relevance for the particular respondent being interviewed. The net result is that some variation results in sample sizes, depending on the data items being analysed.

In preparation for our interviews, we compiled a series of detailed information packets consisting of background statistics on each company to be interviewed, product line information from each company, and general background on each equipment type.

1.3 The Analysis and Findings

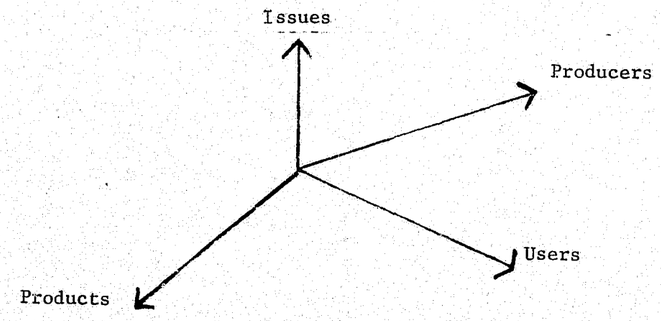
The data was processed and analysed along four dimensions:

1. By the eight selected law enforcement equipment R&D system issues (cooperation, information transfer, etc.)
2. By product type --based on the ten selected product areas (low light, etc.)
3. By type of producer (size and technology)
4. By type of user (size and function).

In addition, separate analyses are being made of:

5. Intermediary organizations
6. Distributors

In each of the four analysis dimensions we are examining for the interaction with the other three dimensions. Thus we could visualize the analysis as taking place in a four dimensioned space, that is, we



are asking what types of issues arise in connection with a particular product manufactured by a particular company being used by a particular law enforcement agency in a specific way.

These analyses are presented sequentially starting with the review of the eight issue area. The format in each case will be to present and define the terms of the issue area and detail out the sub-issues and any hypotheses with

which we went into the main empirical phase. Following a general review of the findings available to this point suggestions are made of some policy options and revised hypotheses meriting further investigation. We recommend that these revised hypotheses be considered in a future reanalysis.

The methods by which the data has been analysed have been very explicitly and formally prepared. In each case the analysis instrument is keyed in to either the producer (P) or user (U) questionnaires. This questionnaire data is then supplemented with information gathered from the literature and other documentation.

1.3.1 Analysis of Law Enforcement Issues

1. The Producer-Research, Development Engineering Process

General Statement of Issue

The R, D & E process refers to the technical innovation process in producer organizations, i.e., research, development, and engineering. Producers vary greatly in their ability and willingness to develop new products for the law enforcement field. Understanding these factors and the problems producers encounter in developing new equipment for L.E. users are necessary to develop policies designed to improve the equipment innovation process.

Sub-Issues

The R, D & E process in companies producing for the L.E. market can usefully be considered from the following perspectives:

1) How willing are producers to manufacture additional L.E. products?
2) How willing are producers to invest in R&D for L.E. products?
3) What are the capabilities of firms to produce for L.E. markets?
4) What are the primary project selection criteria for L.E. products?
5) What specifications are utilized in designing L.E. products?
6) What are the primary problems encountered in R&D for L.E.?
7) What information sources are utilized during R&D?
8) To what extent do producers cooperate with users in developing L.E. products?

Sub-Issue #1: How willing are producers to manufacture additional L.E. products?

Definition: This sub-issue refers to the extent to which producers commit resources, i.e., manpower, funds, and equipment, to produce new products for the L.E. market. In essence, this issue is a reflection of a producer's net estimate of the profitability of this market and his interest and commitment to working in it.

Rationale: It was felt that producers would vary widely in their assessment of the L.E. market. Knowing the major and recurrent factors that caused producers to have a positive (or negative) image of this market would form the basis for policies aimed at increasing and improving their efforts to make L.E. products.

Hypothesis 1: Producers who produce for markets in addition to law enforcement will generally exhibit the following tendencies:

(a) Not be willing to produce L.E. products not currently made by the firm.

(b) Not want to produce competitor's type of product.

Hypothesis 2: The smaller the firm the greater the following:

(a) Willingness to produce L.E. products not currently made by the firm.

(b) Desire to make competitor's type of product.

TABLE 2 Willingness to Produce LE Products Not Currently Made by Firm (Only includes firms producing in markets in addition to L.E.)

Type of Firm	TOTAL NO. FIRMS	Willing to produce L.E. products not currently made by firm			NO RE-SPONSE
		YES	NO	OTHER	
Tiny	20	7	8	1	4
Small	12	3	7	0	2
Medium	7	4	2	0	1
Large(1)	17	5	7	3	2
Total	56	19	24	4	9

Interviewee Comments:

Tiny Firms

"Yes" Response

- Wished had more time and money. Being a successful company kept him from getting into L.E. market.
- Lack of money

(1) Throughout this section Large refers to Corporate size.

"No" Response

- Don't want too many L.E. lines - too many eggs in one basket. Will get into consumer protection first since so little in that market.

"Other" Response

- Not now. Will go to soft armor after Aerospace finishes its program, but not until.
- Did make a bullet proof helmet. Discontinued because of insufficient demand.

Small Firms

"Yes" Response

- Lack facilities

"No" Response

- We are soured on the police department market in general.
- No plans for further L.E. involvement.
- Not at this time

Medium Firms

"Yes" Response

- Don't because of L.E. agency reluctance to assemble kits and also they are doing quite well outside the L.E. market so they feel no great urge to enter it.
- Would like to build radios for government agencies but we don't have the engineers, personnel and money is tight.
- There are so many possibilities from a technological point of view that people do not utilize.
- Yes, we don't because our background, production equipment, and product sales system does not lend itself to the products.

"No" Response

- Communications market is tied up by Motorola and G.E.

Large Firms

"Yes" response

- Consider L.E. an interesting market.

"No" response

- Money is tight.
- Not interested in new L.E. line.
- Will not make products specifically for L.E. market.

"Other" Response

- Have an extensive list.
- Not worth their time.
- Don't feel they could add anything.

TABLE 3 Willingness to Produce Competitors' Type of Product

Type of Firm	Total No. Firms	Would like to produce competitor's type of product			
		Yes	No	Other	No responses
Tiny	24	7	11	2	4
Small	16	3	11	0	2
Medium	7	2	3	2	0
Large	17	4	11	0	2
Total	64	16	36	4	8

Interviewee Comments:

Tiny Firms

"Yes" Response

- There would be marketing problems.

"No" Response

- Cannot afford to do anything but improve own product.

"Other" Response

- Blames lack of technical awareness of user for demand.

Small Firms

"No" Response

- We are soured on P.D. market in general (same response for item II-2)
- Too competitive

Medium Firms

"No" Response

- We are the leaders. This question would be more pertinent to our competitors ... If we wanted to get into a competition product line badly enough, we would acquire another company rather than gear up for production here.

Large Firms

"Yes" Response

- Not equipped with technology.

"No" Response

- Update and redesign what they have.
- Only trying to get rid of inventory now.
- Don't have competitor's equipment.

Analysis of Findings

Hypothesis 1 (a) was weakly supported by the data gathered in interviews. However, a number of "yes" responses were qualified by the interviewers perceived need to change their own organizations or environmetal conditions i.e., user receptivity, government assistance, etc. before producing additional L.E. products. (See interviewee comments above). Also, "other" responses while not a direct "no", are generally negative.

Hypothesis 1 (b) is supported more strongly than 1 (a). If a market is generally viewed unfavorably, this bias may be easier to deal with when examining a competitor's product in that market than ones own product line.

The generally negative attitudes expressed toward the L.E. market is further reinforced by the intention of some companies to limit their L.E. activities or to leave the market altogether. In comparison, none of the "yes" responses are accompanied by intentions of expanding L.E. lines.

Neither hypothesis 2 (a) or 2 (b) appears to be supported by the data based on visual examination i.e., the size of the firm is not a factor in determining willingness to invest in the L.E. market.

Policy Implication

Hypothesis 1 indicates a need to deal with several structural problems at the producer-user interface. A general campaign to attract producers to L.E. markets will not be effective so long as the marketing process is so prolonged and complex. In short, the producer has all the difficulties of selling to government agencies, but to relatively small organizations for small often non-recurrent orders.

Hypothesis 2 indicates that increasing producer willingness to invest can not be reduced to one type of producer. This implies that the problems are more likely to be found at the producer-user interface than directly on producer willingness to invest. Combined with the implications of Hypothesis 1, it does not appear that policies aimed at the producer level of awareness, attitude toward L.E. agencies, or information on L.E. needs are as critical as starting points as are measures to improve user capabilities. Among these capabilities are "willingness to utilize existing products" and to "assist in the development of new products." Although it should be noted that these measures aimed at producers are still important components of an on-going program to improve, L.E. equipment development on delivery systems.

Hypothesis 3:

Equipment producers will tend to limit the scope of their commitment to L.E. product line primarily to minor improvements on servicing the current line.

Hypothesis 4:

The smaller the firm, the greater the scope of its commitment to the L.E. market.

TABLE 4 Scope of Commitment to L.E. Market

Type of Firm	No. of Firms	Scope of Commitment to L.E. Market (1) Major improvements in Current Line/ New Products	(2) Minor improvements in Current Line	(3) Service current line, improve as necessary	(4) Leave L.E. Market	(5) Other	No Response
Tiny	24	2	9	6	3	2	2
Small	16	1	5	4	1	2	3
Medium	7	0	3	1	1	1	1
Large	17	0	4	6	3	3	1
Total	64	3	21	17	8	8	7

Interviewee Comments:

Tiny Firms

Category 1

- Trying to get $200,000 in private funds to go with $250,000 asking in federal funds as capital. Purpose of this money is for development of R&D capabilities.
- "Chemical mist" a new product.

Category 2

- The use of better materials as they develop.
- Continually improve and refine .
- Keep current and add innovations of market seems to exist.

Category 3

- None with exception of special requests, if feasible.
- Make improvements as necessary when defects, etc., are discovered.
- Maintain the line.

Category 4

- Tenuous may leave the L.E. area .
- Phase this out, no new items.

Category 5

- Depends on market research.
- Nothing new in leather products.

Small Firms

Category 1

- Continue to produce, bring our product up to the state of the art. A solid state base station is our next product.

Category 2

- Continually modify and improve design and quality.
- New innovations and better quality.

Category 3

- No major changes are foreseen.
- No, have just recently gotten into transceivers.

Category 4

- More industry a market (i.e., as opposed to L.E. market.

Category 5

- Some top secret work for military.
- Communicate to city that P.D. need it.

Medium Firms

Category 2

- Try to build quality reliability.
- Growth, increase sales, additional options and accessories.

Category 3

- Continue to offer to market.

Category 4

- Doing well outside L.E. market, no great urge to enter it.

Large Firms

Category 2

- Develop and market the _____ system.

Category 4

- Phasing out, selling out inventory, will not replenish.
- We are only trying to get rid of inventory now _____ abolished due to lack of sales and profit.

Category 5

- Not really in L.E. Market, sell for industrial security.

Analysis of Findings

Hypothesis 3 is supported by the data. This assertion is consistent with hypothesis 1, that is, firms that do not view the L.E. market as attractive will limit the scope of their commitment to minor product improvements or servicing the current line. Again, the higher incidence of negative reactions than positive reactions to the L.E. market is evident (See comments above).

Hypothesis 4 received very weak support. Out of 57 firms responding only three were willing to make major improvements in the product line or to add new products as these were either smaller tiny firms. However, in category 2 there is no significant trend related to company size, i.e., 40.9% of the small firms, 50.0% of the medium, and 25.0% of the large firms. In categories 3 and 4 combined, the incidence of large firms limiting their activities to servicing their current line or to leaving the market is higher (i.e., 9 out of 16 or 56.3%) compared to the tiny firms (i.e., 9 out of 22 or 40.9%). The significance of this trend is minimized by the reverse trends for small and medium firms.

In general it appears that several producers might be willing to expand based on their desire to improve current products. However, a significant total number of firms in categories 3 and 4 (i.e., 16 out of 57) are at a level of minimum development or are ready to leave the market indicating that market conditions and user receptivity may be a major problem area.

Policy Implications

This analysis reinforces the one for hypothesis 1 and its policy implications are similar (see above). One factor of potential interest is the slight support for hypothesis 4, indicating there may be a potentially valuable resource in the development of small firm capabilities on the L.E. market; that is, if it is true that similar market conditions result in a greater willingness to make a commitment to the L.E. field than evidenced by large firms.

Sub-Issue #2: How willing are producers to invest in L.E. R&D?

Rationale: While producers may be quite willing to produce products requiring only minor modification limiting risks to production and marketing problems, it is quite another thing to invest in R&D. It is important to determine the extent to which producers are willing to make this investment, since it offers the most attractive alternative in a market economy. It is also important to determine why firms are not willing to invest in R&D if government funds or other assistance are to be offered as incentives in this area.

Hypothesis 5: Producers, will tend to be unwilling to invest in R&D for L.E. equipment.

Hypothesis 6: Small and medium sized firms will be the most willing to invest in R&D for L.E.

TABLE 5 Willingness to Invest in R&D

Type of producer	Total No. Firms	Willingness to invest in R&D		
		Low	High	No Response
Tiny	24	14	6	4
Small	16	9	6	1
Medium	7	4	0	3
Large	17	7	8	2
Total	64	34	20	10

Interviewee Comments:

Tiny Firms

Low

- Marginally now, major with soft armor in future.
- If two or three dealers indicate a desired innovation and if it seems it will sell - O.K. I'm very conservative.
- Some not a lot due to poor financial position.
- None. A question of money, we would if we could get government money. Not doing much currently (in L.E.). For other markets infinity for L.E. nothing.
- No experience. Probably unwilling.
- If demand warrants and prospects look good.
- Some interest depends on market.
- Limited - Small investment, short R&D time.
- Not at all
- Other market areas. Military private security, banks. Some products are sold so there is no distinction between markets.
- R&D is mainly at leisure of owner and when time presents.

High

- Hard to answer. Have moral obligation and market is ready. Question is marketability. I'm enthusiastic. 80% of R&D in L.E. through this product. If it fails, it will jeopardize whole corporation.
- Very extensive and very willing. Less than military, but in R&D, the two overlap.

Small Firms

Low

- 10% of company business in L.E.
- $20,000 per year
- Company not willing to invest in R&D
- "Little", very small in L.E.
- _____ does not have R&D capacity to be innovative.
- Do not see themselves as a growth company.
- Only reason we haven't is funds. They are tied up in production.
- R&D costs a lot. We would invest little unless it was a firm deal.

High

- Very willing to invest - only market.
- 75% on new items; 25% on revising current items.
- Yes, whenever feasible, L.E. an attractive market marginally.
- Original product research higher than expected.
- As much as possible.
- Fair amoung, sometimes specific to L.E.

Medium Firms

Low

- Develop for public safety and other markets.
- No R&D for L.E., market too limited.

Large Firms

Low

- Not interested in L.E. R&D
- Willing to extent a return is feasible. L.E. not a market that commands a lot of resources.

TABLE 6 Amount of R,D&E Effort

Type of Firm	No. of Firms	AMOUNT OF R,D&E EFFORT								Owner only R&D Effort	No R&D (Not applicable)
		At Outset				As Ongoing Process					
		Lo	Med	Hi	No response	Lo	Med	Hi	No response		
Tiny	24	4	2	5	6	5	2	4	6	3	4
Small	16	3	2	4	3	4	0	2	6	0	4
Medium	7	0	1	1	0	1	0	1	0	0	5
Large	17	3	1	7	5	2	1	5	8	0	1
Total	64	10	6	17	14	12	3	12	20	3	14

Interviewee Comments (Owner Only R&D Effort)

- Of my personal time since March, 1974, 6½ days/week, 11 hrs/day, picking minds to design it.
- Just the personal time of the owner which was not estimated as a cost.
- My own knowledge of guns, ammo, nylon.

Analysis of Findings

The generally low willingness to invest in R&D in the L.E. field (i.e., 34 out of 54 responding firms or 63.0% in the first table above) tends to support hypothesis 5. What is surprising is the rather high incidence of firms (i.e., 20 out of 54 or 37.0%) willing to invest in L.E. R&D. These latter figures are offset by the qualifications which accompany them. (See comments above). Of equal interest was the great number of specific reasons why L.E. was not a good field to invest in, while the majority of those indicating a willingness to invest in R&D were generally not explicit as to their reason. Findings in the second table do not show significant differences between initial and on-going R&D efforts. One point of interest is the owner-entrepreneur who is the only source of R&D effort in the tiny firm.

Policy Implications

Willingness to invest in R&D is an even more sensitive indicator of willingness to invest in a market because of its uncertain outcome and longer pay off period. Therefore the finding that this indication was not much weaker than those used in testing hypothesis 1 and 3 (see above) is surprising. It may be that R&D efforts and marketing testing and servicing may require different types of companies whose energies have to be combined on an overall L.E. technology development/diffusion strategy fostered by government intervention.

Sub-Issue #3: What are the capabilities of firms to produce for L.E. markets?

Definition: Capability to producer refers to the capability of L.E. producers to identify, design, and produce new L.E. products.

Rationale: This factor provides an index of technical and productive capability for L.E. products. The extent to which market forces fail to attract producers willing to invest in developing the R&D capabilities necessary to produce new L.E. equipment, this becomes a problem for policy makers. It then becomes important to know the types of R&D capabilities required and the conditions under which

similar capabilities exist and operate. It is especially important to know if there are unique R&D capabilities which are required and cannot be developed profitably in the private sector.

Hypothesis 7: The larger the company the greater the likelihood of conducting R&D which is common to L.E. and other areas.

TABLE 7 Extent of Common Effort

(Only includes firms producing in markets in addition to L.E).

Type of Firm	Total Firms	EXTENT OF COMMON EFFORT				No response
		Major Regular	Minor Regular	Occasional	None	
Tiny	20	7	1	0	6	6
Small	12	8	1	0	2	1
Medium	7	1	1	2	0	3
Large	17	8	0	5	4	0
Total	56	24	3	7	12	10

This hypothesis is not supported by the data; in fact, the rates of small firms with a common R&D effort is highest of all from types. In fact, it is interesting to note that even in the tiny firms (i.e., up to 50 employees) it is useful to conduct R&D so it serves several markets. Part of the explanation may lie in the ability of large firms to specialize R&D so that L.E. is a separate effort.

Policy Implications

In the case of tiny firms, a major portion of their R&D effort may be totally absorbed by the L.E. market. Small and medium firms, on the other hand, may be potentially a major source of innovation in L.E. equipment based on the concept of a R&D effort in common with other fields. This enlarges the number of potential firms that can effectively utilize R&D funding. Also, funding smaller and medium size firms may result in a higher commitment to L.E. markets than in large firms where the number of markets receiving user attention increases rapidly.

Hypothesis 8: The size and scope of R&D capabilities dedicated exclusively to the L.E. market in companies serving more than one market will vary directly with the increasing size of the firm.

Findings: This hypothesis was not substantiated in that no companies indicated separate L.E. R&D capabilities in their responses to the questionnaire (item II-8); this sample included 24 tiny firms, 16 small firms, and 7 medium, and 17 large firms. Expertise for L.E. R&D was indicated in companies of all sizes. This would seem to imply that R&D for L.E. equipment was more related to interest in the field than size of the firm.

