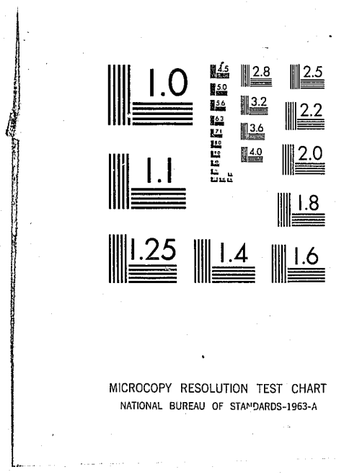

MICROCOPY RESOLUTION TEST CHART
NATIONAL BUREAU OF STANDARDS-1963-A

RETURN TO KOCHANSKI

AEROSPACE REPORT NO.
ATR-76(7903)-1

MF 1

EQUIPMENT SYSTEMS IMPROVEMENT PROGRAM

ANNUAL PROGRESS REPORT FISCAL YEAR 1975

Law Enforcement Development Group

July 1975

DEVELOPMENT

Prepared for

National Institute of Law Enforcement and Criminal Justice
LAW ENFORCEMENT ASSISTANCE ADMINISTRATION
U.S. DEPARTMENT OF JUSTICE

The Aerospace Corporation

Aerospace Report No.
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EQUIPMENT SYSTEMS IMPROVEMENT PROGRAM

ANNUAL PROGRESS REPORT
FISCAL YEAR 1975

Approved

J. O. Eylar

John O. Eylar, Jr., General Manager
Law Enforcement and Telecommunications
Division

CONTENTS

CONTENTS (Continued)

FIGURES

FIGURES (Continued)

TABLES

I. INTRODUCTION AND SUMMARY

I. INTRODUCTION AND SUMMARY

The National Institute of Law Enforcement and Criminal Justice (NILECJ) has established a program under which all equipment-related activities of the Institute are being conducted.

The Aerospace Corporation has been under contract since May 1972 as the Development Group to provide analysis of equipment needs and problems related to crime prevention, law enforcement, and crime control under the criminal justice system and to translate equipment needs into practical systems for law enforcement and criminal justice operations.

The FY 75 activities of the Aerospace Development Group, therefore, included studies to identify high-priority problems and define solutions to these problems, as well as system engineering and technical management support for guiding the development and field evaluation of new and improved equipment to solve these problems. In meeting these responsibilities, the Development Group utilizes the resources of industry to fabricate hardware and prototype systems.

The Aerospace Corporation is a California-chartered not-for-profit corporation, technically defined as a Federal Contract Research Center. The company provides planning, engineering, and scientific services to federal and local government agencies. By limiting its contractual involvement to government agencies and not engaging in the fabrication of hardware except through industry subcontracts, Aerospace is able to provide unbiased, objective advice and counsel to its sponsors. The Corporation employs a technical staff of over 1600 engineers and scientistis, trained and experienced in systems operations, program management, and scientific engineering disciplines; 60 percent of the staff possess master or doctorate degrees. By selectively utilizing the capabilities of this staff, the Equipment Systems Improvement Program is provided an extensive resource of experts to support the planning, systems management, contractor monitoring, and evaluation

activities required to successfully develop new equipment systems. Furthermore, by utilizing industry resources through subcontracts, the Development Group can provide a broadly supported development program involving the most appropriate elements of industry.

During FY 75, the Development Group supported four general categories of effort:

- General Program Planning
- Analysis
- Development Support
- Special Technical Support and Grant Monitoring

The FY 75 activity under each category is described and summarized briefly in the next four sections.

A. GENERAL PROGRAM PLANNING

An important element of the Development Group activity is the planning support provided to ongoing projects and new equipment-related projects. During FY 75, program plans were prepared for eight ongoing development programs, one new development program, and two new field evaluation programs. In support of the new police patrol car program, briefings were prepared and presented to the Law Enforcement Assistance Administration (LEAA), NILECJ management, and to an advisory committee of chiefs of police. The Annual Operating Plan for FY 76 was prepared and submitted; in addition, Task Plans were prepared and revised throughout FY 75 to reflect changes in the direction of the individual projects. A total of 125 separate Task Plan documents were submitted to the Institute during FY 75.