Policy Implications: As in hypothesis 1, the implication is that small and medium sized firms may also be a resource for improving innovative L.E. equipment, equal to (perhaps greater than) larger firms.

Sub-Issue #4: What are the primary RD&E project selection criteria for Law Enforcement products?

Definition: Project selection criteria refer to the research, development, and engineering (R,D&E) considerations utilized by producers to choose projects that will lead to new products for the L.E. market.

Rationale: Information on producer R,D&E project selection criteria is useful in determining the extent of producer research orientation in equipment development, and as a basis for comparison of similarities and differences with user equipment purchasing criteria. Corollary to this, it is important to know who participates in the R,D&E project selection decision, in the event of policy maker attempts to influence the decision process.

Hypothesis 9: Producers of L.E. equipment will tend to have the following R,D&E project selection preferences:

1) Highest priority to marketing consideration, followed by production, engineering, development, and research factors, in that order.
2) A short innovation cycle
3) Low estimated development risks

Hypothesis 10: Priorities for project selection criteria will differ among producers according to their size in the following manner:

1) A marketing orientation will be stronger, the smaller the firm.
2) An R&D orientation will be stronger, the larger the firm.
3) A preference for short term projects will be stronger, the smaller the firm.
4) A preference for low risk projects will be stronger, the smaller the firm.

Hypothesis 11: The order of importance of producer executives in the R,D&E project selection process, as indicated by the frequency of times cited as participants, will be as follows:

a) Top management
b) Marketing Manager
c) R&D Manager
d) Production Manager

TABLE 8 Participants in Decision to Select

Type of Firm	No. of Firms	PARTICIPANTS IN DECISION TO SELECT							No response	Not applicable
		Top Management	Marketing Manager	R&D Mgr.	Production Manager	Owner	Board of Directors	Venture Group		
Tiny	24	10	2	1	0	1	1	0	11	3
Small	16	9	2	0	0	0	0	0	7	0
Medium	7	1	2	0	0	0	0	0	4	0
Large	17	5	2	0	0	0	0	1	10	0
Total	64	25	8	1	0	1	1	1	32	3

TABLE 9 R&D Project Selection Criteria

Type of Firm	Total No. of Firms	R&D PROJECT SELECTION CRITERIA														
		Estimated R&D Costs	Estimated Production Costs	Estimated Marketability	Estimated Market Potential	Estimated Development Risks	Length of Innovation Cycle	Regulatory Agency	Price	Public Safety Market	Method of Financing	Method of Marketing	Time	Quality	Will It Save Lives	No Response
Tiny	24	4	6	7	7	3	3								1	10
Small	16	2	2	5		2	2									11
Medium	7	1		1												6
Large	17	1	5		9	2		1*	1	1	1	1	1	1		6
	64	8	13	13	16	7	5	1	1	1	1	1	1	1	1	33

*FAA regulation

Analysis of Findings

The evidence supporting Hypothesis 9 is weak, although "estimated marketing potential" was cited more times than other considerations in selecting projects. Also, when responses to this factor are added to those for "estimated marketability", then market considerations appear to be the most significant selection criteria.

Evidence for a gradually decreasing utilization of criteria from production to R&D was not supported, nor was there direct evidence to support a preference for a short innovation cycle and low development risks. However, these latter criteria may be inferred if a market orientation, coupled with a production instead of a research orientation in product development, dominates as appears to be the case so far.

So far there is insufficient evidence in support of (or against) Hypothesis 10. However, it is interesting to note the lack of any reference to R&D criteria by large firms. This is contrary to initial expectations.

Hypothesis 11 is supported strongly with respect to the pre-eminence of the marketing manager. The descending number of response from the R&D manager and the production manager technically support the hypothesis, but what is even more interesting is almost the total exclusion (or assumed exclusion or minor role) of these executives in the decision process for new R,D&E projects.

It could have been hypothesized that the increasing importance of the chief executive would be even more essential smaller firms. However, there is little evidence to this effect. Top management is involved in the decision making process in 10 of 13 tiny firms, 9 of 9 small firms, 1 of 3 medium and 5 of 7 large firms.

Policy Implications

An emphasis on marketing criteria coupled with a production instead of a research orientation can make it difficult to get certain types of L.E. products produced and distributed, i.e., high risk, long term, high technology equipment; equipment for a limited number of initial users and for a limited total market; and equipment which creates opportunities for repeat business (except normal replacement), high user resistance, or a need for substantial user staff development and upgrading. Unfortunately, these aforementioned factors are all too characteristic of many of the products now required in the L.E. field. The problem that emerges is, again, one of how to enlist the interest and cooperation of potential producers in L.E. markets, and how to increase the efforts of those already in the field.

If R,D&E projects for L.E. equipment differ significantly among different types of producers, this may mean policies to attract and sustain interest in the L.E. market may have to be adjusted according to producer types. For example, if small producers are more interested in L.E. markets, but the capabilities of larger firms are required for R&D, how are the efforts of each best harnessed to the L.E. market? In such a case, are both to have a role in R&D for L.E. equipment? If so, how will it be distributed?

With respect to hypothesis 11, the most significant finding, even in this limited sample, is the apparent omission of the R&D manager in selecting R,D&E projects for L.E. equipment, given the inclusion of the marketing manager. Taken together this reinforces hypothesis (1) and (3) and further indicates the emphasis on marketing and the low priority of R,D&E considerations.

Sub-Issue #5: What specifications are utilized in designing L.E. products?

Definition: Product design specifications refer to the design parameters developed by the producer and those required by state and federal agencies.

Rationale: It is important to know to what extent producers take into account users, government agencies, and/or associations in making design specifications. It is also important to know reasons why these sources may not be utilized. The use of external sources in design specifications is an index of the sensitivity of producers to new needs and regulations and standards governing a given equipment area.

Hypothesis 12: Producers will tend to rely on their own staff as a primary source of information for designing job specifications; users will be a secondary but minor source of specifications; and government sources will be the least important consideration.

Hypothesis 13: The size of the producer will not be a factor in the type of external source as its frequency of use.

TABLE 10 Primary Method of Developing Standards

Type of Firm	No. of Firms	PRIMARY METHOD OF DEVELOPING STANDARDS			No response
		User	Producer	Other	
Tiny	24	4	11	5	4
Small	16	3	5	3	5
Medium	7	2	1	2	2
Large	17	4	4	5	4
Total	64	13	21	15	15

Interviewee Comments:

Tiny Firms

User

- Threats were assessed and products were tested against them.
- Reports from field users
- Designed a prototype based on a description given by a potential customer.
- Performance standards were developed by request and really no formal reason.

Producer

- In-house research
- By seat of our pants, what we could do, would it help? Not they say what we want.
- In-house technical literature
- One man worked it up in his basement.

Other

- U.S. military standards
- Police Weapons Center certification process a complete farce based on $200.00 payment (assumed result not used, therefore comment not tabulated above).
- The company and specifications from other companies.
- Other existing products and own information.

Small Firms

User

- Developed from national incidents where weapons detection was needed.
- Developed from working with NYPD.
- Performance specifications geared to products already on market.

Producer

- By trial and error
- Performance specifications were developed by scientists.
- Sales manager made them up as they went.

Other

- LEAA requested a certain product.
- FCC standards were used in the headset.

Medium Firms

User

- Based on market
- Looking at other products, consumer requests

Other

- Original equipment manufacturer

Large Firms

User

- Consulting with Witchita P.D. & Association of Public Service Communications Officer
- L.E. depts. had influence
- User needs

Other

- Developed form military applications.
- Government organization set specifications.

Hypothesis 12 is supported with respect to companies using their own in-house resource to set design specifications as supplied by the small number of external sources cited. However, users are a slightly less important source of design specifications than other L.E. agencies or associations. With respect to federal agencies it is interesting to note the use of Department of Defense and military standards for design specifications. It is also important to note the law incidence of reference to other government agencies for equipment design specifications, especially in the field of L.E.

Hypothesis 13 is supported, there is little significant difference in the type of sources utilized for design specifications, or the frequency of their use.

Policy Implications

The apparent low rate of reference to either users, regulatory agencies or associations in the sample group, if generally true, is indicative of the lack of user-producer feedback and the low impact of any standard setting organization.

Sub-Issue #6: What are the primary problems encountered in R&D for L.E.?

Definition: Problems are defined as those recurrent barriers and conditions confronting producers which appear significant and which may be ameliorated by appropriate policies and programs. This definition does not include project-specific technical problems.

Rationale: (See definition)

Hypothesis: None

TABLE 11 Types of Problems Encountered in Various Firms

FREQUENCY OF OCCURRENCE REPORTED IN SAMPLE FIRMS				
Tiny 24 Firms	Small 16 Firms	Medium 7 Firms	Large 17 Firms	Type of Problem
1				Supplier of Parts
1		1		State-of-Arts Developments
1				Testing
1				Obtaining Authority
1				Funds
1				Technical Equipment Acquired
1				Lack of Training in Use of Equipment
			1	Training Users in Use of Equipment
1			1	Finding Material to Meet Project Performance Specifications
	1			Obtaining Scientific and Technical Information
		1		Inadequate Marketing Capability
		1	4	Meeting Cost Requirements

Analysis of Findings

The lack of responses to the question are perhaps more revealing than actual problems cited. That is, the lack of specific barriers and problems cited in the L.E. field, where so many other indicators point to its marginal place in many firms, further reinforces its marginality. Except in the case of a few tiny producers, most firms have failed to give L.E. products much attention.

Policy Implications

Even the few firms responding indicated a wide variety of producer problems amenable to policy intervention. One class refers to producer assistance, i.e., technical information, equipment, funds, testing, while another refers to user related problems, training and marketing.

Sub-Issue #7: What information sources are utilized during R&D?

Rationale: Knowing the type and frequency of information utilized, can provide a basis for improving the dissemination of L.E. equipment needs and specifications through current channels or the development of new channels.

Hypothesis: None

TABLE 12 Sources of Information Utilized During R&D

Sources of Information Utilized during R&D	Frequency of Usage by Type of Firm			
	Tiny 24	Small 16	Medium 7	Large 17 Firms
Federal laboratories	3	1		1
Aerospace	1	1		
Technical journals	6		1	4
Basic scientific/engr. info.	1	1	1	7
Another industry	5	1	3	6
L.E. agencies	1	1		7
Professional Personnel	5	4	1	6
Private laboratories		2		2
Parent Company			1	
Suppliers			1	
Feasibility Study of Competitive Product Consultants			1	1
Military				2
Total	22	11	9	36

TABLE 13 Sources of Standards

Type of Firm	Total No. Firms	Stds. for Product Development					No resp.	Stds. for Controlling Production					No resp.
		State	Federal					State	Federal				
			FCC	EIA	FAA	Other			FCC	EIA	FAA	Other	
Tiny	24	1	1			2 [a]	2						2
Small	16		2			1 [b]	2	1	2	2			2
Medium	7		2	2				1					0
Large	17		2		1	1 [c]	2	1					2
Total	64	1	7	2	1	4	6	3	2	2			6

[a] Military specifications
[b] Unspecified in interview
[c] IACP and NBS

Analysis of Findings

Generally, questions regarding information sources during the R&D process drew little interest from interviewers. This may have been due to their level of interest in or knowledge of the topic. The information collected and shown in the first table above indicates a limited but balanced range of sources. No attempt was made to assess their utilization or effectiveness.

The second table above indicates the very limited use made of either state or federal standards either during product development or during production.

As might be expected, the number and type of information sources utilized increased with the size of the firm (i.e., 36 sources for 17*large firms, or 2.12 per firm reported compared with 1.29 per medium firm, .69 per small firm and .92 per tiny firm.

In general, a picture emerges of low sensitivity to external technical information sources and prevailing standards. This is indicative of both an inward focus and reliance on one's own resources. It may also indicate a low level of interest in the L.E. market generally.

Policy Implications

This lack of awareness of sensitivity to; and utilization of external information sources may be rationalized if user needs are known and if technical information required is readily available in the firm. However, it is not an effective approach if user needs require precise definition, if development of related technical specification, and if compliance with existing standards and regulations. Unfortunately, the latter conditions exist in the L.E. equipment field all too frequently, as performance requirements become more complex which, in turn, often implies more complex technology. Government efforts to disseminate information to producers, in veiw of their current level of interest in L.E., require close examination and evaluation.

Sub-Issue #8: To what extent do producers cooperate with users in L.E. products?

Rationale: Producer-user cooperation is essential to design equipment to identify and fill user needs for L.E. equipment effectively.

Hypothesis 14: Producer's cooperation with users will increase with the size of the firms.

TABLE 14 Producer/User Cooperation

Type of Firm	No. of Firms	Coop. with L.E. agent in testing	Other (Specify)	No response
Tiny	24	16	1 Uof Mich - Voice Lab	4
Small	16	9		2
Medium	7	3	1 US Forestry Dept. Fire Depts. 1 Underwriters Lab	
Large	17	6	2 FAA 1 Ford Motor Co.	5
Total	64	34	6	11

Anaylsis of Findings

Hypothesis 13 is not supported; in fact, a slightly higher proportion of smaller firms corperates with users in testing (i.e., the rates for tiny firms is 16 out of 20 responding or 80%, 7 out of 14 or 50% for small firms, 3 out of 7 or 42.9% for medium firms, and 6 out of 12 or 50.0% for large firms). This may also be due to a lack of testing facilities than any increased desire to cooperate with users. In general, their is a high level of user cooperation with respect to testing.

The extent to which this is true in other areas is examined in section 5: Cooperation Between Users, above.

Policy Implications

The need for user cooperation was considered significant enough to warrant a separate section (see section 5: Cooperation Between Users, above.)

Areas requiring further research

1) More information is required on the conditions which prompted producer expansion into new L.E. products.
2) More specific itemization of both incentive and barriers to entering the L.E. market.
3) Identification of differences among producers with respect to (1) and (2) for different producer types and for different product lines.
4) The potential role of small firms in L.E. should be more fully explored, especially as it relates to technological innovation and diffusions.
5) Information on incentives required to get producers to invest more in L.E. R&D is required.
6) Information should be developed on firm size and market size required for each major type of L.E. equipment, depending on the function(s) performed, i.e., research development, engineering, production, marketing, in order to sustain a competitive market.
(7) Identification of those products which have not and/or cannot be produced by the private section is required.
(8) Identification of the possibilities for producers to perform only a part of the innovation process. That is, what types of firms are willing to consider specialization and work in some joint program with other firms?

(9) Determination of the impact of competition on innovation in firms producing for the L.E. market.

(10) Examination of the extent of R&D efforts common to several markets.

(11) Assessment of the role of marketing laboratories as a source of L.E. R&D, as well as an examination of the possibilities of common R&D program areas.

(12) More extensive identification of information channels and sources utilized in the R&D process for L.E. equipment and their relative effectiveness.

(13) Information should be gathered on the interests of individual scientists, engineers, and technicians in companies that might potentially serve the L.E. goals, and it may well be that the social priority of crime prevention and law enforcement may be very appealing to individual professionals.

Illustrative Policy Options*

1) Conduct analyses and evaluations of producer L.E. programs. Analysis of selected products and their diffusion in law enforcement agencies are required to assess more accurately producer motivation and interest in law enforcement, as well as the problems they face. The alternatives to private enterprise are costly and, as in the case of the ESIP Aerospace Corporation contract, seldom solve the problem of commercialization of a new product.

2) Provide producer information services. Some producers see the L.E. market in positive terms and are willing to invest. For these firms, accurate market information is a key incentive to effective expansion. Market information for each major L.E. product group could be provided to current and potential producers. In addition, a market information service could be made available to answer producer inquiries.

3) Initiate programs to develop small scale technological entrepreneur serving the L.E. market. Their combination of technical expertise, willingness to undertake risk and develop innovations, as well as their commitment to the L.E. field may make them a good bet for program building.

(4) Provide funds selectively to R&D producers already working in the L.E. field. Develop the sub-contracting mechanism between large and small scale producers as part of this program.

(5) Experiment with joint venture arrangements between large and small scale producers when the responsibility for R&D is assigned to the larger firm and distribution to smaller firms.

*These policy options focus primarily on producers. Those relating to users are considered of more immediate importance in the establishment of a market for innovative equipment. These user oriented recommendations are covered in those sections dealing more directly with user.

(6) Give contracts for prototype development and initial orders to provide a market aggregation effect so as to reduce distribution and marketing costs and to allow the firm to concentrate on R&D.

(7) Undertake a comprehensive survey of current R&D capabilities for the L.E. market. This should include university and government laboratories and private firms and laboratories.

(8) Limit federal R&D projects to concept and possibly prototype development, but only utilize this means if no effective alternative exists in the private enterprise system.

(9) Initiate programs to include producers in performance standards development.

(10) Design programs to develop new capabilities with respect to evaluating purchasing and utilizing innovative L.E. equipment.

(11) Develop a program to systematically explore the possibilities of transferring technology from other sections, especially the military.

2. Law Enforcement Markets

General Statement of Issues

Apparently many products required by L.E. organizations are not produced, while others are produced and not widely distributed. There are indications of poorly developed markets and a lack of communication between producers and users. Before any effective long range program to develop L.E. equipment can be implemented, the market and its general characteristics must be determined. This includes analyzing specific markets for selected products, producer types and users. Of particular importance are the malfunctions and gaps in the marketing system for L.E. equipment. A useful way of examining these markets is indicated in the following sub-issues.

Sub-Issues

1) What are the dominant characteristics of the L.E. market?
2) What are the major characteristics of distribution channels in L.E. markets?
3) What are the major characteristics of selling procedures and practices utilized in the L.E. market?
4) What are the barriers, problems and opportunities in the L.E. market as perceived by producers?
5) To what extent can L.E. markets be aggregated?
6) To what extent are L.E. products originally developed in other sectors and transferred to the L.E. market with little or no modification?
7) To what extent is it necessary for producers of L.E. equipment to combine sales in the L.E. market with other markets?
8) How competitive are L.E. markets perceived to be?
9) What problems do firms encounter when first attempting to enter the L.E. market?

Sub-Issue 1: What are the dominant characteristics of the law enforcement market?

Definition: Dominant characteristics refer to such factors as size of the market, importance of the L.E. market to the producer, degree of product adaptation, degree of competition, utilization of bidding procedures, degree

of market fragmentation. These and other characteristics are also examined in sub-issues (2) through (8) in greater detail.

Rationale: While markets for individual products will each have their distinguishing and unique feature, it is useful to determine the general characteristics of the L.E. market. Such information will help determine the overall strategy for developing policies to stimulate and guide development and distribution of new L.E. equipment.

Hypothesis 1: L.E. markets will tend to exhibit the following characteristics:

a) The L.E. field is only of secondary importance, as a market to some producers of L.E. equipment.
b) The L.E. field is a restrictive market (small in size) in relation to the total market (i.e., non-law enforcement market for similar products).
c) Producers see law enforcement as a highly fragmented market to sell to in volume.

Findings

The character of the L.E. market is to a great extent the consequence of the extreme fragmentation of the market, i.e., over 40,000 police departments (ranging in size from one man to over 30,000) make independent purchase decisions on equipment. Purchasing by other federal, state and local law enforcement agencies is also fragmented. Utilization of one piece of equipment by one law enforcement agency does not assure that it will be accepted by others. Each potential user must be approached and persuaded on an individual basis. This fragmentation has operated as a major obstacle in marketing L.E. equipment.

The majority of companies interviewed were uncertain of the total size of their market -- except of course for those that had an exclusive piece of equipment in the market place. High technology companies were more sure of their market size than companies of medium and low technology. Most items reported were stock items; very few companies made special orders. Some would adapt their stock items to a new system, but "specials" were much too costly for the low profit margin.

Most companies did not find it economically feasible to sell just to the L.E. market. Sales in L.E. were low with marginal profit. This is partially

accounted for by tight money and a great deal of bureaucracy especially on the bidding items. Most companies did much better in other major markets such as the military, government agencies and public service organizations with the exception of voice I.D. which is used in medicine and speech therapy.

Implications

The generally negative picture of the law enforcement market emerging from the verification of Hypothesis 1 above, leads to considering two major approaches to developing innovative L.E. equipment: 1) strengthening the private sector by eliminating barriers and providing incentives for producers to serve this market, and 2) intervening with government action programs which, to greater or lesser extent, supplant the efforts of private firms in developing new equipment. Of course, it may be possible to differentiate the types of technology requiring government intervention to achieve development, but such decisions are not easily made using any clear-cut a priori premises. Whichever course is followed, information of the sort described above is necessary to design effective policies.

Sub-Issue 2: What are the major characteristics of distribution channels in L.E. markets?

Definition: Distribution channels refers to all means utilized to bring products from the manufacturer to the user. These include direct salesmen, manufacturers' representatives, catalogue sales and the use of distributors.

Rationale: It is important to ascertain the way L.E. products are distributed and to ascertain the relative effectiveness of each method. This information will aid in the development of more effective marketing programs and in designing programs to improve marketing channels.

Hypothesis 2: The level of technology incorporated in a product is a major determinant in the channel of distribution utilized. Specifically:

a) Highly technical products are sold on a direct basis.
b) Less technical or maintenance type products are sold through distributors, manufacturers' representatives, or catalogues.

Analysis of Findings

Hypothesis 2(a) is supported by the data, i.e., high technology products account for 77% (23 out of 30) of the companies using direct sales (See Table 15). However, Hypotheses 2(b) is not supported by the data. In fact, it is of great interest that high technology firms reported utilizing all methods of distribution to a greater extent than low technology firms. These differences are exaggerated by a lower response ratio from low technology firms (on this particular question).

More specifically, 46% of the tiny companies used catalogs and direct mail as their method of distribution. 38% of the small companies used both catalogs and direct mail and 43% used direct sales. 66% of the medium sized companies used direct sales and 88% of large companies used direct sales. Large companies did not use manufacturers' reps at all, while a small percentage of the other size companies did.

Among small companies, 38% employed advertising and mentioned exhibits at trade shows, 66% of the medium sized companies also employed advertising, exhibits and demos at trade shows and 75% of the large companies used demonstrations and exhibits at trade shows. An interesting comment made by a producer of trade shows was as follows:

> "the psychology of trade shows, one man commented:
>
> -- nobody goes to the exhibits... so they come up with the method of getting a card stamped (by all the booths) and you turn it in for a chance on a prize (note: I had noted many persons coming by like little puppy dogs to get their "card" stamped)
>
> -- at this show (Bank Administrators Institute), those people are not oriented to security.
>
> -- police convention exhibits do not attract any more interest than exhibits at other conventions. They go to the IACP conventions as a vacation and don't go to the meetings. They do walk through the exhibits at least once."

Most companies employed multiple methods of distribution.

TABLE 15

MANNER OF DISTRIBUTION BY LEVEL OF TECHNOLOGY

AND SIZE OF COMPANY

Manner of Distribution*	Level of Tech.	Company Size: Tiny 29 Firms	Small 21 Firms	Medium 6 Firms	Large 8 Firms	Total
Direct Sales	Lo	1	1	0	0	2
	Med	3	1	1	0	5
	Hi	6	7	3	7	23
	Total	10 (30%)**	9 (43%)**	4 (66%)	7 (88%)	30
Catalog and Direct Sales	Lo	0	1	1	0	2
	Med	5	4	1	1	11
	Hi	9	3	1	2	15
	Total	14 (46%)	8 (38%)	3 (50%)	3 (38%)	28
Manufacturers' Reps	Lo	1	0	0	0	1
	Med	0	2	1	0	3
	Hi	6	2	1	0	9
	Total	7 (23%)	4 (19%)	2 (33%)	0	13
Advertising	Lo	1	2	1	1	5
	Med	2	1	3	2	8
	Hi	8	5	0	0	13
	Total	11 (27%)	8 (38%)	4 (66%)	3 (38%)	26
Exhibits and Demonstrations at trade shows	Lo	1	4	1	1	7
	Med	1	1	3	3	8
	Hi	5	3	0	2	10
	Total	7 (23%)	8 (38%)	4 (66%)	6 (75%)	25
Distributor	Lo	0	0	1	0	1
	Med	1	1	1	0	3
	Hi	3	5	1	2	11
	Total	4 (13%)	6 (29%)	3 (50%)	2 (25%)	15
Other Methods	Lo	0	1	0	0	1
	Med	0	0	0	0	0
	Hi	4	1	0	0	5
	Total	4 (13%)	2 (10%)	0	0	6

* Most companies employed multiple distribution methods

** 30% = 10/30, 43% = 9/21, etc.

Policy Implications

More accurate and extensive information is required on the type of distribution channels, both by product type and size of firm. There is sufficient information at this point to indicate significant differences exist along both dimensions. Also, it is important to know the relative effectiveness of the various channels. Two major policy issues arise in regard to manner of product distribution, neither of which are reflected in the preceding data: 1) effective distribution channels for tiny and small producers, especially those with products requiring demonstration, extensive technical service, or user training; 2) direct access to new equipment by small users especially those who are in remote locations.

To some extent this exposure is provided at infrequent intervals at trade shows and exhibitions, but these are no substitute for direct producer-user contact when product needs are identified or when producers are able to demonstrate their products on the user's premises. One method of intervention in the L.E. market is to establish some form of centralized or joint purchasing to reduce the number of user calls a producer must make for a given number of products sold. Another is to provide a regional test and evaluation center with widespread dissemination of results.

Sub-Issue 3: What are the major classifications of selling procedures and practices utilized in the L.E. market?

Definition: Selling procedures refers to the variety of techniques utilized by producers to market L.E. equipment. These include: allocation of resources for marketing the product, advertising media, demonstrations, trade shows, technical service, meeting user specifications, bidding, and studying problems unique to law enforcement.

Rationale: It is important to know which selling procedures are effective for different types of law enforcement products. This knowledge is useful in developing policy options, especially in marketing products developed with government assistance, and in strengthening existing institutions.

Hypothesis 3: Selling procedures and practices in L.E. markets will include the following characteristics:

a) Bidding procedures complicate the selling process (extensive papers to be filled out, guarantees, etc., special purchasing, multiple shipments, etc.).
b) Technical service or training of users is required by the manufacturers of highly technical or sophisticated equipment.
c) Specifications for products are developed jointly by producer-user.
d) Sophisticated equipment is best sold by actual demonstration to the potential user.
e) Sophisticated equipment needs to be sold by highly trained individuals.

Findings

Some comments made by the producers on the bidding process are as follows:

1) "Half of the people who write bids (specifications) are idiots." Agency should specify what they want equipment to do. Instead municipalities ribbon clerks insist on technical overspecification. The first salesman in writes the specifications. Agencies frequently have to spend appropriated funds before a certain date. Rush causes them to buy wrong equipment."
2) "It (the L.E. market) is a "bit" market...i.e., the quantity is greater than for industry per order in relation to communication.... it tends to go to BID frequently, which means that the price levels go down to where the profit per unit is lower than in the commercial market. Thus, the L.E. market pays less than anywhere in the world."

"What makes the market worthwhile is that it tends to be large for each order...and they tend to innovate more.....LEAA money and assistance has helped this innovativeness.....I can do more experimentation with systems or equipment...such ideas are more difficult in industry.....and sometimes there are spinoffs for the commercial market... the L.E. market is too big and too innovative not to be in it, yet it is the least profitable overall.....it was innovative before LEAA; it always has been....e.g., the Detroit P.D. re. PORTABLE TRANSCEIVERS....the portable transceiver idea came out of conversations with them (I was there) re. better ways to handle situations that were beginning to occur....at that time, our product line was the

big model (basically the HT200, though it was not called that then) ...it was a helluva problem re. how to carry, mount, where to put cords, antennaes, etc.....but this was done without LEAA money.... there are guys who have been innovative."

3) "yes.....L.E. agencies have a tendency to pay their bills (as cf., e.g., with taxi companies), so it is attractive re. cash flow.... it is also a big market potential....further, what P.D.s use today can later be used/sold re. other businesses (P.D.s are product forerunners)"
4) "-- cash flow; they pay on time
-- they are forerunners for other markets
-- most is bid, and a negative part of this is politics, where they are low bidders and don't get the bid but the purchasing agent won't even talk about why not; thus, a lot of their dealers do not even want to bid, even though they are "home-town" people.... bidding also is a problem in that in at least one instance, they lost the bid simply because they were not known....this bidding process differs from other business bidding processes in that businesses specify what they need rather than a specific product....businesses want the best product for their money, and you have a chance to show them how and why your product is their best buy

--he notes that the Federal govt. is "clean" re. bidding (the manufacturer's product must be approved re. specs before it is even submitted for bidding)
--he also notes the "specmanship" game (writing your specs to make your product appear better)
--with State Police and city L.E. agencies, he feels he has to be in on the original negotiations, but this takes personnel and is therefore a problem."

Analysis of Findings

There is no clear cut support for Hypothesis 3(a) regarding bidding procedures. There is no quantitative data and the few illustrative comments excerpted above indicate both advantages and disadvantages to the purchasing process. Advantages include: opportunity to demonstrate product, to be in on original negotiations, and a clean market, i.e., prior product approval before submitting bids. Disadvantages include politics, producer must be known to purchaser, and lack of experitse among users in writing specifications.

No data of significance was collected regarding Hypotheses 3(b), 3(c), and 3(d), although they are still presumed to be true, based on impressions gathered by interviewees. Hypothesis 3(e) is supported on a qualified basis, but so few responses were obtained on characteristics of salesmen (see Table 16) that it is not possible to make firm assertions. Secondly, technical qualifications are also a prerequisite of salesmen in firms with an intermediate level of technology. Lastly, there were only two responses from firms with low technology and neither of these indicate technical qualifications, other than those gained by experience.

Table 17 indicates that several journals are used to advertise L.E. products. Those most often cited are Law and Order (6) and Police Chief (3), although most citations were not specific.

Policy Implications

Bidding procedures should be considered in conjunction with a more extensive analysis of purchasing procedures (see section 7: Equipment Acquisition Process)

An analysis of salesmen's qualifications raises the question of how well salesmen meet these requirements especially those imposed by the technical sophistication of the product. Low user capabilities invite producers to lower their standards for sales and technical personnel. In part, this can be offset by regional testing and evaluation of products and upgrading user capabilities.

Sub-Issue 4: What are the barriers, problems and opportunities in the L.E. market as perceived by producers?

Definition: Barriers refer to obstacles as perceived by producers which either inhibit entry into the L.E.market or constrains marketing efforts of

TABLE 16-SALES CHARACTERISTICS OF L.E. SALESMAN USING DIRECT SALES

Technology of Product		
Low (2 responses)	Medium (8 responses)	High (6 responses)
• Familiarity with guns • 35-40 years - good background selling	• Expertise in electronics • Tech background, market skills experience in L.E. • Product knowledge • Selling background • Experience as court recorder • Mechanic engineer know photograph & sales • Tech - application feasible • Ability to sell	• Will have equipment knowledge & perseverance, basic honesty with product • Smooth selling technique ability • Product knowledge, tech oriented systems understanding • Good salesman - willing to work • Understanding user needs, product knowledge • Tech orientation - product knowledge

TABLE 17- MEDIA EMPLOYED BY PRODUCERS WHO ADVERTISE

Level of Product Technology	Size of Firm: Tiny (11 firms responding)	Small (8 firms responding)	Medium (4 firms responding)	Large (3 firms responding)
Low Technology Product	1 1 Law & Order *(1) Made to Measure	3 3 L.E. Publications (1) Gun World	0	0
Medium Technology Product	7 (2) Law & Order (3) Police Chief (1) National Sheriff (1) Security World (1) L.E. Journals 2 N/A 1 Trade Shows	2 1 L.E. Journals 1 N/A	1 1 Law & Order & Other Journal	0
High Technology Product	3 1 L.E. Journals Communications 1 Non L.E. Journals 1 Fuel Oil News Radio Communications	2 1 Law & Order 1 L.E. Magazines	3 (3) L.E. Magazines (1) Signal Magazine 1 International Publications	2 2 L.E. Journal
Floaters (Mixed Technology)	1 APCO 1 Fire Engineering 1 Business Radio Action 1 Law & Order	1 1 L.E. Journal 1 L.E.		1 1 L.E. Journal

*( ) - Multiple response

those already selling in this market. Problems refer to unsolved issues which producers confront in marketing L.E. equipment. Opportunities refer to the perceived potential for development in the L.E. market.

Rationale: It is essential to know producers' perceptions of the L.E. market, if policies are to be developed to influence the scope, direction and innovativeness of producer activities. It is necessary to ascertain the accuracy of their perceptions and modify those which are inaccurate and where they are accurate, to assist in removing barriers, solving problems and enhancing opportunities.

Hypothesis 4: Producers will view the L.E. market as one in which barriers and problems far outweigh opportunities in their scope and significance. That is, producers will have a generally negative attitude toward the L.E. market.

Findings

In general, this hypothesis is supported in the qualified responses to the inquiry regarding identification and evaluation of L.E. markets, their problems and potentialities.

The following comments were made by interviewees:

1) "Finding the person who makes the purchase decision is a major problem. The process (purchasing) is a maze." "Don't have expertise to defend infra-red viewer in the budget." "Example of Japanese National Police Force. Test and evaluate equipment for L.E. If they think equipment is beneficial they will influence the distributors of the equipment. For smaller, less wealthy police departments, the national P.D. will assist in funding and procurement. For larger, wealthier P.D.s, the national will exert pressure to have them acquire and use equipment."
2) "No national standards for equipment. Need to research and market each state separately due to differing standards."
3) "It takes one and one half years from the first contact to purchase. Need other business to afford own equipment for production."
4) "Regarding communication equipment, it takes too long (2 years) to get FCC type acceptance of a new transmitter."

5) "Police don't have enough money, education (that order) and are handicapped by the legal system, in their opportunities to do a better job."
6) "Bidding Chiefs often lack technical skills so studies don't follow through."
7) "Lack of information on what is needed."
8) "High opportunity cost, lack of information dissemination, uncertainty over what will sell."
9) "Relatively low level of acceptance by LEAA and lack of funds in police budgets for new equipment."
10) "Limited markets."
11) "L.E. market: this is too unstable to attract business...e.g., when LEAA puts up money, it attracts business, but then when they don't... the more equipment is really needed, the less likely it is to be budgeted."
12) "**Politics:** a mayor has so many groups (including L.E. groups) to contend with, and the groups are interested in themselves, and so these groups watch each other..."
13) "**Training:** having equipment without upgrading of personnel is a problem."
14) "A prime example of the major problem in law enforcement equipment is the nonexistence of reliable information on what products exist. Your study should focus on dissemination, not innovation."
15) "...the equipment is the same, but prices are doubled. He blames manufacturers."
16) "all P.D.s operate so differently....i.e., some may get money and others may not."
17) "would like equipment at a reasonable cost."
18) "felt that so many new products are simply a waste of money because they are no good or do not do what they are supposed to do. He feels such products should not be allowed."
19) "L.E. agencies have no one technically qualified to say if they are getting a good deal or are getting screwed."
20) "the small company with a good product has no ability (because of limited financial ability for P.R., etc.) to communicate; further L.E. agencies have lesser confidence in the smaller companies."

21) "the procurement situations of L.E. organizations is bad... they don't have adequate data for judgment, nor do they control the money to be spent in purchasing equipment.....i.e., those who control the funds and those who know what they are doing are two different sets of people, and there is no pipeline of communication."
22) "Few companies have made large sales in the L.E.-C.J. field.... there are large markets for fleet autos, computers, electronics, i.e., where the company has a product and can adapt it to L.E.-C.J. use."
23) "people are trained in their equipment and there is the spare parts problem....an L.E. agency compounds its problems if it uses a variety of manufacturers."
24) It is a hazardous market. Large companies will not go under if the L.E. market slips, but small companies would. For example, there was the LEAA boom, but now a lot has dried up because of criticism of equipment (hardware) purchased by P.D.s."
25) A lot depends upon the local budget. Here, if there is a choice between (a) a raise, (b) training, and (c) equipment, the choice would be in that order, with the raise being clearly the priority choice because it is less of a political problem for cities than spending money elsewhere."
26) Criminal Justice, esp. P.D.s, have not always spent money prudently in the past, and this hurts the market."

Summary of Findings

1) Several key factors stand out as barriers. These include:
   a) Purchasing procedures (see (1) and (21) above)
   b) Lack of user technical expertise (see (1), (5), (13), and (19) above)
   c) Lack of national standards for equipment (see (2), (18), and (23) above)
   d) Length of procurement cycle (see (3) and (4) above)
   e) Limited funds (see (5), (9), (20) and (25) above)
   f) Bidding procedures (see (6) above)
   g) High opportunity cost (see (8) above)
   h) Uncertainty over product marketability (see (8), (11) and (24) above)

i) Lack of acceptance by LEAA's (see (9) above)

j) Limited markets (see (10) and (22) above)

k) Political influence (see (12) above)

1) Reliable information (see (14) above)

m) Increasing price of equipment (see (15) and (16) above). Note: It is not clear from the responses the extent to which this is the result of inflation and the rest due to a manufacturer's marketing advantage.

n) Product quality (see (18) above)

o) Confidence in producer (see (20) above)

p) Past pattern of expenditures (see (26) above)

2) The question apparently hit a fruitful area of investigation. Each of the several dimensions (a-p) should be examined in more detail to determine the relative importance and interrelatedness of these factors.

3) Factors (a-p) are especially important in limiting the entry of new firms in the L.E. market.

4) Considerable know-how is necessary on the part of the producer in dealing with L.E. agencies.

5) Barriers are especially hostile to the introduction of innovation equipment since they increase risk and uncertainty.

6) Differential technical sophistication of producers and users may be a major problem in marketing in the L.E. market. If the market is large enough the producer can adjust his marketing tactics with appropriate personnel. In small markets it may not be worth it to him.

7) Innovation for L.E. equipment may be a low producer (and for that matter user) priority.

8) The L.E. market may be secondary to a large number of producers. It is important to find out the extent to which this is a factor in key product areas.