B. ANALYSIS

The Analysis effort related to the potential initiation of development programs has in previous years been reported under General Program Planning. For FY 75, however, Analysis is being reported as a separate

task. The following activities were undertaken as part of the FY 75 Analysis effort:

- A list of candidate problem areas for survey and assessment was prepared on the basis of a comprehensive set of potential problems derived from a wide range of references and previous studies. The candidate list was derived from the preliminary survey by means of filtering and consolidation of related areas. Priorities were assigned to the candidate areas by means of weighting factors to assist in the selection of subjects for indepth survey and assessments.
- A study was performed to determine the utility of an advanced forensic science capability, which was estimated by its impact on arrest and conviction rates. The study was begun in FY 74 and was completed in FY 75. During FY 75, the study effort focused on the crime of burglary and provided estimates of the impact of increased conviction rates on the burglary rate and dollar loss.
- A study of promising areas of technology which show potential for application to criminal justice problems was also conducted. The index of the National Technical Information Service was used to develop an applications matrix. A computer and communications subgroup was examined in detail to identify 35 new and developing applications suitable for criminal justice research.
- Finally, support was provided to the citizen alarm program by means of an operations analysis which determined the relationship between system cost and effectiveness in terms of the system operational parameters.

C. DEVELOPMENT SUPPORT

Of the nine development projects included in the FY 74 program, eight were continued in FY 75. In addition, one new development project was

initiated in FY 75, and two of the existing development projects entered the field evaluation phase. These eleven activities are briefly summarized in the following paragraphs.

Cost-Effective Burglary Alarm System

This effort, initiated in FY 73, is part of a program to develop reliable low-cost alarm systems for use in residences and small businesses. Initial feasibility hardware for internal power line transmission was investigated in FY 73 and 74 under subcontract with Sylvania. An eight-month subcontract to make a tradeoff study of alternative external alarm transmission options was completed in a followon feasibility analysis, and a report summary of the FY 75 effort by Stanford Research Institute was completed. Aerospace efforts included hardware simulation, laboratory investigation of intrusion sensor designs, and procurement document preparation. A second subcontract was competitively awarded to Sylvania to develop and pilot test an integrated burglary alarm internal communication and control system by May 1976.

Citizens Alarm System

This program involves the development of a personal, portable alarm system which provides a means of reporting in real time when, where, and against whom a criminal attack is occurring. The development of feasibility hardware was completed in FY 74, and an improved system development was substantially completed in FY 75 under subcontract with the Compu-Guard Corporation. Operational analysis has been performed to show the benefits and limitations of the system concept. Additional analysis was initiated to evaluate integration of the concept with other alarm systems and response strategies. The development and analysis are sufficiently complete to commit this system to a formal field evaluation.

Protective Armor Development

This project involves the development of lightweight protective armor that could withstand common handgun threats. The armor utilizes a new

high-strength material called Kevlar. Past efforts have focused on understanding blunt trauma effects (body damage resulting from energy absorption of the nonpenetrating bullet) and garment design. The project was completed in FY 75 with technology transfer through a National Industry/User Symposium and a comprehensive final report. The resulting armor is ready for formal field evaluation.

Speaker Identification

The current objectives of this project are to develop and test a computer-aided speaker identification system and to identify other applications of speaker identification technology. The state of the art was assessed during FY 73, and a subcontract for hardware and software development was accomplished by Rockwell International, Inc., beginning in FY 74. During FY 75, a followon subcontract was awarded to Rockwell for laboratory and pilot field test use of the Semiautomatic Speaker Identification System brassboard. Inhouse analysis was completed on system applications.

Cargo Security System

The objective of this project is to provide security for cargo in the trucking industry with emphasis on local pickup and delivery operations, which are the principal targets of the cargo thief. Effort was initiated in FY 73 and, as a result of loss studies, redirected to concentrate on local operations in FY 74. In FY 75, a prototype vehicle location system (augmented signpost and AM phase lock) was selected for implementation in a pilot field test. The selection was based on the results of inhouse experiments and design studies by Hoffman Navcom. The inhouse experiments found the hybrid dead-reckoning system to be technically feasible but not cost effective and the AM phase lock concept to be an able candidate. Loran C will also be acceptable in the future, when transmitter coverage is extended to a larger portion of the U.S. A 16-square-mile area in central Los Angeles has been selected for the pilot test.

Blood and Bloodstain Analysis

This is a continuing project to improve current techniques for analysis of bloodstains in order to identify specific individuals by means of blood or bloodstain clues. A study of the persistence of genetic markers in dried blood was completed during FY 75. The conceptual design of a blood data file was also completed, and a number of sources for statistical blood-factor frequency distributions was located. A contract was awarded to Mason Research, Inc., to modify conventional immunochemical methods of antigen typing and electrophoretic methods of enzyme typing for adaptability to instrument readout and to develop the instrumentation for this purpose.

Control of Illegal Use of Explosives

A previously initiated program to develop hardware for the detection and identification of explosives was continued during FY 75. A taggant detection investigation supported at Brookhaven National Laboratory under an interagency agreement was completed. Also completed under an interagency agreement was the taggant identification investigation at Lawrence Livermore Laboratory. It was concluded that both predetonation and postdetonation explosive tagging are feasible, and a preferred method has been established.