TABLE 18

PERCEIVED ATTRACTIVENESS OF L.E. MARKET BY SIZE OF FIRM

		Perceived Responsiveness			
Size* of Firm	Product Line	Yes	No	Qualified Response (Y=Yes, N=No, UC=Unclassified)	No Response
Tiny	Portable Transceiver	2			2
Small		3		1-No, market is too small and too specialized (N)	1
Medium		2		1-Yes, highly competitive (Y)	
Large		1		1-Yes, profit is low due to competitive bidding (Y)	3
				1-Not especially (low profit margin) (N)	
Tiny	Voice I.D.			1-L.E. is an excellent market (Y)	
Small				1-No, tight money, bureaucracy, more attractive markets -- medicine, speech therapy (N)	
Tiny	Non-lethal Weapons		2	1-Yes, if we market product at $1.50/unit (Y)	1
Small		1			
Large		1			
Tiny	Body Armor	3	1	1-No, too small, limited sales (N)	5
				1-Two years from now, yes; now, no (N)	
Small			1	1-Marginal profit but otherwise attractive (Y)	1
				1-Hard market..takes lots of money (in) big cities (UC)	
Large				1-Market is diffused and fractured (N)	
Small	Court Recording	1			
Large		1			

* Refers to corporate or division size.

(Table continued on following page)

TABLE 18 (Continued)

PERCEIVED ATTRACTIVENESS OF L.E. MARKET

Size of Firm	Product Line	Perceived Responsiveness: Yes	No	Qualified Response (Y=Yes, N=No, UC=Unclassified)	No Response
Tiny	Weapons Detection			1-Not an attractive market (N)	2
				1-Yes and growing market (Y)	
				1-Not so far (N)	
				1-Courts are a big market (UC)	
				1-We think it could be; have not surveyed (UC)	
Small				1-Not really; a small sideline to L.E. (N)	2
				1-Soured on L.E. (N)	
				1-Yes obvious application, but market (is) inadequate (Y)	
				1-Discouraged from market; standards not universal; hassle of standards (N)	
Medium	Vehicle Locator			1-Yes, is commercial once developed, stable, reasonable, predictable, expanding (Y)	
Large				1-just gotten into market (UC)	1
Tiny	Low Light Photography	1	1	1-Not at present (N)	1
				1-Very attractive (Y)	
				1-Extremely difficult; requires winning buyers (UC)	
Small			1		
Medium			1		
Large				1-Limited (N)	1
				1-All products go through dealers (UC)	

(Table continued on following page)

TABLE 18 (Continued)

PERCEIVED ATTRACTIVENESS OF L.E. MARKET

Size of Firm	Product Line	Perceived Responsiveness: Yes	No	Qualified Response (Y=Yes, N=No, UC=Unclassified)	No Response
Tiny	Utility Belt and Holster	3			
Small		2		1-Yes, demand and production to increase (Y)	
Total		21	7	29 (Yes=10, No=13, Unclassified=6)	22

Grand Totals	Yes	31
	No	20
	Unclassified	6
	No Response	22
Total Number of Product Line Assessments		79*

*Some companies interviewed make more than one product for the L.E. market

TABLE 19
PERCEIVED ATTRACTIVENESS OF L.E. MARKET BY PRODUCT

Product Line	(1) Yes	(2) No	(3) Unclassified	(4) No Response	(5) Attractiveness of Market *
Portable Transceiver	10	1		6	Highly attractive
Utility Belt & Holster	6				Highly attractive
Court Recording	2				Attractive
Vehicle Locator	1		1	1	Attractive
Non-Lethal Weapons	3	2			Moderately attractive
Voice I.D.	1	1			Moderately attractive
Body Armor	4	5	1	5	Moderately unattractive
Weapons Detector	2	5	2	2	Unattractive
Low Light Photography	2	5	2	2	Unattractive

*Based on ratio of Column (1) to Column (1) + (2)

TABLE 20

PERCEIVED ATTRACTIVENESS OF L.E. MARKET (LEVEL OF TECHNOLOGY)

Reporting Companies = 56

Size of Company	Level of Technology: Low Yes	Low No	Medium Yes	Medium No	High Yes	High No	Total by Size Yes	Total by Size No
Tiny 25	3	0	9	10	3	0	15	10
Small 17	3	0	3	6	3	2	9	8
Medium 6	0	0	1	2	3	0	4	2
Large 8	0	0	3	2	2	1	5	3
Total by Tech.	6	0	16	20	11	3	33	23

TABLE 21

PERCEIVED DIFFERENCES IN L.E. MARKET AND OTHER MARKETS

Size of Firm	Product Line	Perceived Differences
Small Medium Large	Portable Transceivers	- Cash flow, pay on time, forerunner of other markets; mostly bid. - Size of market, small not enough standardization - Highly specialized, bid business, politically oriented. - More sophisticated, stringent regime, tougher. - Competitive bids - more sales service; more paperwork; performance requirements very high; competitive bids - Competitive bids; lack of sophistication of users
Tiny Small	Non-lethal Weapons	- More receptive, critical need situation - Discriminating market; L.E. agencies (have) considerable initiative
Tiny Small	Body Armor	- Smallness of sales - More specific kind of market; takes more labor (i.e., sale effort) for L.E. industry - Lack of standards. Too willing to believe sales pitch; don't understand available standards
Large	Court Recording	- Not sure L.E. is viable industry
Tiny Small Medium	Weapons Detection	- Seldom have large single sale in L.E. market; not a standardized market - It is a personal market - All technology; weak in utilization - Results (are) measured better in industry - L.E. (is) too inconsistent; L.E. reluctant to assemble kits

(Table continued on following page)

TABLE 21 (Continued)

PERCEIVED DIFFERENCES IN L.E. MARKET AND OTHER MARKETS

Size of Firm	Product Line	Perceived Differences
Medium	Vehicle Locator	- Direct selling (is) difficult; different people in their thinking diverse; under public eye both in group and as individual; military is great company
Tiny	Low light Photography	- Can not communicate - Poor decision making; bureaucracy; slow payer - Unknowledgeable buyers - Don't know contacts; not educated; bribing
Small		- Budget cycles difficult to work in
Medium		- Lack of sophisticated buyers; bidding headaches; volume too small
Large		- High cost; low sales for marketing

Analysis of Findings

The problems of L.E. markets, as perceived by producers, are extensive as the foregoing illustrative list and summary indicate. These problems are enumerated as starting points for more intensive analyses, since there is no indication of the incidence of these problems, nor their relative priority.

The perceived attractiveness of the market is not easily analyzed. Ostensibly, the market is attractive to a majority of the firms interviewed (31 found it attractive against 20 who found it unattractive). However, many of the responses were qualified (see Table 18). Also, the attractiveness of the L.E. market varied among the various product lines (see Table 19)

In view of these negative perceptions of the L.E. market, it was surprising to find that the majority of the companies reporting felt the L.E. market was an attractive one (see Table 20). High technology and low technology producers felt it was the most attractive. Actually, medium

and large companies said "yes" by a greater percentage probably because they have the marketing staff to do research, where small and tiny companies do guess work or go by sales since their incomes are limited by size. As in the case of Hypothesis 2 in the preceding section on the R,D&E process, many apparently positive reactions to the L.E. field were qualified or tempered by reactions to several problem areas.

Finally, the L.E. market is perceived by some interviewees to differ significantly from other markets in which they operate. Some noted negative factors such as bidding, small market size, and user personnel limitations, while others noted positive features such as level of sophistication, more receptive, and forerunner of other markets. (See Table 21)

In view of these varied reactions, Hypothesis 4, as stated, is not supported, and, in general, the high incidence of problems cited and qualifications on opportunities are indicative of limited commitments of many producers to the L.E. field.

Policy Implications

Each of the problems listed above in the summary of findings, is indicative of important policy issue. They are all covered elsewhere under appropriate sub-issues.

Sub-Issue 5: To what extent can the L.E. market be aggregated?

Definition: Market aggregation refers to the extent to which a standard product can be sold in the L.E. market without having to make product modifications to meet individual user needs.

Rationale: This is an issue of critical importance. If markets can be aggregated, then many of the techniques of mass marketing and production and product standardization can be utilized. On the other hand, if users require a number of modifications, then the market will have the high marketing and production costs associated with small orders and considerable customer service. Especially important is the need to ascertain the extent of misconceptions regarding market aggregation.

Hypothesis 5: Special requirements of individual users will cause producers to make changes in their product which will limit the possibilities of aggregating the market, mass production, and product standardization.

Findings

1) This hypothesis, so far, has not been supported. Producers were asked whether they could generally sell stock equipment or were there local conditions which make major and/or special modifications necessary? The great majority of responses were that they sold from stock, or stock products with occasional modifications. A minority made regular local modifications. Additional observations based on interview comments:
    1) Most companies interviewed sell to L.E. agencies from stock.
    2) Producers do not want to make product modifications.
    3) Most producers make product modifications in order to accommodate the user, not to protect their markets (product differentation).
2) In reply to a question asking what problems did the demand for special designs create for them, most reported no problems. Problems that did receive mention were time, "creates higher production costs and causes personnel problems", "favors U.S. manufacturers - since they do this better than foreign firms."
3) Producers were also asked, how much did they modify equipment to meet individual user requirements and perferences? Most replied that they made either no or only slight modifications. (One reply was that modular construction permits modification and potential addition of features.) A minority indicated major modifications or "made as necessary" (where profit margin permitted).
4) Interviewees were also asked how much adaptation to local requirements went on? Most responded that there was none or only a little. They were also asked how much of a necessity is this adaptation to local requirements and again the majority felt that it was of little or no importance, although there was an indication that urban versus rural as well as city size did require some adaptation.

To the question of what problems does special adaptation of problems create, most producers replied none. Some did indicate problems of time, effort, etc., that it creates more costly products and places stress on people relationships. Most producers felt it was not possible to be profitable and innovate just in the law enforcement part of the business, although a large minority did not see it this way.

Policy Implications

A few firms can make it by serving only the L.E. field. The characteristics of these firms and their products should be determined as well as how they differ from firms serving the L.E. field only incidentally. Incentives to innovate L.E. equipment may differ considerably between the two classes of firms.

Sub-Issue 6: To what extent are L.E. products originally developed in other sectors and transferred to law enforcement market with little or no modifications?

Definition: Other sectors refers to any market other than law enforcement.

Rationale: It is important to know the source of innovations for the law enforcement market. If most major product innovations are transferred from other sectors, it may make sense to go directly to these sources for L.E. innovations, rather than attempting to build R & D capabilities exclusively for law enforcement.

Hypothesis 6: Law enforcement products are usually developed in other sectors and adapted to L.E. needs with little or no product modification.

Findings

Based on the data in this study, this hypothesis is supported. Most producers indicated that their law enforcement products were an extension of and/or a modification of products developed for other sectors. That is, circumstances leading to the developement of the products were not the L.E.

market as such but products were developed because of a need -- the armed services, hijacking, the riots, treasure hunters, industrial security and aviation.

Nine companies reported that their product was developed just for the L.E. field and market, a very small segment of the companies interviewed.

Policy Implications

1) According to firms interviewed, L.E. equipment is primarily a modification of equipment developed for other markets.
2) If true, this has important implications for the development of innovative equipment for the L.E. field, eg., it may have to be developed first for (or in conjunction with) other markets.
3) These findings also imply that measures must be taken to insure a) knowledge of product innovations in other markets that may be relevant to L.E. and b) means are available to make this equipment available to L.E. agencies and c) methods of stimulating inventions.

Sub-Issue 7: To what extent is it necessary for producers of L.E. equipment to combine sales in the L.E. market with other markets?

Definition: This issue refers to the producers need to sell the same product simultaneously in law enforcement and other markets.

Rationale: It is felt that firms wholly dependent on the law enforcement market will react differently to incentives to increase or change the scope of their marketing efforts than those to whom L.E. equipment is a sideline.

Hypothesis 7: Most producers of L.E. equipment will consider it necessary to be in other markets in addition to L.E. markets.

TABLE 22

ECONOMIC FEASIBILITY OF MARKETING EXCLUSIVELY FOR L.E. MARKETS

	Economic Feasibility			
Type of Equipment	Yes	No	Qualified Response	No Response
Portable Transceiver	4	5		4
Voice I.D.		1		1
Non-lethal Weapons	1		1 - Depends on support we get 1 - Project cancelled - lost money 1 - Yes, as a phase out 1 - Product not a profitable item	
Body Armor	3	3		5
Court Recording		2		
Weapons Detector		4	1 - Only market but it is small 1 - No, not for large corporation because (it is a) slow moving evolving market	4
Vehicle Locator			1 - Sales never high - very few sold	2
Low Light		6	1 - Barely but less so 1 - No, but pays bills 1 - No, but there is potential 1 - Delays in selling L.E. agencies	1
Utility Belts and Holsters	4		1 - Yes, private security too	1
Total	12	23	12	18

Analysis of Findings

The data from this study tend to support this hypothesis. Most producers felt that it was very or moderately important in terms of profitability and innovation to be able to combine their law enforcement equipment with equipment sold in other markets. For example, out of 44 companies, 66% of companies felt it was not economically feasible just to be in the L.E. field, while the remaining 34% felt the L.E. field was a big enough market to stand by itself.

Policy Implications

The fact a majority of the firms interviewed found it necessary to also sell in other markets is indicative of the marginality of the L.E. market. This may result in certain benefits of an increased infusion of new technology through a common sales force. It may also result in insufficient attention being given to the L.E. market by producers. The latter situation reflects the general problem of strengthening the market and other producer-user contacts.

The mixture of firms operating in several markets include L.E. while other firms operate solely within this market, complicates the problem of implementing any set of policies to strengthen the market. This is a result of the different level of commitment which is likely to exist with these two types of firms.

Sub-Issue 8: How competitive are L.E. equipment markets?

Definition: Competition refers to the number of firms making a similar product and capable of selling it to the same users.

Rationale: It is generally assumed that competition leads to product improvements and lower prices. To the extent that markets are not competitive it is often assumed that these two advantages do not occur. To the extent that this promise is true, it is important to ascertain the extent of competitive practices in a given market.

Hypothesis 8: Law enforcement markets are generally not competitive.

TABLE 23

PRODUCERS' APPRAISAL OF DEGREE OF COMPETITIVENESS OF MARKET

Product	Low	Medium	High	N/A*	Total
Utility Belts	0	0	6	1	7
Body Armor	1	4	5	5	15
Portable Transceivers	0	1	15	2	18
Non-Lethal Weapons	2	0	3	1	6
Court Recording	2	0	0	0	2
Building Design	0	2	0	0	2
Voice I.D.	2	0	0	0	2
Vehicle Locators	0	2	0	1	3
Weapon Detection	1	1	2	5	9
Low Light Photography	3	0	7	1	11
Total	11	10	38	16	75

*Not Appraised

Analysis of Findings

The competitiveness of the market varied with the type of equipment, not necessarily the degree of technology or the size of the company. Utility belt manufacturers and portable transceivers producers found the market highly competitive. Over 50% of the producers of non-lethal weapons and low light photography felt the market was highly competitive, but less than one third felt there was low competition. Building design and vehicle locators fell right in the medium degree of competition. Court recording and voice I.D., newcomers to L.E., felt the competition was low. Weapon detection and body armor was spread over all three categories with highly competitive being the most significant.

With these differences according to product line, it is difficult to generalize about the competitiveness of L.E. markets, although 64% (38 out of 59) of the firms responding perceived their markets as highly competitive.

It should be recognized that even in a competitive market where one or two firms dominate (e.g. transceivers) the majority of firms might still tend to "perceive" their environment as competitive. Further research is required in this area.

Policy Implications

Assuming the extent of competition is indicative of product improvements and lower costs, it is important to insure that these conditions prevail. This implies considerable government intervention in markets which have developed on a marginal basis. This presents a major problem since the size of many markets is not sufficient to insure more than a very limited number of firms.

The degree of competiton must be examined more extensively in the important product lines, so that policies can be implemented more effectively. More important, the extent of competition must be evaluated in terms of its impact on innovativeness, product quality, price and service.

Hypothesis 9: Innovativeness is a basis for competition in law enforcement markets.

Findings

There is some limited support for this hypothesis. Many producers felt that there was competition between firms on the basis of innovation. One producer reply was "If anything is developed, it is copied." Another replied, "To maintain its share of the market, -------, -------, -------, compete in upping the state of the arts in the hand mobile communications field." A third producer indicated that there was not really competition on innovation. Another replied, "The companies in this field are weak companies as far as innovations because of the types of companies involved". Beyond this, few comments were made on innovativeness as a basis for competition.

Policy Implications

Apparently, innovativeness is a basis for competition in some L.E. markets. There is a need to identify the degree of competition by major product types to ascertain its impact on innovation.

Sub-Issue 9: What problems do firms encounter when first attempting to enter the L.E. market?

Rationale: If firms are to be attracted to the L.E. market, it is essential to know the major problems they will face so that action can be taken to mitigate their problems.

TABLE 24

PROBLEMS PERCEIVED FOR NEW COMPANIES ENTERING THE L.E. MARKET

Size of Firm	Product Line	Problems Perceived
Tiny	Portable Transceivers	- Financial backing - Competition for larger companies
Small		- Getting to be known - being aware of market needs - Financial resources - Product acceptance
Medium		- Manpower, money, reputation, specifications - Competitive engineering, sales competition - Recognized reputation, high volume, low profit
Large		- Lack of expertise, money, experienced salesmen - Very competitive financing - Large amount of capital, distribution, maintenance required, customers are unsophisticated
Tiny	Non-lethal Weapons	- Money, credibility, size - Sales, volume - Establishing contact with L.E. agencies
Tiny	Body Armor	- Not a large market so a new company would have little to sell - Not many get a product; selling it - Mainly money - Reputation, getting known, diffused market - Trouble gaining access to buyers
Small	Court Recording	- Credibility, personal knowledge, immediate responsiveness to market

(Table continued on following page)

TABLE 24 (Continued)

PROBLEMS PERCEIVED FOR NEW COMPANIES ENTERING THE L.E. MARKET

Size of Firm	Product Line	Problems Perceived
Tiny Small	Weapons Detection	- Market saturation with competitors - Very competitive, must educate seller (i.e., distributor) - No experience - Maintenance of sales volume - Product has to adapt to L.E. use, hazardous market, demand dries up quickly - Similar to all commercial markets, a large number of display models is required, getting expenditures in next year's budget
Medium Large	Vehicle Locator	- Small company, can't afford best people - Limited budgets, sell at only one level, extreme rank consciousness - Not enough money for system, too long to wait for sale
Tiny Medium	Low Light Photography	- No demand - Need large amount of capital; very technical - Hard to handle L.E. political influences; highly competitive - Volume too small; purchasing procedures
Tiny Small	Utility Belts and Holsters	- Develop good products and representatives - Tight market - Competing with major established company - Market crowded, competition

Analysis of Findings

The above list of problems makes it apparent that entering the L.E. market is no easy task. However, as in any list such as this, the incidence of these problems by product line and size of firm must be determined before policies can be designed and implemented.

Policy Implications

Entry into the L.E. market should be facilitated so that new firms with innovative L.E. equipment can attempt to sell their product without insurmountable barriers. The importance of new firms entering the L.E. equipment field underscores the need to get better statistics on the size, growth rate, entry and exit of firms, and their rate of innovation in the L.E. field.

Areas Requiring Further Research

1) Analysis of market size by product line to determine funding available for R,D&E from private enterprise for product development; requirements (if any) for external funding; and number of firms which can be economically supported by the market.
2) Determination of the extent to which sales in non L.E. markets must be combined with L.E. markets.
3) Assessment of the degree of competition in each of the major product lines and its impact on product development, cost, quality and service.
4) Comparative analysis of the effectiveness of alternative channels of distribution by product line and size of firm.
5) Identification of problems encountered by firms entering the L.E. market and assessment of their incidence and relative importance by product type and size of firm.
6) Identification of the patterns of technology transfer for new L.E. products originating outside the L.E. market.
7) Determination of the impact of the bidding process on distribution patterns by product line and product size.
8) Analysis of the buying patterns of different types of users in each of the major product lines.

Illustrative Policy Options

1) Dissemination of market information -- There is a need to have comprehensive studies made of actual equipment needs in L.E. agencies. These probably require government sponsorship to assume widespread dissemination after their completion.
2) Centralized purchasing -- A centralized agency would be able to test, inspect, and recommend the best equipment as well as purchasing it in an economical lot size. This would make it easier for producers to sell their products as well.
3) Equipment rental -- One means of insuring exposure to new equipment would be to rent it for a trial period with an option to buy. Such arrangements may not be feasible for small producers and worthwhile to larger ones. Arrangements for rental could be undertaken in conjunction with centralized purchasing (see (2) above).
4) Joint purchasing arrangements -- An option at the local or state level to combine purchasing power.
5) Subsidized prices -- Some law enforcement agencies are not able to purchase all their basic equipment needs much less new innovations. Arrangement to distribute equipment to these organizations should be explored.
6) Need contacts to survive and many existing companies are small and they need protection. They are certainly not given it now because of patent costs and laws. If new person came in, he would have edge for short term until product, assuming it was innovative, was copied. Otherwise, a new company would not really be able to survive, if it were just going to produce the existent products, without contacts.

3. Information Transfer and Dissemination

General Statement of Issue

This issue deals with the communication that takes place between various elements of the R&D system in law enforcement. This includes communication from producers to users, other sources of information by which users learn about products, communication from users to producers, and the sharing of information between users.

Specific areas of concern are with type and adequacy of information available, sources and credibility of the various information sources to L.E. users, the feedback from users to producers and the extent to which producers encourage and utilize such feedback and the patterns and extent of user to user communications.

Sub-Issues

1) Can the communication that takes place between producers and users be improved?
2) What is the usual pattern of communication between users and how can this method of information exchange be improved?
3) What role can the government and other third party sources play in the dissemination of information?

Sub-Issue 1: Can the communication that takes place between producers and users be improved?

The exchange of information is a definite problem in law enforcement with respect to innovative equipment. Information dissemination is both limited and distorted. The most serious problem rests in the transfer of information between producers and users. These two components of the R&D system neither respect one another nor attempt to communicate very extensively with each other. As long as this difficulty persists, the utilization of innovative equipment in law enforcement will be seriously impaired even when producers are conscientious about developing useful innovations and users are desirous of new and improved equipment to aid in law enforcement.

The Producers (N=71)

Communication To Determine User Needs:

Producers show little effort to solicit user input on the development or modification of equipment. In those instances where a law enforcement user has had suggestions or recommendations to make regarding the creation of innovative equipment, these ideas have been communicated generally only through the initiative of the user who contacts appropriate

producer either formally or at conventions. In addition to this fact that most innovations are developed and manufactured by producers rather independent of solicited user input, most of these producers (with the exception of some larger companies who also actively service users in other fields) also make little or no attempt to gain information from users in the form of market research after a product is developed in order to develop an accurate estimate of demand. Few producers indicated having a truly realistic idea of how a product will sell. In fact, there were several situations in which companies overperceived demand by misinterpreting (overgeneralizing) the enthusiasm that was communicated to them by a limited number of users who were hardly representative of the range of law enforcement agencies.

Communication to Determine Effectiveness:

Coupled with the rather limited effort that most producers exhibit regarding determination of law enforcement needs directly from users is the general failure of producers to solicit feedback from users regarding equipment effectiveness. Unless complaints are made by the users, most manufacturers are unaware of difficulties that might arise more than infrequently regarding either maintenance or utilization. For instance, many users of voice identification have experienced annoying maintenance problems rather frequently although the producers did not acknowledge an awareness of this situation.

The failure of producers to determine user needs and equipment effectiveness is attributed to several factors. One structural cause is the separation of producer and user. These parties are buffered by salesmen or distributors who do not consider such activity as part of their role. When the salesmen are uninterested in performing this function and no other formal channels of communication generally exist, it is not surprising that potentially significant information is frequently not exchanged. A second reason is that many producers simply don't want input from users. This is based on a fairly widespread belief among company representatives that law enforcement personnel are not knowledgeable. Given the view that most users aren't smart enough to know what they need and frequently aren't sophisticated enough to adequately make use of existing equipment capability, most producers feel no desire to get information from law enforcement users because they do not see such input as having much credibility. A third reason is that many companies

view the law enforcement field as only marginally profitable (and then frequently only when the product is sold in conjunction with other markets) and therefore don't see much payoff from making the effort to know what is happening regarding needs or successes and failures.

Communication About Product Line:

As expected, producers are far more conscientious in communicating about the equipment they have for sale. In order of importance, the most frequently adopted means of communicating about products is: direct sales, magazine advertising, and convention exhibits. Mailings and free samples are also used on occasion. Generally a company relies upon some combination of the three most prevalent marketing approaches. A special problem exists for the small producer. He frequently lacks the money and manpower necessary to communicate widely to users about their products. Therefore it is more difficult to create awareness of their product list. Typically it is the small user and the rurally situated user who is most likely to suffer from this limited ability to communicate.

In addition to product availability, many producers also make the following supplementary information available either to consumers or potential consumers.

Type of Information

	standards	list of previous purchasers	instruction manual	service manual
% of producers supplying the information	26%	42%	48%	26%

Quotes on Producer Attitudes Toward the User

"Equipment is not useful until L.E. groups are educated about the new technology and its application."

"Equipment is more sophisticated than the user. Too often they go in for gimmickery."

"We actually seek and receive very little feedback."

"The small company with a good product has no ability (because of limited financial ability) to communicate. Furthermore, L.E. agencies have less confidence in the small companies."

"Our company is physically and financially constrained and can't get to potential buyers who would buy the product if they could see it."

The Users (N= 47)

User Communication of Needs:

Twenty one per cent of all producers indicated that they had received information regarding user equipment needs in law enforcement. In only one fourth of these instances was this information solicited by the producer; in all other instances the users initiated the exchange. This usally occurs through personal contact. This personal contact generally involves finding the appropriate channels of communication. User needs would be communicated more readily if 1) Formal channels already existed, or 2) the users were not constrained by their intense distrust of producers. This attitude severely limits any desire or willingness on the part of users to express their views to producers. Largely it appears that this view is based on unfortunate personal experiences rather than some ill formed stereotype that was largely perpetuated due to rumor and misinformation.

User Communication Regarding Effectiveness:

Again, there is an unwillingness to communicate anything to producers. In the area of effectiveness, lack of trust is only one reason. Typically it appears that most users perform informal and rather crude evaluations (if any at all) and most users do this for personal information or because of a government requirement. In either case, users generally make no effort to publicize the results so that either the producers or other users might benefit from their experience.

User Communication Regarding Desire to Purchase:

Because of user attitudes regarding producers, most users are hesitant to base their purchase on information provided by salespeople. Therefore, most information about innovative equipment is solicited from users currently operating the equipment under consideration. Only after, the initial impressions are formed on a basis of information supplied from other users.are producers either contacted or listened to seriously. At this point other users have suggested specific producers (to use or avoid so that information is only seriously sought and processed from a limited number of potential suppliers. Information exchange during the prepurchase phase is therefore limited to later stages and occurs only among a small proportion of potential sources of information.

User Quotations:

"If we had an idea for new equipment, we wouldn't know right now where to go or to what manufacturer."

"We view L.E. equipment salesmen with suspicion."

"We rely heavily on other Police Departments to learn about new products. We have an inherent distrust of manufacturers..in fact one salesman almost killed himself demonstrating a poor product to the department. We learn about less than 20% of all innovations via manufacturers."

Policy Implications:

1. Work on training programs designed to improve the willingness of producers and users to communicate with each other.
2. Develop centralized function (eg. a national clearinghouse) which will more readily permit communication. Both small producers and small users are seriously limited in their ability to either obtain or disseminate pertinant information under the existing R&D system.
3. Convince users (through training programs, etc.) of the positive consequences that would result from more readily reporting to others the results of innovative equipment they have purchased and utilized.

Sub-Issue 2: What is the usual pattern of communication between users and how can this method of information exchange be improved?

Most of the users reported that they rely primarily on other users to learn about new developments regarding innovative equipment. This dependence on other users is basically due both to a desire to take advantage of the expertise and experience of more innovative users and also to avoid the need to rely on producers who are typically viewed with distrust if not contempt. There are definite gatekeepers in law enforcement and information on availability and effectiveness of new equipment diffuse downward from these users. The advice of these innovative users is frequently solicited and typically followed regarding adoption, what to buy, and from what source.

Most communications between users is informal, occuring through discussions at association meetings, as a result of conversations with friends and acquaintances in other departments, or by direct contact when a specific need arises. Typically, communication between users follows this type of pattern:

a) Small users generally obtain information at regional and state and local L.E. meetings.

b) Medium size users obtain information from other users of equal or larger size within their state.

c) State police get information from other state police or from regional meetings.

d) Large users typically

(1) buy minor (unsophisticated) equipment direct from producers.

(2) for larger purchases

(a) some buy direct from manufacturer on basis of internal evaluation (36%)

(b) some seek information from other large L.E. users (large but not really an early innovator) 34%

(c) others obtain information from non law enforcement equipment users. (26%)

Thus, there is a definite pattern to the exchange of information between users. Typically the users who need the information act as the initiators of the communication. They generally contact other users of similar or somewhat larger size. Small law enforcement agencies are hesitant to contact very large users. Largely this is because they are uncomfortable about making requests of such busy departments where there is no way of reciprocating for the favor. Therefore there is a trickle effect. Smaller departments are informed by somewhat larger users who are informed by larger ones.

An alternative approach is to have regional (e.g. portion of state, total state, multistate) associations whereby information can be exchanged formally.

Problems with this approach to communication between users:

1) Information is available on request. It is not typically publicized or made readily accessible to a wide number of users.

2) It is sometimes difficult to know which users are doing what innovatively in order to request the information.

3) There is frequently a large time delay before smaller users are exposed to innovative experiences.

4) Distortion can occur by user x telling user 4 what user 2 has done?

5) Frequently what works well and is appropriate for one user is wrong for another user with different circumstances and needs.

6) Users are often not adequately trained to understand what they learn from other users.

7) The most knowledgeable users can not always informally service all interested requests for assistance.

Quotes

"More and more we are borrowing ideas and information from other state police."

"Salesmen come and tell us what police departments are doing what and then we call the departments directly."

"Ordinarily if the chief wants information, we will call others, especially within the geographical area of the state."

"If you sell a couple of big police departments, the small ones will see the product and even use the manufacturer's specs or big police department bid request to make their own order."

Policy Options

1. Develop more formal channels by which users can exchange information on innovations.
2. Make information regarding the experiences of innovative users readily accessible to all other law enforcement agencies.
3. Establish a national clearinghouse to provide information.

Sub-Issue 3: What role can the government and other third party sources play in the dissemination of information?

Most users agree that neither LEAA nor JACP do an effective job of communicating important information. 23% of all the users analysed indicate that they would like a national clearinghouse or some other technique to easily and effectively learn what is available and how good it is.

Most users complain

(1) A lot of useful information on effectiveness of equipment never gets conveyed to other users.

(2) Much of the information available from producers or through the media have questionable credibility. There is a consensus that law enforcement users need more information which is trustworthy and easily accessible.

Thus, most users agree that much really helpful information is not accessible (particularly a) regarding really new innovations, b) pertaining to equipment available from small producers, c) relating to the actual experiences of innovative users) and much of the information that is accessible can not be taken at face value.

A clearinghouse could provide information quicker, easier, and more accurately, permitting users to become more knowledgeable, be better prepared to decide whether an innovation is really appropriate for their needs, to aid in the selection of proper equipment, and to help eliminate the needless reoccurence of innovative failures and fiascoes. It could also reduce product costs thereby increasing the attractiveness of the L.E. field as a market -- at present a very serious problem.

Quotes:

Producers

"A real need is a central repository to assemble and disseminate new product information to L.E. users."

"Would like to see LEAA making search of what is available for users."

"There should be a clearinghouse for L.E. equipment which either endorses it or disapproves of it."

"Dissemination of information about what exists is the key to getting innovative equipment into the law enforcement field.

"A national group is needed... the user would know where to go and get info... the producer would have the benefit of having his product made

known at less expense to himself... also each user agency does not need to know who has expertise about each product."

User

"We need a central repository so we would know exactly where to go with an idea."

"I would like to see a national service to set standards and evaluate... also information dissemination to local police departments."

"If everyone's ideas were in a common pool; how x has worked in practice so we could go to a central source for information it would be helpful... all the time, there are things you think should work but often don't, and it would help to know the experiences of others."

"Yet practically no one has heard of the experiment... no distribution from LEAA. They should be distributing the report to get widespread reaction."

"What we do in the name of innovation does not get recognition and we do not publicize it... e.g., you may have two P.D.s doing a similar innovation and they are not aware of each other, so they cannot compare notes... if there were some kind of clearinghouse, repository.... I guess there is... the LEAA... but I'm not really aware if it is... the problem is that lots of planning officers have lots of ideas... if there was some place they could go and get information to see if others have tried it."

In addition, something needs to be done to improve user-producers attitudes toward each other. As long as each has limited respect for the other, little can be achieved regarding better transfer of information. Training may be one way of starting to improve this problem.

Policy Options

1. It is apparent that alternative means of communicating are needed. A national clearinghouse is one option which could provide users with information regarding the availability of equipment and the standards which might exist as well as to publicize the results experienced by users who have implemented and evaluated innovative equipment.
2. Make readily available to all other users the results of evaluations

Law Enforcement Standards Laboratory; Projects Proposed for Fiscal Year 1974; May 2, 1973.
Additional Projects - Fiscal Year 1974; Equipment Systems Improvement Program; Law Enforcement Development Group; The Aerospace Corporation; August 1973.
Annual Progress Report - Fiscal Year 1973; Equipment Systems Improvement Program; Law Enforcement Development Group; The Aerospace Corporation; July 1973.
Law Enforcement Standards Laboratory Progress Report for January 1973; National Bureau of Standards.
Law Enforcement Standards Laboratory Progress Report for May 1974; National Bureau of Standards.
Law Enforcement Standards Program "Walk-Through Metal Detectors For Use for Weapons Detection", National Bureau of Standards; September 1973.
LEAA Police Equipment Survey of 1972 Volume I: The Need for Standards -- Priorities for Police Equipment; National Bureau of Standards, July 1973.
Law Enforcement Standards Program Project Plans for Fiscal Year 1973 of the Law Enforcement Standards Laboratory; National Bureau of Standards; December 1972.
British Police Research Bulletin, No. 4, October 1967.
British Police Research Bulletin, No. 8, October 1968.

Equipment Item Analysis

9. Courts and Prisons: Architectural Designs and Court Recording Equipment

Introduction

Data was collected separately for (a) prison designs, (b) court designs, and (c) court recording equipment.

Data[1] was collected from 7 users, 2 producers (of court recording equipment), and 12 intermediary organizations.[2] As most of the resources of this project were focused on the other eight equipment items, the 21 organizations interviewed here are basically an exploratory sampling. The results are therefore tentative but are in many instances remarkably consistent both for the sampling and when compared with the overall results of this study. These tentative samplings, plus the acquisition from the interviews and literature search of many additional potential information sources, provide reasonably clear direction for further research and analysis.

While "architectural design" and "court recording equipment" were considered as two separate research items, there is strong repetition in the data collected. Thus, the analysis is presented here simultaneously. Data more specific to one or the other item will be so noted.

We may also note here that a more detailed study of court-recording equipment for courts is provided in the report of the Special Committee on Increasing Administrative Efficiency Through Technology to the 1972 American Bar Association Appellate Judges' Conference (hereinafter referred to as the 1972 A.B.A. report).

Background Information

For architectural designs of court and correctional facilities, the most important theme emerging from this research is the dependence of designs upon the interaction of a variety of organizational, social, and personal factors. For example: the contract for a building design as a "political plum" for a local architect; legal considerations and rulings; whether the building is an old one to be remodeled or a new one to be built; the role of technology; the influence of key user personnel; perceived "functional philosophy" of a criminal justice system and related facilities; etc.

(1) Data includes main and pilot studies

(2) "Intermediary" organizations are L.E.-related organizations which neither produce nor use L.E.-related equipment. For example, NILECJ would be such an "intermediary" organization, as would be distributors and vendors.

Inter- and intra- systemic considerations also apply to court-recording equipment. "Court-recording equipment" refers specifically to technology utilized in relation to transcription of the record of court proceedings. Essentially, court-recording equipment is of four types: stenographic machines operated by court reporters, which is in essence mechanical shorthand; computer transcription of mechanical stenographic notes; audio recording (tape record); and audio-visual tape recording (A-VTR). Though not considered in this study, a closely related area of technological innovation is the area of legal research (microstorage; computer-assisted retrieval, etc.).

The stenotype was "first devised in 1912".[1] "In the late 1950's and early 1960's, IBM began working in computer transcription of stenotyped notes."[2] The state court system of Alaska was the first to use audio equipment as an official record. The 1972 A.B.A. report gives an evaluation of court-recording equipment and its usage.

While we will examine the innovative process in more detail below, it may be worthwhile noting here that several sources commented upon an inadequate introduction / usage of non-court-specific audio equipment and an ensuing lowering of receptivity to technological innovation.

The Need

Data from the literature research and the interviews of this study indicate a clear need for technological innovation in courts and prisons, as is indicated by the representative comments below.

1) "Courts and jails are becoming non-functional."

2) "Only technology can help courts solve the problems of producing court records and of information storage and retrieval."

3) "Modern technology has revolutionized business practices and has been successfully applied in many areas of government. Yet, although courts are seriously encumbered by old-fasioned record-keeping systems that are overwhelmed by today's volume of litigation, this technology is only now beginning to be used in the judicial branch... The results of work already completed prove that the application of new technology can dramatically improve both the speed and quality of court performance."[3]

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(1) 1972 A.B.A. report, p. 15

(2) Ibid.

(3) "Annual Report, 1973", National Center for State Courts, p. 12.

With respect specifically to court recording equipment, the following interactive factors emerge to indicate a need for technological innovation.