The effort on a subcontract to Case Western University to determine the feasibility of utilizing laser optoacoustic spectroscopy for detecting vapors emanating from explosives was successfully completed. A complementary subcontract was awarded for an explosives vapor characterization program to Analytical Research Laboratories, Inc. In addition, an inhouse research effort was initiated to apply counterpropagating-beam two-photon spectroscopy to the detection of explosives molecules in the gas phase.

Police Patrol Car System Improvements

This project was initiated as a Special Technical Support effort during FY 74 and converted to project status in FY 75. Its purpose is to apply currently available technology to enhance the capabilities, safety, and effectiveness of the patrol officer and to improve vehicle economy, safety, and utility. General program guidance was obtained from an advisory group consisting

of chiefs of police from several major U.S. cities and representatives of other law enforcement agencies. Steps were initiated to release subcontracts for the development of a prototype integrated, mobile data system and also for the design of alternate police car bodies.

Detection and Analysis of Gunshot Residue

This effort was initiated in FY 74 and continued during FY 75. A survey of gunshot residue detection procedures currently in use and their associated problems was completed, and possible techniques for improving detection capability were identified. The feasibility of the particle analysis method was established, and conclusive test results were obtained. Also being experimentally evaluated is an elemental luminescence analysis method which may be attractive as a low-cost means of detecting organic constituents of gunshot residue. Some promising preliminary results were obtained.

Body Armor Field Evaluation

The preliminary planning for Body Armor Field Evaluation was initiated in FY 74 under the Protective Armor Development program. In FY 75, the field evaluation was given separate program status with objectives which included the evaluation of the following:

- Acceptability of continuous-wear limited-protection garments.
- Garment impact on law enforcement operations.
- Garment performance in field use.

Fifteen representative cities have agreed to participate in this evaluation, and appropriate orientation and coordination activities were initiated. Contracts were let for test garment procurement, and deliveries are scheduled for early FY 76.

Improved Citizen Alarm Field Evaluation

This project was initiated in FY 75 as an outgrowth of the Citizens Alarm System development program. The purpose of the field evaluation phase is

to perform tests of adequate dimensions so that the effects of the system can be quantitatively evaluated and its performance capabilities established from the view points of both the user and the response agent. A subcontract was let to aid and support the test-planning phase, and specific program goals and test objectives were defined.

Potential test sites were identified, including institutions, small businesses, residences, and public areas, and the preparation of detailed test plans was initiated. Steps were also taken on two subcontract procurements, one for the citizen alarm hardware needed for the field evaluation and the other for a field test conductor. Awards for both contracts are anticipated during early FY 76.

D. SPECIAL TECHNICAL SUPPORT AND GRANT MONITORING

The activity in this category of effort covers special tasks requested by the Government Project Monitor (GPM) and normally authorized through the formal issuance of Technical Instructions. Included are tasks such as special development and/or testing of designated equipment; technical review, evaluation, or monitoring of various Institute grants; evaluation of proposals under consideration for support by Institute grant or contract; and review of equipment-related technical reports submitted to the Institute for evaluation and comment. In addition, special short-term technical support to the Institute for which an unanticipated need arises during the contract period is provided under this category of effort.

Forty-eight Technical Instructions were received during FY 75 authorizing special technical support tasks. Forty-one of these tasks were completed during FY 75, and appropriate submittals were delivered to the Institute. In addition, the submittals on eight Technical Instructions initiated during FY 74 and carried over into FY 75 were delivered in FY 75. Seven Technical Instructions received during FY 75 are being carried over into FY 76 for completion.

E. APPENDICES

There are three appendices to this report summarizing the correspondence, documentation, briefings presented, and meetings attended in the course of supporting the equipment development program during FY 75.

A summary of all major documents completed by the Development Group during FY 75 is given in chronological order in Appendix B. In addition to the detailed reports prepared at appropriate milestones for each project, numerous status briefings for reviewing problem areas and summarizing progress were prepared. These were presented primarily to the Institute and other interested agencies. The major briefings prepared by the Development Group during FY 75 are listed by project in Appendix C. Also included in Appendix C is a listing of the more important meetings and conferences attended during FY 75. The information obtained at these meetings and conferences was useful to the development effort and was summarized, as appropriate, in correspondence and monthly progress reports.

II. GENERAL ANALYSIS AND PLANNING

II. GENERAL ANALYSIS AND PLANNING

The purpose of the general analysis and planning activity is to conduct studies, analyses, and planning in order to identify and define new system development programs and to plan for the orderly implementation of both new and ongoing programs. The initial Analysis phase evaluates law enforcement and criminal justice system operations to identify problem areas and analyzes the impact of candidate solutions on these operations. Once the suitability of a candidate solution is determined, the Planning phase is initiated to determine project objectives, scopes of effort, schedules, and the funding required.