1) ...high appellate court decisions (including the U.S. Supreme Court) which increase the need for the recording of court proceedings;

2) ...the desire/need of attorneys for fast and easy access to the recordings of court proceedings;

3) ...an increase in the number of courts of record;

4) ...an increase in court loads;

5) ...an inadequate number of Court Reporters, whether shorthand reporters or reporters operating stenographic machines;

6) ...the high costs for salaries of Court Reporters;

7) ...the potential amenability of court recording problems to technological innovation.[1]

With respect specifically to building architecture and design (and also to other more specific technological equipment), the following interactive factors emerged:

1) ...high appellate court decisions;

2) ...security needs: detention re. inmates and safety re. institutional personnel;

3) ...the effects of a philosophy of/understanding about the functions/ purposes/objectives of correctional institutions;

4) ...current facilities being "old" and "outdated".

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(1) The 1972 A.B.A. report notes "four major periods of delay in the appellate process", and then notes that technological innovation "might more readily and effectively be applied" to two of these four delay points (p.1).

Taking a Systems Approach

One of the most consistent and often mentioned themes emerging from this study is that innovation in both building designs and court recording equipment needs to be pursued in the context of an analysis of the nature and needs of courts and prisons as a total system, as parts of the larger criminal justice system, and as related to other systems such as industry and specific communities.

-- "The function of architecture and technology is to put the parts together, but this cannot be done without awareness of the nature and function of the total system."

-- "The role of police departments affects the usage and design of courts and prisons."

-- "In designing facilities, you must consider architectural design, technology, operations (use of buildings), and personnel in relation to objectives and cost/effectiveness. Which of these is most cost-effective for increasing security?"

-- "When using audio-visual transcription equipment, you must consider technology, legal issues, and where to place the equipment."

-- "While 'quality transcript would be produced from a few reporters in a court environment, the implementation and preparation of a total court system would require system analysis, system design, reporter training and phasing-in and complete motivated cooperation.'" (1)

Systemic themes most often mentioned were the following:

1) Legal issues

Rulings of higher courts (e.g., re. the role of public defenders) affect building design and usage of court-recording equipment. In particular, the legal status of machine-produced transcripts has not been clarified. An illustrative question raised was the use of handcuffs on defendants: "Does this violate the defendant's right to a fair trial? (A handcuffed defendant 'looks' guilty.) Should courts be designed so as to prevent a prisoner's escaping, so that handcuffs are not needed?"

2) Courts and Correctional Personnel

(See 4 below.)

3) Autonomy and subsequent variety of state and local court systems.

(1) 1972 A.B.A. report, p. 17.

4) Relationships between system parts

Especially with respect to court systems, interviewees noted inadequacy of communication between various parts of a court system, whether within a particular court or between court systems. As one interviewee noted: "each person is concerned with what affects him. Thus, when something new comes along, he asks 'Will it hurt me?' rather than 'Will it help?'" An architect noted a similar lack of communication and concern between various governmental and L.E.-related agencies using the same courthouse facility.

The "parts" of the courts and prison system were variously described.

-- "...judges, administrators, public defenders, probation and parole personnel, witnesses, citizens, clerks, lawyers, bar associations, and producers."

-- "Courts deal in people, paper, and cash."

5) Philosophy (function, purpose, objectives)

-- "Why build buildings just for the incarceration of persons without cash who would be released if they had it? A building is not the solution to the real problem here. Instead, reduce pre-trial incarceration and design incarceration facilities for a security function and according to the type of security needed."

-- "Design of facilities should be non-repressive."

The Currently Existing Innovation Process: Dynamics and Issues

A clear and consistent finding from this study is that innovation in courts and prisons "is happening, but it is fragmented," and that there are major blockages to innovation, even though there was some feeling that "there is more support for change now." The currently existing innovation process will here be examined in terms of the eight L.E. issues of this study.

Issue: The Producer R,D&E Process

As there were only two producers (1) (of court recording equipment) interviewed, no generalizations can be made from these two interviews. However, when

(1) Both companies sold in non-L.E. markets. One was small, the other very large. One was quite happy in the L.E. market, the other was not sure the L.E. is viable. Both saw the State of the Art as changing rapidly. One had done equipment testing/evaluation with both user and intermediary organizations.

all of the interviews and the literature research are taken together, there was general agreement that because of market considerations industry R,D&E which is specifically court or prison related is minimal to non-existent. Rather, interviewees felt that currently, any technology used by courts / prisons is "fall-out from other (producer) projects."(1) A market dynamic noted by interviewees re. audio court-recording equipment was that small producers have seen courts as a good market for their existing products (i.e., without court-related R,D&E) -- with some very negative results ensuing.

Issue: Law Enforcement Markets

Basically, interviewees had a common perception of the court/prison market as being best described as "cautious": industry is cautious and the system is cautious. The factors noted which were seen as producing the cautious climate were the following.

1) The market was seen as "fragmented."
   -- With the exception of the federal court system, courts are not "unified" across the country, and often not within a specific state. The causal factor here is the autonomy of federal, state, and local court systems in relation to each other.
   -- As a result of such autonomy, usage of innovative equipment or designs is dependent upon the leadership of (a) individual judges or administrators and/or (b) top level leadership of a state or local court system.

(1) The 1972 A.B.A. report on technology noted: (a) with respect to computer transcription of stenotype notes: "Only seven companies came to our attention in this field; none are ready with an off-the-shelf court system"; (b) with respect to audio- visual tape recording systems, "only one unit has come to our attention which has been especially designed for courtroom use." One interviewee noted an attempt to contact court-recording equipment companies. About 200 companies were contacted; 85 replied. Most of the replies were useless, having either misinterpreted the request or misrepresenting the court-related applicability of equipment.

   -- The fact that court and prison facilities are high-cost, long-term capital investments means simply that there will not likely be any building design "mass market." Rather, an architect is not likely to do more than one design in his career -- i.e., a building in his local community -- and interviewees noted that these contracts are often "political plums."
   -- One interviewee noted that "while some courts are being re-designed, not all judges are pressing."
2) Courts were seen as "tradition-oriented." Because law is to a large extent a matter of "precedent", judges tend to be cautious about setting precedent, whether in designs of facilities or usage of equipment. However, several interviewees noted that judges' awareness of the problems facing courts today is an impetus towards innovation.
3) Court personnel were seen as lacking sufficient technological sophistication to evaluate equipment before purchase or to utilize equipment effectively after purchase. (Some interviewees further noted that LEAA & NILECJ lacked personnel with a technological viewpoint). The result, noted interviewees, is that innovation tends to be in the area of procedure (with which court personnel are familiar) but not in the area of technology (with which court personnel are not familiar). Thus, there is a disjointedness in the innovation process. Another result appears to have been the purchase of unsatisfactory equipment,(1) with resulting problems and the subsequent development of resistance to any further consideration of technology usage.
4) Resistance by court recorders was seen as a major factor limiting the market for court recording equipment.
5) The court recording market was seen as a "new" market.

While the two court recording producers interviewed had different opinions as to the attractiveness of the L.E. market, both reported highly favorable reactions from actual users (courts) of their equipment.

(1) The reference here is to audio equipment (tape recorders).

From all of the above, interviewees generally concluded that some kind of market aggregation would be needed to motivate producers to develop specifically court-related equipment.

While interviewees did not note a widespread interest in innovative designs or equipment, several did note hopeful signs -- even if no more than awareness that courts and prisons are faced with serious problems.

-- One interviewee simply noted that the amount and rate of change in the world has changed attitudes towards change.

-- The 1972 A.B.A. report noted that video-taped depositions "are fast becoming commonplace." (p. 17)

Issue: Information Transfer and Dissemination

There was strong consensus in the following:

1) There is precious little information available.

-- The architects interviewed said they had had to do their own research.

-- One national-level intermediary organization said that most court research consists of "consultant reports, small technical assistance reports, in-house reports, which do not get national dissemination."

-- One interviewee asked: "Where is the study showing whether building designs, equipment, or personnel would be the most cost-effective way of improving prison security."

-- "Few real studies have been done."

-- One interviewee noted that courts generally do not have funds to do in-depth research.

-- Various interviewees noted a general lack of planning guidelines for architects, standards or performance requirements, evaluation, or information or guidelines re. technology application. One interviewee noted that, in contrast to the Department of Defense, there is no organizational sponsorship of innovation in the criminal justice system.

-- One interviewee did note studies on audio-visual applications in courts in Massachusetts, and a fewer other scattered experiments elsewhere -- but the interviewee otherwise noted a general lack of such studies.

-- One interviewee noted that while the need for court recording equipment has been identified "too much", the results of studies "have not been promulgated."

-- The "Publications List" of the National Center for State Courts lists 32 works, only 11 of which clearly are or might be technology-related. Their 1973 "Annual Report" lists 6 technology-related publications.

2) Dissemination of information which is available is varied and generally very inadequate, either between courts and/or court systems, or within a court system.

-- As noted above, the small reports which constitute the bulk of available research on courts "do not get national dissemination."

-- Information dissemination is largely dependent upon individual leadership of top-level personnel (which varies greatly).

-- One judge noted he regularly sends reports to other judges, but this process is not reciprocated.

-- One architect had no idea what kind or extent of information dissemination there was about the (innovative) courthouse on which he worked.

-- Several interviewees made a point to note that there are no technology-oriented courses in law schools.

3) To a large extent, information dissemination is informal. To a large extent, this fact is due to the autonomy of federal, state, and local court systems and the resulting variations, especially within state and local systems.

4) Notwithstanding the above, there do exist some formal vehicles of communication.

-- There are at least three national-level "clearinghouse" type organizations. These are relatively new, and federal level agencies and/or personnel (1) were credited with a significant role in their organization. However, one interviewee noted that it is harder to fund a "clearinghouse" function than it is to fund research. Further, while at least one of these agencies does communicate regularly with top level court officials, the agency itself noted that information dissemination of its reports, etc., to lower level court personnel is dependent upon the leadership of upper level court personnel.

(1) The impetus given by Chief Justice Burger was mentioned several times here.

-- There are some national level conferences.

-- There are some publications that have carried articles relevant to architectural design and court recording equipment.

Issue: Need Identification

The process appears to be mixed. In the individual cases where strong leadership initiative is present, the process appears to be that of an identified need leading to a search for equipment or designs. On the other hand, the process is reversed in the instance of small producers of audio equipment seeing courts as a good market for their equipment. Confounding this issue is the general fragmentation of the market and (particulary in courts) the "cautiousness" of the market -- i.e., in many (perhaps most) instances neither process (A or B) of need identification[1] is at work. Similarly, several interviewees noted that as contracts for designing new buildings are likely to be one-time, "political plums", architects are not likely to have the resources for or even interest in research re. either needs or equipment -- i.e., once again, the need identification process is likely not to be at work at all. Another interviewee stated: "There is a national apathy about design. There has been no new thinking in court designs in the past 150 years, and tradition has prevailed over logic."

Still further confounding the need identification for court recording equipment issue is the fact that when innovation is considered and/or utilized, procedural concerns are involved much more often than technological concerns (because of court personnel unfamiliarity and lack of sophistication re. technology).

An architect noted that the research for need identification was the result of the dedication of a small (architectural) firm.

One interviewee noted the difficulty of either experimentation during a regular experimentation -- and also the artificiality of the latter.

The study found at least one instance where a state-level L.E. commission was instrumental in the identification of the need of innovative courthouse design and equipment. Also, one interviewee noted that the McGeorge Courtroom of the Future "shows what is possible."

Overall, there appears to be a lack of any kind of central guidance or direction in the need identification process -- and often a lack of any process at all.

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(1) See section on Need Identification.

Issue: Cooperation Between Users

This sample was not large enough to determine the extent, if any, of cooperative action between users. However, we may note the following.

1) One interviewee noted that except where there is a specific effort at some form of unification of services (e.g., in a regional basis), cooperative action between users in architectural design is not relevant.

2) One interviewee stated that some form of cooperative action by users is necessary if industry is to be motivated to develop court-recording equipment specifically related to the needs and dynamics of courts. Another interviewee stated that all the courts in a system must cooperate, or no one would use the equipment.

3) Two architects noted resistance from judges re. courthouse designs, one at the beginning of the design process (followed by later cooperation) and the other later in the design process (after initial cooperation).

4) Both time and political factors were noted as likely to affect cooperation between users (judges) and between users and architects in designing of buildings.

Issue: Funding and Budgeting

Tentative findings re. funding and budgeting of court recording equipment and architectural designs are the following:

1) Generally, state courts were seen as having influence within state legislatures for funding purposes. One specific instance was discovered of the successful use of this influence for the funding of a new court building. However, interviewees generally noted that the standard budgets of courts are not sufficient for major equipment purchases or for the funding or research studies.

2) Neither of the two producers interviewed had received any external funding for R,D&E.

3) Funding for the 1972 A.B.A. Appellate Judges' Conference study was provided by both the A.B.A. (research) and producers (testing). Interviewees generally commented that courts do not have funds for studies.

4) Some dissatisfaction was expressed re. the grant process for federal LEAA funds.

Issue: The Equipment Acquisition Process

Little information was obtained about this issue. However, one may note the following:

1) One illustration was given where a test was made of court-recording equipment. The judges involved felt the equipment was satisfactory; the court reporter involved did not. This illustration is consistent with the general finding re. the resistance of court reporters.

2) The statement of one interviewee that equipment acquisition is highly individualistic would appear to be supported by other data already reported above.

3) As already noted above, there are reports of inadequate testing/evaluation of audio equipment being sold by small producers -- with some very negative results.

4) Two interviewees stated that court equipment is often obtained as gifts or is borrowed.

5) Interviewees generally noted a lack of guidelines, evaluation, or standards for court equipment or for building designs.

6) Both producer firms did note problems with the user acquisition process: bidding and specs for one and the variety of "individual tastes" for the other.

Issue: Installation, Utilization, Maintenance, and Assessment

No data was obtained re. installation and maintenance.

The 1972 A.B.A. report was the primary source of usage assessment information found in this study. This report notes the following.

1) Alaska is the only "state whose courts are totally dedicated to the use of audio-recording equipment...its system has been both praised and criticized but is considered adequate in spite of inadequacies". The report further noted that the "Alaska Court System Manual of Electronic Recording sets forth the advantages gained through the use of the tapes themselves as the record of proceedings."

2) The report also gives both positive and negative evaluations by judges re. servicing of equipment.

3) Reliability of equipment and trained operators are key needs for usage of court-recording equipment.

4) No evaluation had been done of audio-visual tape recording equipment.

A number of dynamics noted previously have strong implications for equipment utilization. For example:

-- Lack of user technological sophistication.
-- Court Reporter resistance.
-- Legal issues.

Possible Policy Options

Implications for a number of potential policy options emerge from the tentative findings of this study, each of which should be considered in a broad inter/intra-systems context.

1) Facilitate determination of relevant legal issues.
   a) Research currently existing rulings.
   b) Could NILECJ facilitate "test cases" to clarify legal issues re. court recording equipment.

2) Provide training
   a) Develop technology-oriented courses in law schools.
   b) Develop technology-oriented training courses for judges, bar associations, court/prison administrators, architects, court reporters.
   c) Provide Organization Development (O.D.) programs to improve communications, understanding, and cooperation between court-related personnel.

3) Provide guidelines[1] re. overall missional goals and system operations for courts/correctional institutions.

4) Provide guidelines, standards, product evaluation relevant to product/design selection/utilization/assessment.

5) Determine relative roles/potential cooperative relationships between the three national-level clearinghouses, NILECJ, and other relevant federal/state/local agencies.

6) Provide/support technology/design related symposiums.

7) Set up national/regional consulting groups, with an emphasis on personnel who (a) are design/technology-oriented and (b) are familiar with courts/prisons.

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(1) Guidelines here should include inter/intra-systemic considerations and issues. "Futures" research and analysis is relevant here.

8) Employ design/technology-oriented personnel within NILECJ.

9) Encourage joint purchasing and unified usage of court-recording equipment.

10) Provide funds for R,D&E Programs.

11) Strengthen user ability to utilize federal grant processes effectively and efficiently.

12) Research and/or pilot projects to identify and demonstrate need/utilization.

13) Determine ways in which NILECJ or any other governmental/private agencies can facilitate unification of state/local court/prison systems.

Bibliography

American Bar Association, Appelate Judges' Conference, "Report of the Special Committee on Increasing Administration Efficiency through Technology", August, 1972 .

Equipment System Improvement Program -- various reports of E.S.I.P. consultation at the Illinois Department of Correction.

Illinois Law Enforcement Commission, "Transition: 1974: The Criminal Justice Plan for Illinois."

Illinois Supreme Court, Committee on Criminal Justice Programs, "First Report on Court Reporter Development", by John Paisos and Associates, May, 1974.

Judicature, "Dedication of the Center for Legal Advocay with the 'Courtroom of the Future'". Vol. 50, No. 7, March, 1967.

L.E.A.A., "Fourth Annual Report, Fiscal Year, 1971".

L.E.A.A., Newsletter, "Equipment for Courts", Vol. 4, No. 6, Dec., 1974.

Moran, Hon. Thomas J., and J.L. Neumann, "Technology and the Reviewing Courts of Illinois: A Special Report to the Illinois Supreme Court", Oct., 1973.

National Advisory Commission on Criminal Justice Standards and Goals, "Courts" Jan., 1973.

National Clearing House for Criminal Justice Planning and Architecture:

-- "Correctional Environments"

-- "Guidelines for Planning and Design of a Unified State Court System".

-- "Prisons and Jail Security", F. Warren Benton and Robert Obenland

-- "To Build or Not to Build: Is That the Question".

National Center for State Courts:

-- "Annual Report, 1973".

-- "Multi-Track Voice-Writing", Publication No. NCSC R0007, Dec., 1973.

-- "Publications of the National Center for State Courts".

-- "Selection of a Court Reporting Method for the Oregon District Courts", Publication No. NCSC R0003, May, 1973.

-- "Video Support in the Criminal Courts: Vol. III: List of Case and Reference Material Abstracts", Publication No. R0008, Feb., 1974.

"Report of the Illinois Appellate Court Administrative Committee", Oct. 6, 1972.

U.S. Department of Justice, L.E.A.A., N.I.L.E.C.J., "A Comprehensive Information Communication System: Courthouse Reorganization and Renovation Program", 1972.

1.3.3 Analysis of Other Organizations

Users

Comparative analysis across user agencies is significant for determining to what extent a "law enforcement market" exists. The premise that law enforcement agencies share a common objective and, therefore, represent a homogeneous market is strained by variation of certain characteristics of user agencies. Comparative analysis should show to what extent the L.E. market is segmented and along which dimensions.

In this analysis, the following characteristics were examined as potential indicators of discrete target markets within law enforcement.

1. Fiscal characteristics, including general budget conditions, funding and budgeting procedures, and use of external funds.
2. Structural or Behavioral characteristics, including capability for self-evaluation, need identification processes, patterns of communication and cooperation with other users.
3. Perceptual characteristics, including reported importance of innovative equipment to L.E. and suggestions for improving the diffusion of innovative equipment to L.E.