A. ANALYSIS

The objectives of the analysis activity in FY 75 were to perform various analyses related to the potential initiation of development programs and to support current programs as required. Three subtasks constituted the general planning activity during FY 75: Surveys and Assessments, Technology Utilization, and Operations Analysis.

Surveys and Assessments

The purpose of this effort is to identify suspect problems, make preliminary assessments of the impact of the identified problem on criminal justice system operations, and propose projects which have a potential for improving operations related to the problem. The effort in FY 75 was twofold. The first part completed a study of the utility of forensic science to the apprehension of offenders begun in FY 74. The second part of the effort consisted of a survey of selected problem areas in criminal justice operations and the recommendation of candidate areas for subsequent operations analysis.

Utility of Forensic Science

This study, initiated in FY 74 to assess the utility of advanced forensic science capabilities, was completed this fiscal year. The interim report submitted in April 1974 provided estimates of increases in the conviction rates of burglary, murder, and rape assuming a systematic use of physical evidence and advanced techniques giving positive offender identification. The second part of the study, completed in February 1975, focused on the crime of burglary and provided estimates of the impact of increased conviction rates on the burglary rate and dollar loss. Burglary was selected for detailed analysis since it is a high-incidence major crime for which conviction rates are very low. Also, good statistics are available that allow reliable estimates of cost savings resulting from burglary reduction.

The study approach included a survey of the present practices and use of physical evidence by forensic laboratories and an assessment of the potential for improvement in techniques. The results of the survey provided

estimates of the frequency with which various types of evidence are found at the crime scene and are sufficient for individualization. Cases with both personal evidence (e.g., fingerprints and body fluids) and nonpersonal evidence (e.g., tool marks and glass) and cases with and without an established data file were considered. Figure 2-1 illustrates the cases considered and the parameters (a through f) estimated from the survey (Cases I through III are defined on pages II-6 and II-7).

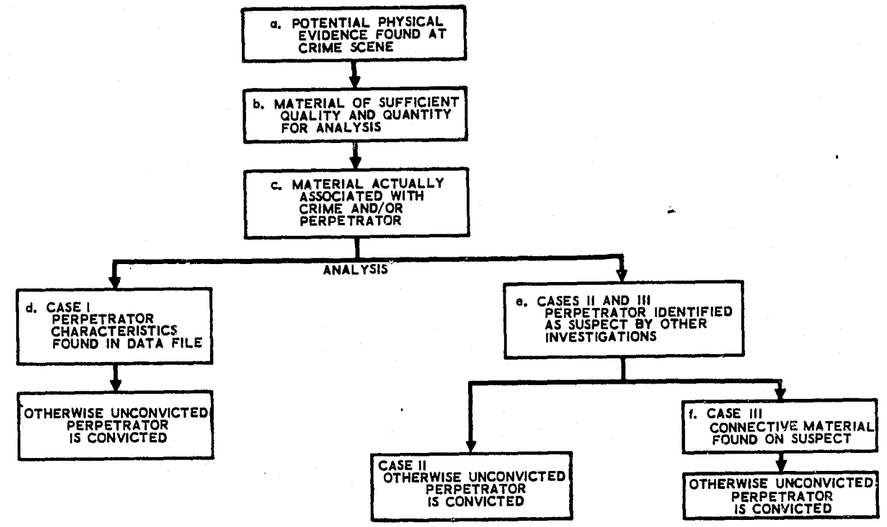


Figure 2-1. Relationship Between Physical Evidence and Conviction

The quantitative estimates of impact were then calculated based upon burglary and offender statistics and upon a mathematical model (Figure 2-2) of the interaction between the average burglar and the criminal justice system. Finally, the study investigated the legal and operational acceptability of the advanced forensic science capabilities postulated.

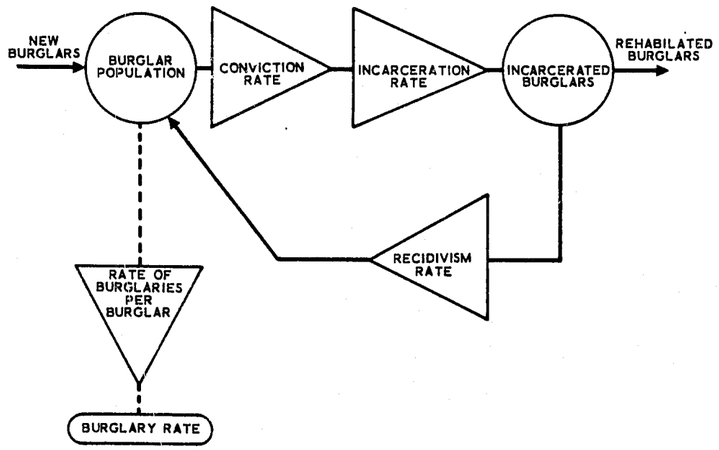


Figure 2-2. Burglary and Criminal Justice System

The survey of present practices of forensic laboratories revealed that the scientific examination of physical evidence plays a minor role in the investigation and adjudication of most Part I crimes; previous studies established that forensics are involved in, at most, 10 percent of all felony crimes. This contrasts sharply with a recent study (1972) by Parker and Peterson,[1] who found that out of a total of 720 Part I crimes 87 percent yielded physical evidence of value. In only four of these cases was the evidence submitted to crime laboratories for examination. Three primary reasons were found for this disparity:

- Lack of techniques and equipment to efficiently and effectively analyze evidence on a routine basis.

[1] B. Parker and J. Peterson, "Physical Evidence Utilization in the Administration of Criminal Justice," LEAA Grant NI-032, Washington, D.C., U.S. Department of Justice, 1972.

- Administrative obstacles that downgrade the importance of evidence collection.
- Limited laboratory staffs overburdened with the examination of drug evidence.

The relatively few individualization procedures in use are so time-consuming, complex, and costly that collection and analysis of crime scene evidence are not generally performed on a routine basis.

In view of these limitations, this analysis reviewed the technology and possible advances attainable through research and development for individualizing, on a routine basis, numerous physical materials associated with Part I crimes. Like fingerprints, other substances of human origin, such as blood, hair, semen, saliva, urine, and skin, have characteristics which are unique to an individual or small groups of individuals. In addition, samples of materials of nonhuman origin, such as paint, glass, tool marks, soil, and fibers from clothing, have microscopic and molecular characteristics which offer the means to uniquely individualize these substances.

The review of applicable technology indicates that numerous potential advances are attainable through research and development which could permit routine individualization of most of the physical evidence listed above. The analysis, therefore, addressed the question of which of the advanced capabilities warrant allocation of research and development resources. This required the assessment of the potential utility and acceptability of the projected advanced techniques.

Quantitative calculations were made to estimate the impact of advanced capabilities on conviction rates and crime rates if they were developed and put into widespread use. The calculations focused on nine major types of physical materials which can be associated with the interaction of a burglar with the crime scene: fingerprints, blood, hair, paint, glass, soil, fibers from clothing, metal particles, and tool marks. The frequencies with which these various physical objects and impressions occur at burglary scenes were

obtained. By use of a simplified model of the evidence utilization process, the impact of the capabilities to individualize each of these materials on burglary conviction rates was calculated. The increased conviction rates were then translated into the corresponding decrease in burglary rates by use of a model which described the flow of burglars into the courts and correctional system. The model also permitted comparisons to be made of the effectiveness of alternative methods (i.e., other than increasing conviction rates through the use of various forensic capabilities) for reducing burglary, for example, through reducing recidivism or increasing sentence length. This allowed the effectiveness of advanced forensic capabilities to be weighed against alternative strategies for reducing crime.

The three measures of effectiveness used to quantitatively compare the various evidence individualization capabilities were (1) the increase in burglary conviction rate provided by each capability, (2) the reduction in the projected total burglaries in the U.S. over the next 10 years resulting from the increased conviction rates, and (3) the dollar savings resulting from the burglaries prevented over the next decade. Three general cases (Figure 2-1) associated with the use of the various evidence types were defined in order to calculate the three measures of effectiveness.

Case I represents the use of the personally unique characteristics of blood, hair, fingerprints, and other physiological materials in the same manner in which latent fingerprints are used to a limited degree today, namely, to permit implication of an otherwise unknown person through the automated or manual search of a previously developed data base which contains a set of these characteristics for some segment of the population (such as previously arrested or convicted felons or known criminals).

Case II represents the use of the same evidence types as Case I, but without a previously constructed data base. Without such a data base, successful use of the crime scene evidence requires that a suspect be taken into custody before his blood, hair, fingerprints, or other personal characteristics can be compared with those found at the crime scene.

Case III represents the use of connective physical evidence which is transferred between the perpetrator and the crime scene environment. Successful use of this evidence also requires that the suspect be taken into custody through other means.

The results of these calculations are shown in Table 2-1. The results show that certain evidence analysis capabilities could have a very significant

Table 2-1. Impact of Advanced Evidence Analysis Systems on Burglary Rates and Losses for the 1974 to 1983 Period

Case	Evidence Type	Convictions per 100 Burglaries (Current = 4.6)	Percentage Burglary Reduction	Dollar Loss Prevented ($ Billion)
I	Fingerprints	17.9	48	7.9
	Blood	8.2	11	1.8
	Hair	7.9	9	1.5
	Total[a]	20.3	53	8.7
II	Fingerprints	7.1	4.0	0.6
	Blood	6.7	0.6	0.08
	Hair	6.7	0.5	0.07
	Total[a]	7.2	5.0	0.7
III	Paint	6.8	1.8	0.3
	Glass	6.9	2.1	0.3
	Fibers	6.8	1.2	0.2
	Soil	6.7	0.6	0.08
	Metal	6.7	0.5	0.07
	Tool Marks	7.7	8.0	1.3
	Total[a]	8.2	11.0	1.8

[a] Because of the assumed statistical independence of the occurrence of each type of evidence, the conviction rates resulting from the possession of more than one type of evidence is not simply the sum of the conviction rates from each type.

impact on burglary rates and losses. These include a latent fingerprint analysis capability, a blood or hair analysis capability used with data files, and a tool mark analysis capability. If any one of these advanced capabilities were to be used throughout the country, savings from burglary losses over the next decade could exceed $1 billion.