The analysis is based primarily on the interviews conducted in the main study of the project.

General Budget Conditions

Forty-seven user agencies were analyzed to determine the perceived stringency of their budgets. This is taken to represent the agency's perception of general budget conditions as a potential barrier to procuring equipment. There are virtually no agencies whose budgets provide large amounts of discretionary funds. To the extent that all agency budgets must be planned, rationalized, and justified, all agency budgets could be considered tight. However, it is reasonable to suspect that some agencies would feel more confident about being able to successfully justify innovative equipment in their budget. These agencies, it was felt, would perceive their budget as not tight or restrictive. Those agencies that do not feel confident about being able to justify innovative

equipment would be expected to indicate that their budgets were tight.

This rationale leads to the following analysis. The response from the 47 agencies were coded according to the following categories:

Tight	little or no chance of getting budget appropriations for innovative equipment.
Not Tight	budgetary funds for innovative equipment are probably available with proper justification.
Other	unusual budgetary arrangements
No Data (ND)	no direct response, or no certainty of inference possible

Table 72
Distribution of Budget Conditions Across The User Typology

User Typology	Tight	Not Tight	Other	ND
# 1 State Police	2	2		3
# 2 Sheriff Officers		1		1
#7/8 City P.D.	5	4		2
# 9 Largest City P.D.	6	4		6
#11 Courts		2		
#12 Prisons	1			3
#13 Special Gov't Agencies			3	
#14 Private Agencies			2	
Totals	14	13	5	15

The agencies categorized as other have budget conditions distinctly different from the other agencies in the typology. Two specialized government agencies (#13) are included in the Federal budgetary process and the private agencies are sub-units within relatively large private corporations. It was felt that both these situations are sufficiently different to warrant a discrete classification.

It should be pointed out, however, that this represents a potentially important characteristic for identifying a discrete segment of the L.E. market. To the extent that these "different" budget processes can accommodate innovative equipment, they should be explicated so that

intervention implications can be identified. Such explication is felt to be outside the scope of the present study.

The category of not tight contains agencies of several types. State Police (#1) and Courts (#11) both explicitly stated that money for innovative equipment is very likely available from State Legislatures if the chief administrators of these agencies could be persuaded to include such items in the budget request. This is direct reference to the function of gatekeeper being performed by top administrators. In the case of State Police, this conclusion is confounded by responses from two other State Police agencies indicating that budgets are, in fact, tight. In the case of Courts, however, the implication is clearly that of top court administrators (Chief Judges) not being technically oriented, i.e., not perceiving court administration problems in contexts amendable to solution by innovative equipment.

The other types of user agencies shown in Table 72 as having not tight budgets are not easily distinguishable from similar types indicating tight budgets. For example, it was not discernible from the data why five city P.D.'s felt their budgets were tight and four felt their budgets were not tight. The important point to be made from the available data is that tight budgets cannot be considered a universal barrier to diffusion of innovative equipment among metropolitan police departments (#7/8 and 9). The unexpected high incidence of not tight budget responses among metropolitan police departments indicates the need for more detailed study of those organizations. One potentially significant distinction of these agencies is discussed in the next characteristic - Funding and Budgeting Procedures.

Funding and Budgeting Procedures

The analysis of this characteristic was reported in detail in section 6. The pertinent conclusions from that section are included here to provide a more complete view of the user agencies in this section.

For those agencies whose budgets are stringent, the budget size and not the budget process, is a limiting factor in acquiring innovative

equipment. For those agencies who budgets are not stringent (not tight), the budgetary processes can be an important characteristic, indicated by the variation of processes identified. For example, some agencies reported variations such as program budgets (rather than item budgets), discretionary line items, and "bottom line" rather than "line item" accountability. The implication here is that budgetary processes might be a characteristic which identifies an innovation-adoptor segment of the L.E. market. This characteristic deserves future detailed investigation.

Use of External Funds

This characteristic was also discussed in section 6, but more in the context of the funding process than as a characteristic of the user agency. An additional analysis of the data is made here along the dimension of active pursuit of external funds by an agency. The following categories of responses were used:

Active	Those agencies that successfully seek external funds to procure innovative equipment. The degree of aggressiveness is not discriminated.
Willing Only	Those agencies that are willing to seek external funds but either do not or have not been successful.
Not Active	Those agencies that do not seek external funds, for whatever reason.
No Data (ND)	Those agencies not certain of their status on this characteristic or not providing sufficient information to make a clear determination of status.

Table 73 shows that the majority of user agencies actively seek, or are willing to seek external funds for the purpose of procurring innovative equipment, with only six agencies indicating they are not active in this regard. The incidence of not active becomes even less significant when it is understood that four of the six agencies in this category indicated they were, in fact, not eligible for Federal funds and therefore, did not seek such funds. The State Police agency and City P.D. classified as not active indicated a strong bias against Federal "intrusion" on the part of the agency's funding organization, i.e., state legislature and city council.

Table 73

Use of External Funds

User Typology	Active	Willing Only	Not Active	ND
# 1 State Police	4	1	1	1
# 2 Sheriff Offices	1			1
#7/8City P.D.'s	9		1	1
# 9 Largest City P.D.'s	13	1		2
#11 Courts		1		1
#12 Prisons	1	2		1
#13 Special Govt. Agencies	1		2	
#14 Private Agencies			2	
Totals	29	5	6	7

An implication develops when Table 73 is compared to Table 72. Table 72 shows 13 agencies as having not tight budgets, taken to mean that these agencies believe that, with proper justification, their funding agencies would provide funds for innovative equipment. Table 73 shows virtually all agencies as actively seeking external funds for procurring innovative equipment. Given the nature of the major source of external funds (LEAA block grants), it is presumed that active pursuit of such funds also requires that the L.E. agencies obtain matching funds from their own funding agencies (state legislatures, city councils, etc.). It could be concluded that those agencies reporting not tight budgets still take the easier path and seek external funds rather than trying to take advantage of their not tight budget situations. If this process is continued over a long period, it is inevitable that these agencies will not exercise their ability (and thereby develop greater competence) to argue for innovative equipment budget items. The net results will be 1) greater and greater dependence upon Federal funds, 2) less and less competence in the budgetary process, 3) abdication of responsibility of local funding sources; and 4) an eventual transfer of responsibility, through the political process, to the Federal domain for funding innovative equipment. No value judgement is argued here. Rather, the argument is for LEAA and/or NILECJ to recognize this eventuality and make a policy decision either to prepare for it (by developing regional equipment centers etc.) or to frustrate the eventuality (by developing in-house user capability to make use of the budgetary process, etc.)

Capability for Self-Evaluation

The rationale for the importance of the characteristic is simple and direct: an organization is more likely to respond positively to criticisms of its performance, if the organizational deficiency is detected by internal self-evaluation than if by an external critic. Therefore, an analysis was made to determine how many user agencies identified in their organizations separate units whose titles indicated that it might perform the function of self-evaluation of the organization. Such names as Planning and Research, Research and Development, Research

and Planning, etc., were thought to convey this functional possibility.

An additional analysis is made of this characteristic to determine, if possible, the user agency's source of technical expertise for the process of evaluating innovative equipment. Therefore, the characteristic of self-evaluation capability is a function of two factors, the existence of a separate evaluation-sounding organizational unit and the source of technical expertise for equipment evaluation.

Table 74 shows the tabulated data used for this analysis. The two private agencies are omitted from this analysis because of the distinctively different nature of their situation, leaving a total of 45 agencies analyzed.

Concerning the first factor, existence of a separate organizational unit, Table 74 shows user agencies analyzed. Not unexpectedly, most of these were metropolitan police departments (#7/8 and 9). This could mean that large police departments recognize the need for a separate functional unit, but such a presumption must be tempered by the lack of clear knowledge of what these separate units actually do. Many indicated that they were predominantly paperwork producers, being responsible for all departmental publications (including publicity releases), or that they were, in fact, federal grant managers, or other such non-evaluation-oriented activities. As Table 74 shows, 15 of the 25 such departments indicated explicitly that equipment evaluation was not one of their functions.

There is an implication here for revitalizing LEAA interest in a study to develop some organizational guidelines for implementing effective Planning and Research Units in Police Departments.(1) There are some models of effective units, but the present study leads to the conclusion that most such organizational units are not effective for organizational self-evaluation.

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(1) A special LEAA grant for implementing Planning and Research Units in Police Departments was mentioned in Introductory Reading Materials on Planning and Research Units in Police Departments (see bibliography at end of this section).

Table 74

User Typology	Source of Technical Expertise: Separate Function W/ Equip. Eval.	Separate Function Wo/ Equip. Eval. (1)	Staff Expertise (Dept. Hds. etc) (1)	Little or None	ND
# 1 State Police	1	3	2		
# 2 Sheriff Office				2	3
#7/8 City P.D.	2	4	3	3	1
# 9 Largest City P.D.	5	8	2		2
# 11 Courts			1		1
# 12 Prisons	1			3	
# 13 Special Govt. Agencies	1	1			1
Totals	10	15(1)	9(1)	8	8

(1) Some of the agencies indicated that a separate functional unit existed but with no equipment evaluation function and staff personnel was the source of technical expertise. These agencies are represented in both the Wo/Equip. Eval. category as well as the Staff Expertise category. The types of agencies included in the group are two (#1), two (#7), and one (#9).

Concerning the second factor, source of technical expertise, Table 74 must be examined more carefully. The category little or none indicates a lack of technical expertise. The eight agencies in this category is not an alarming number, particularly when three of the eight are prisons. However, the category of separate function, without equip eval. is pertinent here. As the footnote to Table (74) indicates five of the agencies in this category do rely on staff personnel for technical experise. However, the other ten agencies in this category indicated no technical expertise. This means that of the 37 agencies providing useable responses (excluding the eight ND agencies), 18 indicated that they had virtually no source of technical expertise available for self-evaluation (eight little or none and ten of the separate function wo/equip. eval.)

The implication here is that, without such technical expertise it is virtually impossible for those agencies to define their organizational or performance problems in terms which will lead to a technically-oriented solution. If the problems are not viewed by at least someone or some group in the organization from a technical perspective, there is virtually no chance of an equipment-oriented solution being developed. On the other hand, if the performance evaluation (and perhaps the suggested solutions come from an external source, the organizations (more specifically, the administrators) are likely to react defensively instead of positively. It seems important, from this analysis, to make availabe to L.E. agencies the capability for self-evaluation (ex., consulting services with L.E. credibility) and the means for developing in-house capability.

Need Identification Processes

This characteristic is closely related to the preceeding characteristic, which was concerned with the capability for self-evaluation. This characteristic is concerned with the practice of self-evaluation.

The analysis of this characteristic is covered in detail in section 4 . The analysis was concerned with the question of the process by which L.E. agencies identified their needs for equipment. Two general processes

were used for analysis; Process A originated from an organizational performance evaluation, Process B originated from an awareness of the existence of equipment.

In summary, the conclusions indicated that Process A is prevalent for Courts (#11) and is well represented in the sample of metropolitan police departments. The prevalence of Process A for Courts was concluded to indicate that courts were becoming increasingly criticized both internally and externally, making performance evaluation salient.

The same rationale is appropriate for the high incidence of Process A in metropolitan police departments. However, the important point here is that Process A does not distinguish between internal and external evaluation of performance. Given the conclusions reached on the preceeding characteristic (see Capability for Self-Evaluation, above) it appears that a substantial number of the incidents of Process A are resulting from external evaluation of performance, at least for those agencies not having access to technical expertise, (18 of the 37 analyzed.)

These conclusions serve to reinforce the implications elaborated above in Capability for Self-Evaluation.

Patterns of Communication and Cooperation

Patterns of communication and cooperation among L.E. agencies are important for identifying potentially important discrete target markets within L.E.

The analysis of this characteristic is covered in detail in section 5, Cooperation Between Users, and section 3 , Information Transfer and Dissemination. As before, pertinent points are repeated here to add to the composite view of user agencies.

Analysis in the above-mentioned sections indicated that:

a) L.E. agencies communicated extensively with each other on an informal basis. Such communications take place among L.E. agencies sharing a local-regional interest in L.E.

b) L.E. agencies communicated extensively on a formal level with each other, but such communications take place more often outside the context of the local-regional L.E. interest.

Some formal communication takes place in that context, but much takes place at state and national association meetings and conferences.

c) Cooperation in the use of equipment is a frequent occurrence and takes place largely among agencies sharing a local-regional L.E. interest, but such cooperation is on an informal basis.

d) Cooperation in the purchase of equipment does not take place very often, but when it does, it is largely among agencies sharing a local-regional L.E. agency.

Two points seem important from this analysis. First, the local-regional L.E. interest factor is a powerful element in identifying discrete target markets within L.E. - more so than a factor such as a similar size. Second, the difference between the incidence of cooperative use and of cooperative purchase of equipment has implications for intervention policies. It is suggested that cooperative use can derive easily from informal communication patterns and, in fact, they are very similar in incidence. It is further suggested that cooperative purchase can only derive from formal communication patterns but that they are dissimilar in incidence because formal communication patterns are less frequently organized around a local-regional L.E. interest. If cooperative purchase is taken to be a desireable feature, it could be enhanced by developing more formal communication patterns around local-regional L.E. interests. This could be done by capitalizing on a form of communication already subscribed to by L.E. administrators, that is, conferences and seminars. If conferences and seminars were organized on a local-regional basis by associations or agencies with L.E. credibility, formal communication patterns could well be initiated and developed around the local-regional L.E. interest. Such patterns could then be used as the base for developing cooperative purchase arrangements among L.E. agencies.

In conjunction with the development described above, the form of the more cooperative purchase arrangements must be studied and well enough understood by the interviewing agency (NILECJ or a State Planning Agency) to permit competent consulting as one element in the intervention.

Importance of Innovative Equipment to L.E.

This perceptual characteristic is determined from the responses given by the agencies as an expression of opinion as to how important innovative equipment is or could be to the process of law enforcement. The question was completely open-ended and the responses were found to fall into four discrete categories:

Very important - (no qualification)

Very important - selectively (important in some areas; important, but not the only important consideration, etc.)

Not important - or not very important

Uncertain or no response - This cateogry included 1) those who did not respond at all, 2) those who responded in terms of another topic, not related to this characteristic, and 3) those who expressed uncertainty.

Table (75) shows the responses tabulated for the four categories

Table (75)

Importance of Innovative Equipment

User Typology	Very	Very Select	No or Not Very	NR/Uncertain
#1 State Police		4	2	1
#2 Sheriff Office			1	1
#7/8 City P.D.		6	2	3
#9 Largest City P.D.	4	7	1	4
#11 Courts	2			
#12 Prisons	1	1	2	
#13 Special Govt. Agencies	2	1		
#14 Private Agencies				2
Totals	9	19	8	11

It is important to note that only eight of the 47 agents indicated little or no importance of innovative equipment for L.E. In fact, in four of those instances, such an appraisal was accurate, considering the circumstances of the respondents. The two State Police respondents were expressing the viewpoint of organizations whose primary function was considered to be traffic and highway patrol (according to the respondents themselves). The two prisons were also accurately reflected in the responses, one of which had been declared out-dated and slated to be closed.

Of more importance is the high number of users who felt not only that innovative equipment is important, but they were discriminating in their opinions. They volunteered that equipment was important in specific functions withing L.E., or that other considerations were equally or more important (for example, one respondent indicated that, in addition to equipment, the deteriorating relationship between police and courts was also very important.) The high number of responses of this nature would indicate a rather sophisticated appraisal of the L.E. agency's situation. Because of this indication, an analysis may be made of the relationship between this perceptual characteristic and one of the behavioral characteristics above (capability for self-evaluation).

That characteristic was said to be determined, in part, by the organization's access to technical expertise for equipment evaluation or for a technical perspective on organizational problems. The following analysis was made to determine to what extent access to such technical expertise might be related to the sophisticated appraisal of importance of equipment described above. Table 76 shows the distribution across the appropriate User Typology categories of the two characteristics.

Table 76

Relation of Technical Experitse to Sophisticated Appraisal of Importance of Equipment

User Typology	Importance Very Selective (From Table 75)	Tech. Expertise Sep. Function and Staff Exp. Combined (From Table 74)
# 1	4	3
#7/8	6	5
# 9	7	8
# 11		1
# 12	1	
# 13	1	2
Totals	19	19

As Table 76 shows, the distribution across the two characteristics is nearly identical. Not only are the totals equal, but the user agencies represented are very nearly identical for both characteristics. The relationship substantiates the earlier conclusion that access to technical expertise enhances the agency's potential for defining technical solutions to operational problems. Moreover, Table 76 indicates that such technical expertise will not lead to global technical solutions but rather to a more sophisticated appraisal of the problems.

The implication is clear - there is a need for L.E. agencies to have access to credible technical expertise and to have opportunities for up-grading their in-house capabilities for self-evaluation.

Improvement of the Diffusion Process

The final characteristic to be examined is another perceptual characteristic - the respondents' suggestions for improving the process by which innovative equipment is diffused to and throughout L.E. Like the preceding characteristic, this one is also analyzed by categorizing the responses to an open ended question regarding improvement of the process.

The analysis is based on the responses from 33 agencies. Of the total of 47 agencies, 14 provided no useable responses here. However, the 33 responding agencies provided 48 discrete responses, so the analysis is made on a total of 48 responses. The responses were coded to indicated where in the diffusion process improvement was needed. Recall that the process generally consists of producers, users, and external agencies (LEAA, local funding agencies, city purchasing departments, etc.). Therefore, the responses were coded according to the following categories:

User-internal - a characteristic of the user agency itself.

User-User - the relationship between user agencies

User-Producer - the relationship between user and producer with reference to a user responsibility or deficiency

Producer-User - the relationship between user and producer with reference to a producer responsibility or deficiency.

Producer-Producer - the relationship between producers.

Producer-Internal - a characteristic of the producer organization itself.

External Agency - a characteristic or relationship involving an external agency, like LEAA.

Statements representative of each category are given later. Table 77 shows the distribution of responses across the above categories. Because of the multiple responses from some agencies, the tabulation does not include reference to user typology.

Table 77

User/Producer Perception for Improving Diffusion Process

Category	# of Responses	
User-Internal	22	User related (27)
User-User	4	
User-Producer	1	
Producer-User	7*	Producer related (15)
Producer-Producer	2	
Producer-Internal	6	
External Agency	6	

*Two of these seven responses were laudatory comments, not indications of deficiencies.

Table 77 indicates that, in general, users perceive the user element of the diffusion process as deserving of more attention for improvement than the producer element.

If the two laudatory comments are removed, the number of responses concerning user-related factors is more than double those relating to producer factors.

This could mean either (1) users have insufficient knowledge of the process to be able to appraise the situation accurately, or 2) the users recognize their own deficiencies in the process. Given the level of discrimination indicated in the analysis of the preceeding characteristic, it would be reasonable to conclude that 1) users are accurately appraising their own deficiencies and 2) the user element of the process requires improvement.

Examples of comments in each category. The following are representative comments in each of the above categories.