Figure 2-3 illustrates an example of the model calculations which compare the effect of conviction rate, recidivism rate, and sentence length. (For recidivism rate, 100 percent means a reduction to zero rate.) Figure 2-3 also compares the effectiveness of the conviction rate increases brought about by the various improved forensic systems (Cases I, II, and III)

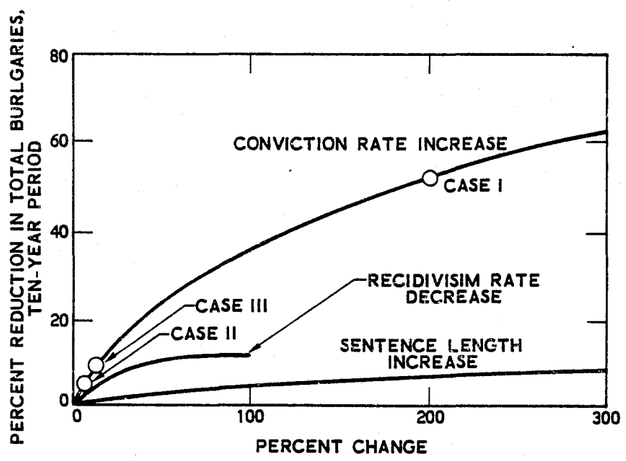


Figure 2-3. Comparative Effect of Changes in Conviction Rate, Recidivism, Rate, and Sentence Length

with that of changes in two other alternatives for control of burglary: increasing the average sentence served by burglars and decreasing the prison-to-burglary recidivism rate. It can be observed that, for equivalent percentage changes, a conviction rate increase yields significantly greater reductions in burglary rate than the two correctional alternatives. In particular, no amount of improvement in recidivism rate or increase in sentence length can duplicate the effectiveness of the Case I type of advanced evidence analysis capabilities. Examination of the calculations reveals that when a low conviction rate is coupled with a large entry rate of new burglars, the impact of correctional system changes on the burglary rate is minimized; i.e., burglars are brought into the correctional system too slowly to allow the subsequent correctional programs to which they are subjected to have a significant effect.

In summary, the relatively high impact that small increases in the conviction rate have on decreasing the burglary rate can be inferred to be true also of other crimes which are characterized by several offenses per offender per year and for which conviction rates are currently low, such as larceny, robbery, and possibly rape. Thus, the burglary rate calculations performed in this section provide a useful, albeit qualitative, perspective on the overall potential of advanced evidence analysis techniques to reduce these other major crimes. The calculations indicate that these advanced techniques if developed have a potential for reducing major crimes which is significant and equal to that of other major alternative strategies proposed.

Full use of fingerprint evidence alone is projected to reduce burglary losses by almost $8 billion over the next decade. This type of advanced system would more than pay for itself since preliminary estimates of the additional costs to collect fingerprint evidence and operate advanced filing and searching systems in the 50 states are, at a maximum, approximately only one fourth of the projected savings from the reduced burglary loss.

An analysis of the court rulings concerning conditions of the admissibility of evidence led to the conclusion that there were no major constitutional obstacles in obtaining these various evidence types on a routine basis.

A report on this work, entitled "Analysis of Advanced Forensic Science Capabilities," was submitted to the Institute in February 1975.

Candidate Problem Areas

The purpose of this effort is to (1) identify problems in law enforcement and criminal justice, (2) estimate the significance of these problems, (3) identify and anticipate the results of proposed projects which might produce improvement, and (4) provide a data base sufficient to conduct more refined operational analysis if warranted by the results of (2) and (3). If such a case develops, further operational analyses are scheduled to address in detail the relative cost, effectiveness, feasibility, and other relevant factors involved in a decision to actually initiate a given development program.

A filtering and consolidation process was used to reduce a large number of potential subject areas into a smaller set of candidate areas. Subsequently, priorities were assigned to this set of candidate areas, based on an appropriate set of weighting factors, to assist in the selection of subjects for in-depth survey and assessments.

As a first step, the following sources were reviewed:

- Problem Identification Reports, The MITRE Corporation.
- The President's Crime Commission.
- The National Advisory Commission on Criminal Justice Standards and Goals.
- The President's Commission on Causes and Prevention of Violence.
- Hearings held before the Small Business Administration Committee in 1969, entitled "Crime Against Small Business."
- Hearings conducted by the House Select Committee on Crime.
- "Candidate Equipment Projects, FY-74," Aerospace Report No. ATR-74(7901)-1.

- "Supplement Annual Operating Plan," Aerospace Report No. ATR-74(7901)-1.
- "Additional Projects," Aerospace Report No. ATR-74(7901)-2.

These sources contained a large and varied number of criminal justice problems and/or recommended system changes representing the collective judgment of a great number of people. As such, the sources were considered to be a reasonable departure point for the generation of a preliminary set of problem areas.

Many of the problem areas referred to in these sources, as well as many others known to all criminal justice researchers, did not lend themselves to a technical solution. For example, such identified problems as the existence of outdated criminal codes, judicial misconduct, and poorly qualified parole board members do not easily lend themselves to a technical approach. Problem areas of this nature were deleted from the preliminary set.

Other problem areas not considered further were those that appeared to be trivial in terms of their significance, as measured in terms of the extent of crime reduction or increased cost effectiveness resulting if the problem were solved. In addition, many of the problems and/or solutions suggested were felt to be effectively addressed by current LEAA and other efforts. These also were not considered further. Finally, many of the remaining items were interrelated and often naturally clustered into broader areas which were more amenable to an indepth analysis treating the broader area. This clustering was performed.

This process led to the identification of some 19 subject areas which meet the minimal criteria discussed above. A set of quantitative criteria for which to assign priorities to these areas for subsequent indepth survey and assessment efforts was then developed. The criteria were as follows:

- The importance of the problem area assessed in terms of the financial costs of the problem, the number of people affected, public attitudes, or stated LEAA priorities.

- The potential of the technical solutions which could be conceptually identified to address the problem area assessed in terms of the feasibility of development of the solutions and/or the impact of those solutions on the problem if they were available.
- The appropriateness of government research in the problem area assessed in terms of the degree of industry incentive and capability already existing in the technical areas of concern, which is in turn primarily a function of the technical risks and potential market demand of the various technical solutions.

A limited amount of data (analogous to a small scale survey and assessment) necessary to properly assess each of these factors was collected for each candidate area and reviewed by the staff of the Analysis group. For each candidate area, these data included a brief review of statistics concerning the nature and degree of the problem, a review of recently available or emerging commercial developments which address the problem area, and the identification and review of potential technical developments which could alleviate the problem area. On the basis of a review of these data for each candidate area, the staff assigned numerical values to each of the three ranking criteria (problem importance, potential of solution, and role of government) and a priority list was established on the basis of the total score for each candidate. This process was reiterated to establish a degree of consensus, and a final set of priorities was established. This list is presented below in decreasing order of the relative priority assigned.

Candidate Areas for Indepth Survey and Assessment

- Collection and analysis of the evidence found at crime scenes.
- Identification and recovery of stolen goods and the prosecution of fences.
- Transmission and retrieval of data relevant to crime investigation and control.

- Inconvenience to the public of interactions with the police and court system.
- Effectiveness of the police patrol function.
- Detection and prevention of employee pilferage and shoplifting.
- Individualization, identification, and tracing of guns and ammunition.
- Detection and prevention of check and credit card abuse.
- Detection and prevention of commercial robbery.
- Application of advanced materials, construction techniques, and electronics for the construction of crime resistant structures.
- Costs and effectiveness of maintaining correctional inmate and officer security and safety.
- Safety of police operations.
- Methods to reduce auto and motorcycle theft.
- Security and privacy of criminal justice information files.
- Efficiency of court operations.
- Delivery of food, health care, recreation, and other services to prisoners.
- Effectiveness of covert police operations.
- Quantitative modeling of the criminal justice system.
- Determination of whether a suspect, witness, or informant is telling the truth.

It is anticipated upon completion of the filtering, consolidation, and priority process that an indepth survey and assessment of three areas selected from the priority list by the Institute and Aerospace staff would then be initiated. However, it was decided by the Institute to focus efforts in the remainder of

the fiscal year on various necessary analyses in support of ongoing projects, with one exception. A complete survey and assessment was performed on the subject area of physical evidence collection and analysis, as previously described.

A preliminary list of the 19 candidate areas for survey and assessment and a summary of the source material and the methodology utilized in deriving this preliminary list was forwarded to the Institute in October 1974. A briefing summarizing the nature and extent of the problem areas, the potential technologies which address each area, and the priorities assigned to each area was given to the Institute at the semiannual review held 15 November 1974.