User-Internal

- not enough money for equipment
- we need to educate the public
- better planning in budget preparation
- better preparation of bid specifications

User-User

- L.E. agencies have trouble maintaining autonomy and avoiding state planning
- communication between L.E. agencies is most important

User-Producer

- very little communication from P.D. to producer

Producer-User

- very satisfied with (name of producer)

need more information from producer to user

Producer-Producer

- need more competition
- the need for producers to make or profit is a problem

Producer-internal

- more credibility needed (from producers)
- manufactures only see needs in emergencies

External Agency

- need national clearinghouse for information
- let LEAA subsidize the first user (pilot programs)
- need more support for small "dreamers" (entrepreneurs)

Conclusion

It is difficult to present a composite view of L.E. agencies based on these analyses. Some summarization is useful, however, for reviewing the characteristics which seem to be important in conceptualizing the L.E. market. The following points help in such a conceptualization:

1. Fiscally, L.E. agencies feel they could successfully include more innovative equipment in their budget requests but they are being conditioned to take the easier path of using Federal funds. There is a danger that they may lose whatever capability they now have for 1) using their present budget procedures to acquire innovative equipment or 2) develop innovative budget procedures.
2. Structural characteristics indicate that L.E. agencies represent discrete target markets for producers in terms of 1) functions within the agencies and 2) local-regional collectives of L.E. agencies with a common L.E. interest. The functional discrimination can be thought of in terms of technical functions, such as communication, administrative, investigative, patrol, etc. or in terms of offensive vs. defensive functions. In either case, the total L.E. agency cannot be viewed by a potential customer. The producer must discriminate between functions, just as the agency itself does. The importance of the local-regional L.E. interest is elaborated in the analyses above.
3. Perceptual characteristics substantiate the earlier conclusion that L.E. agencies are discriminating, and are willing to become sophisticated. They lack adequate models and assistance for effecting the necessary changes.

Producers:

Considerable diversity exists among the producers who provide equipment for use in law enforcement. The interviews have shown that producers differ in terms of; company size, the number of persons employed in the law enforcement division, extensiveness of R&D effort, whether other fields are serviced in addition to law enforcement (and in what proportion), and also in the degree of technical complexity associated with the product.

Important issues regarding producers include the quality and extensiveness of their research effort, their willingness to produce innovative equipment for law enforcement, and their ability to effectively communicate to users about availability and to service purchases. Factors such as size, market segmentation and technical sophistication, may determine the extent to which producers satisfactorily meet law enforcement needs regarding these issues. Before producers can be accurately assessed and policy recommendations develped to help make them more effective and responsive, it is advisable to determine the degree of producer homogeneity as well as the extent to which they can be categorized into a typology.

Sub-Issue 1:

TABLE 78

PRODUCT AND PRODUCER RELATIONSHIP BY SIZE

	Type of Company	
	Large % of companies which employ over 500 persons	Very Small % of companies which employ less than 250 persons
Vehicle locators	75	0
Court Recording	50	0
Portable Transceivers	39	22
Low-light Surveillance	38	38
Weapon Detection	25	50
Non-lethal	29	57
Body Armor	23	61
Holster-Utility Belts	13	50
Voice I.D.	0	50
Building Design	0	100

While the sample findings are biased by the fact that most producers of law enforcement equipment are in fact very small, percent differences suggest that large company size is necessary in order to produce and sell vehicle locators and court recorders, that there are as many very small producers as there are large with respect to low light and weapon detection, while there are greater numbers of very small producers (than large) making and selling all other types of equipment investigated. This does not imply that the smaller companies do the most business, only that the market for this type of equipment is competitive enough to support the effort of small producers as well as large ones. Also, while not totally related, we can observe that the higher technology items) vehicle locators, court recorders, transceivers) are produced by the bigger companies and the lower (body armor, holsters) by the smaller firms. This relationship is disturbed however by a speciality item such as voice identification. It should also be noted that this analysis deals only with the distribution of firms in the market, not the actual share of the market held by different size firms. Clearly one large firm could be doing more business than many small ones combined.

Sub-Issue 2:

Determinants of producer concentration in the law enforcement field and producer attitudes toward the law enforcement market.

A) Size appears to have a definite relationship to market diversification. Only 5% of the 39 producers interviewed which employ more than 50 people and have annual sales in excess of one million dollars concentrate solely on the law enforcement field. In contrast 33% of thirty smaller companies contacted were strictly and totally producers of law enforcement equipment. It appears as though law enforcement can not, by itself, be a large enough market to make anything other than very small companies profitable unless they deal in other markets as well.

B) With respect to producer opinions of the law enforcement market, of those who expressed an opinion exactly one half viewed the market as a good one while the other half were very dissatisfied with their experiences selling to law enforcement. An analysis of producer characteristics in table A does provide some evidence of the relationship between type of company and its view of law enforcement.

TABLE 79
Per Cent Satisfaction with Law Enforcement by Company Size

	Company Size			
Attitude towards selling to law enforcement	Tiny	Small	Medium	Large
Favorable	30%	73%	50%	43%
Unfavorable	70%	27%	50%	57%

The results show that size is very much related to producer atitudes toward law enforcement. For different reasons, very small and very large companies are most negative about selling to law enforcement while intermediate size producers responded more favorably.

Very small (Tiny) producers are a serious problem in law enforcement. Seventy per cent feel that law enforcement is not a very good market and many of these respondents sell only in this field (and regret it). The problem, as they present it, is that they lack the money, manpower, and reputation necessary to 1) be knowledgeable about opportunities, 2) adequately sell their products with limited sales staff, 3) obtain the credibility and political leverage necessary to actually get purchased in a competitive situation (i.e., bidding.) and 4) have inadequate R&D. Many of those tiny companies have to sell through dealers or larger producers due to insufficient sales staff. Many had falsely positive expectations (due to lack of sophistication) and got in over their heads. By contrast the small companies found,

overwhelmingly, the L.E. market to be favorable. This type of company should be supported and encouraged by federal efforts.

Quotes - Tiny Producers (only)

"Lack of success in sales largely due to small size of company: i.e., the company did not look strong enough financially to potential users."

"The small company with a good product has no ability to communicate and further law enforcement agencies have lesser confidence in the smaller companies."

"80% of our R&D is law enforcement through this product, if it fails it will jeopardize the whole corporation."

In contrast the large companies are negative toward law enforcement because of the built in hassles and low margin profit make it less attractive than other fields which represent alternate opportunities. Many of those large companies which are favorably inclined toward law enforcement actually base this attitude on indirect criteria (publicity opens up markets in other fields, have a public service commitment to aid law enforcement). Thus, it is ironic that while very small companies feel that the large companies make the law enforcement market difficult, risky, and unprofitable for them, the larger companies are also typically unfavorably inclined with regard to the field.

Quotes - Large Producers

"The profitability is not very good because of competitive bidding ."

"The law enforcement market is as competitive as any and the profit margin is small."

"Law enforcement people are the worst. . . buying the least expensive equipment. . . they are suspicious of marketing sales organizations. . . they won't believe anything."

"Law enforcement not a very viable market."

"Law enforcement is not an especially attractive market. Profit benefits are not great due to competitve bidding. . . . .Second benefits, such as exposure to other markets though law enforcement sales do exist."

"Our least attractive market; lack of appreciation and profitability. A large proportion of competitve bids and specs requirements. . . . Our company philosophy is service to community and nation with a reasonable return."

C) While there is a definite relationship between size of a producer and its opinion of the attractiveness and profitability of the law enforcement fields, there is very little relationship between whether or not a company concentrates totally on law enforcement and its opinion.

TABLE 80

Effect of Market Concentration on Opinion of Law Enforcement Field

	Company Market Segmentation	
Attitude toward selling to law enforcement	Sells only in Law Enforcement	Sells Product in Several Fields
Favorable	60%	45%
Unfavorable	40%	55%

While those firms selling entirely to law enforcement agencies have higher opinions of the field, it is surprising that the difference in attitudes is not greater. Due to biases, familiarity, rationalization and other psychological processes one would think that companies who are committed entirely to servicing law enforcement would be relatively

much more favorably inclined. The fact that 40% of those producers involved totally in law enforcement feel negatively toward the market is quite notable and somewhat disconcerning. The mixed reaction of producers involved in multiple markets is far more understandable.

D) An analysis of companies attitudes by product type indicates that firms involved in the selling of two way receivers and holsters primarily feel positive toward selling to law enforcement while those firms selling body armor, weapons detectors, and non-lethal (less lethal) weapons are typically quite cynical in their feelings toward law enforcement.

Policy Options:

1. Better dissemination of information is needed to compensate for inadequate sales staffs of small producers.

2. Increased product standardization may improve willingness of producers to involve themselves in law enforcement.

3. Federal subsidy of the R&D and other efforts of small producers is required if any significant innovations are to be expected.

4. The risks of producing for law enforcement must be more adequately communicated to firms considering involvement.

Intermediary Organizations

For the purpose of this study, intermediary organizations are those organizations which relate in some direct way to L.E. organizations but which neither produce nor use L.E.-related equipment. Thus, such organizations would include vendors, distributors (who sell L.E.-related equipment), governmental agencies such as NILECJ, LEAA, etc., (who could become involved in equipment purchase), clearinghouse-type organizations, architects[1], unions, universities, etc.

In this study, twelve intermediary organizations (and an additional 8 vendors[2]) were contacted directly. Additionally, literature from other intermediary organizations was researched.

The twelve organizations interviewed reported a variety of self-perceived roles:

-- distribution of Federal grant funds
-- product evaluation
-- collection and dissemination of information
-- consultation
-- being a linking agent between users and other organizations
-- research

From these interviews, a number of issues emerge.

1) Questions were raised as to the adequacy of information collection and dissemination.

-- one interviewee noted that it is easier to fund research than to fund clearinghouse functions.

-- one clearinghouse organization, noting that it distributes information only to top-level L.E. personnel, then noted that further information dissemination is dependent upon the initiative of these top-level personnel.

-- comment was made about a lack of communication between two specific intermediary organizations.

2) Questions were raised about the adequacy of product evaluation currently being done by any intermediary organization. The interviewees commented about:

-- usability of product evaluations

(1) Architects have also been included as "producers" for purposes of Building Design analysis.

(2) Venders are not included here -- they are treated separately in the next section of this report.

-- anxiety regarding lawsuits if comments about product defects are published.

-- testing being done regarding producer specs., not regarding what a product should do -- "If a manufacturer said his car will roll down a hill without the motor on if it is in neutral and the brakes are released, we would take it to the top of a hill and ..."

3) A number of interviewees commented about the role of governmental agencies in the L.E. equipment innovation process.

a) ... two instances were reported of a helpful role of governmental agencies or personnel in establishing an innovative project.

b) ... several comments were made that were critical re. agency capabilities.

-- "experts are too isolated from the need of the people."

-- "not geared to everyday practical needs"

-- "test standards of NILECJ are unrelated to user-requirements."

-- "LEAA personnel do not have a technological orientation because the career path in the Justice Department is law oriented".

c) ... one interviewee criticized the grant process for Federal funds as being burdensome.

d) ... one interviewee felt that "LEAA has not been open and supportive with us".

4) The intermediary organizations reported doing and/or collecting/disseminating varied amounts of research, but none reported comprehensive and extensive research efforts. Their research appears to be in response to specific requests. Thus, a question may be raised as to

-- who has/should have responsibility for developing more comprehensive research objectives.

-- who has/should have responsibility for doing comprehensive research.

-- coordination of the current research efforts/results of various organizations.

The issues which emerged from this sampling of twelve intermediary organizations, along with comments from other interviewees of this study, strongly indicate the need for further research on the current and potential roles of/relationships between various intermediary organizations.

Data about interviewee comments re. the eight L.E. innovation process issues of this study has largely already been reported in the discussion of Courts and Prisons and need not be repeated here.

Distributors

Study of the role of Distributors in the L.E. equipment innovation process was done primarily in the first (exploratory) phase of this research project (N = 6). As a decision was then made to focus research resources primarily on producers and users, only two Distributors were interviewed in the second (main) phase of the project. Thus, this report will suggest directions for more intensive research.

The eight Distributors interviewed ranged in length-of-existence from 6 to 25 years, were all of less than 50 employees, and were varied in their main geographical market area and in types of equipment sold. Three had 95% or more of their sales to L.E. agencies, and three sold extensively in other markets. They usually handled equipment from several manufacturers. Some carried a quite varied range of types of equipment, some basically sold only one type of equipment (e.g., firearms). Among the eight Distributors, there was general consensus about the following:

1) While the eight Distributors differed in their opinions about the current rate of innovation, they did not see innovation as a "big issue", and generally saw innovation as the responsibility of producers or users. The Distributors indicated that users are not using available equipment (as cf. to a need to develop new equipment). Distributors do not generally test equipment, varied in their willingness (and perceptions of incentives) to distribute innovative equipment and to assist users in trying new equipment. Two of the Distributors have done test marketing and evaluation with users. Three did carry such "innovative" equipment as night-vision, mobile labs, CCTV. These three Distributors varied as to size, geographical market area, single or multiple product types sold, etc. Distributors generally did not indicate much flexibility in expanding/adding to their equipment lines.

Future Research Question #1: Are there viable roles in the L.E. equipment innovation process? What roles? How can they be developed? Would these roles be cost/effective in cf. with other options for improving the L.E. equipment innovation?

2) Communication is low at all levels (between Distributors and users; between Distributors and producers; between Distributors and federal/state governmental agencies).

Future Research Questions #2: Would improved communications improve the L.E. equipment innovation process? What kinds of communication? How can it be developed?

3) Cost of equipment, reputation of manufacturers, and budget conditions of purchasing agencies were most often mentioned as critical selection/purchasing criteria of users in equipment acquisition. Technological personnel were most often mentioned as having high influence on user decisions to acquire new equipment.

4) Other than manufacturers' specifications, the Distributors had a generally low level of awareness of availability of standards for L.E. equipment, nor did they see such standards as an "important" issue in equipment innovation.

5) The Distributors generally had a low awareness level of the role of government (including NILECJ), either federal or state, in relation to equipment. They differed as to their desire for a more active/effective governmental role. However, none of them attached importance to governmental regulations in the L.E. equipment innovation process.

6) The Distributors generally felt that funding for L.E. equipment was adequate. Here, however, we may note that for the most part, the Distributors sold small cost and/or personal and/or single-unit items (e.g., firearms).

7) Generally, the "future plans" of the original six Distributors re. their L.E. equipment product lines and distribution did not include significant changes.

With respect to other questions asked, the Distributors varied in their responses.

1) Comments about the L.E. market included:
   -- "Small producers suffer from distribution problems. They need their own sales reps, but cannot afford them."
   -- "L.E. is usually a sideline."
   -- "Some L.E. agencies hesitate to buy non-U.S.-made equipment."
   -- "It is a more secure market -- they pay their bills."

2) L.E. market problems noted included:
   -- "Because city purchasing is outside the Police Department, issues of quality are often ignored in comparison to cost."
   -- "One problem is finding a concentration of users."
   -- "There are none. It is a secure market."

3) When asked, "What sells L.E. Equipment?", the Distributors noted:
   -- how it is to be used
   -- service
   -- demonstrations
   -- price
   -- ease of use
   -- no mechanical problems

4) Advertising methods varied widely, including differences re. usage of L.E. oriented magazines.

5) Equipment-related post-sale services varied from just the warranty to strong concern about the need for offering post-sale services.

Basically, the interviews with eight Distributors indicate that the current Distributor role in the L.E. equipment innovation process is quite small. However, as Distributors are a significant part of the L.E. equipment diffusion process, further research is needed re.:

1) the potential role of Distributors in the L.E. equipment innovation process;
2) insights of Distributors about the L.E. equipment diffusion process, esp. re. the eight key issues of this study;
3) background information about the Distributors.

General Bibliography (excluding product bibliographies)

National Conference of State Criminal Justice Planning Administrators, State of the States on Crime and Justice, Frankfort, Kentucky: 1973.

Winkle, John W., III, "Intergovernmental Relations in Criminal Justice", Policy Studies Journal, Autumn, 1974, pp. 25-29.

National Symposium on Science and Criminal Justice, Washington, D.C.: U.S. Government Printing Office, 1966.

Advisory Group on Productivity in Law Enforcement, Opportunities for Improving Productivity in Police Services, Washington, D.C.: National Commission on Productivity, 1973.

1974 Criminal Justice Plan for Texas, Governor's Office Criminal Justice Division, 1974

Stanford Research Institute, Miami Modern Police: First Year Summary, SRI Paper 1755, Working Paper, Menlo Park, California

Baranson, Jack National Efforts to Mobilize Technology in Support of Industrial Enterprise. Paper prepared for Financiadora de Estudios e Projectos, S.A. (FINEP), Ministry of Planning, Rio de Janeiro, Aug. 30, 1972

Aerospace Corporation Law Enforcement Development Group, Equipment Systems Improvement Program Annual Operating Plan Fiscal Year 1975.

Aerospace Corporation Law Enforcement Development Group, Equipment Systems Improvement Program Annual Progress Report Fiscal Year 1974.

Chakrabati, Alok K. A Review of the Models of Technology Transfer, Working Paper Series No. 29 Technology and Development Institute, East West Center, Honolulu, Hawaii, July 1972.

Department of Defense, Technology Transfer Program, A draft copy.

Gruber, William H., Marquis, Donald G. "Research on the Human Factor in the Transfer of Technology", Factors in the Transfer of Technology, MIT Press, 1969.

Haigh, G. E., Pearson, A. W., Watkins, D. S. "NRDC and the Environment for Innovation", Nature, Vol. 232, No. 5312, August 20, 1971, pp. 527-31.

Hetzner, William A., and Rubenstein, Albert H. An Analysis of Factors Influencing the Transfer of Technology from DOD Laboratories to State and Local Agencies, Department of Industrial Engineering and Management Science, Northwestern University, Evanston, Ill.

General Bibliography (Continued)

Institute for Defense Analyses, A National Program of Research, Development, Test, and Evaluation on Law Enforcement and Criminal Justice, November, 1968.

Law Enforcement Assistance Administration, Fifth Annual Report of the Law Enforcement Assistance Administration, July, 1973.

Law Enforcement Standards Laboratory, National Bureau of Standards, FY-74 Project Plans, June 22, 1973.

National Advisory Commission on Criminal Justice Standards and Goals, Police, 1968.

National Bureau of Standards, Alternative Plans for a Center for Law Enforcement Equipment User Standards, October, 1970.

Olken, Hyman Technology Transfer: How to Make It Work, Olken Publications, Livermore, Calif.

Ray, G. F., The Diffusion of New Technology: A Study of Ten Processes in Nine Industries, National Institute Economic Review

Security Planning Corporation, Non-Lethal Weapons for Law Enforcement: Research Needs and Priorities, March, 1972.

Bancroft, Raymond Municipal Fire Services Trends: 1972, Washington, D.C.: National League of Cities, 1972.

Introductory Reading Materials on Planning and Research Units in Police Departments, LEAA Technical Assistance Materials, NCJ #002545, U.S. Department of Justice, Office of Law Enforcement Assistance, C. March, 1967.

Larson, Richard C. Resource Allocation in Public Safety Services, Cambridge, Mass.: Operations Research Center, MIT, 1973

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