Technology Utilization

This study was initiated to survey promising areas of technology which show potential for application to criminal justice problems. The objective was to identify those existing and emerging technologies which could significantly improve the capabilities of the criminal justice system and to form a basis for LEAA research in specific technological areas. Examples of technology which have been developed for other purposes but found to be applicable to the criminal justice system include (1) a high-strength, synthetic fiber for tire construction being used for a lightweight, body armor material and (2) electronic miniaturization allowing wristwatch size personal alarm development.

A literature search and numerous contacts were made toward establishing the extent of previous work related to a systematic review of technological capabilities for resolving specific problems. Reports on technology assessment and technological forecasting were reviewed, and the governmental agencies contacted included the Office of Technology Assessment, the National Science Foundation, and the Department of Defense. The existing approaches and methods applicable to the study were analyzed; of these, the methodology favored was a systematic exploration of all opportunities.

A broad search was made for a technical subject classification index that would be comprehensive and provide access to a large data base. The most useful was found to be the index of 22 technical fields used by the Commerce Department's National Technical Information Service. With this index, a matrix relating potential applications of all the technical fields to the spectrum of criminal justice functions was developed. This matrix then illustrated, by individual cell density, which technical field(s) held most promise for further examination. By use of this technique, the field of electronics and electrical engineering was found to have the most entries. A subgroup within this technical field, computer/communications, was examined in detail, and an application matrix containing some 35 specific new or developing applications within the criminal justice system was developed. In particular, computer cost, performance, and size trends were compiled for identification of possible future applications.

The developed technique, when applied to all technical fields and subgroups would thus permit an identification of promising areas for research. An assessment of these identified areas to define criteria for determining the priority of research would fulfill the study objective. At this point, a presentation of study progress to date was made in conjunction with the semiannual review on 15 November 1974. As a result of the review, funding reallocations and revised program priorities necessitated the curtailment of work, and no further effort was expended for the remainder of the year.

Operations Analysis

The purpose of this work was to conduct indepth analyses of the costs, effectiveness, feasibility, and other appropriate factors associated with specific technical programs designed to reduce crimes. Each of the analysis would provide the data necessary to support a decision by the Institute as to whether or not to initiate a subsequent developmental program in the subject technical area.

During this fiscal year, the resources for operations analysis were focused on an operations research study of the citizen alarm system. The

study determined the relation between system cost and effectiveness in terms of the system operational parameters. The study estimated annual system costs per user and assessed the effects of response agent tactics, receiver locations, and victim location performance on system effectiveness. A summary of the study results are reported under Section III, B.

Delivered Items

The following items were produced by Analysis personnel during FY 75.

Documents

1. List of Candidate Areas for Survey and Assessment, October 1974.
2. Analysis of Advanced Forensic Science Capabilities, February 1975.
3. Briefing on Candidate Areas for Technology Utilization, November 1974.
4. Briefing on Operations Analysis of Citizen Alarm System, June 1975.

B. PLANNING

The objective of the planning activity in FY 75 was to develop plans for programs, tasks, and annual operations. Reviews and analyses of programs were conducted to derive the planning data necessary for the development of these plans. This involved an assessment of existing development programs for the maintenance of current program and task plans. In addition, approved new candidate programs were further developed, and Program Plans were prepared as required.

Three subtasks constituted the general planning activity during FY 75: Program Planning, Annual Planning, and Task Planning.

Program Planning

The objective of Program Planning is to develop Program Plans for current and new development programs. These plans are submitted each year and are used by the Institute as a review and approval document for the following year's effort. Upon approval, they form the basis of the Annual Operating Plan. These plans provide a description of the program requirements and rationale for development, its goals and objectives, and the scope of work. A systems development plan, program funding plan, schedules, and critical milestones are included which cover the period of development from start to finish. Individual projects or tasks of the program are defined, as are unusual requirements for facilities, significant equipment, or material.

Existing Programs

During FY 75, Program Plans for the following ongoing development programs were prepared:

- Cost Effective Burglar Alarm System
- Citizen Alarm System
- Speaker Identification

- Cargo Security System
- Blood and Bloodstain Analysis
- Control of Illegal Use of Explosives
- Detection and Analysis of Gunshot Residue
- Improved Citizen Alarm Field Evaluation
- Body Armor Field Evaluation

First draft copies of these plans were completed in January 1975 and were submitted to the Institute for approval. During February, revisions and corrections to these plans were made for final presentation at the Semi-Annual Program Review held in March. In addition, Planning personnel assisted the Improved Citizen Alarm Field Evaluation program in test planning. The data from a HUD pilot test of a personal alarm system were assessed to determine whether the citizen alarm test plan should be augmented with additional user behavioral factors.

Candidate Programs

At the beginning of FY 75, work was initiated on the compilation of a comprehensive list of candidate programs for further analysis and development. A survey was made of previous work, and programs were conducted by the Institute, MITRE, Aerospace, and others active in law enforcement and criminal justice research and development. In October 1974, a list of 29 new development programs, aimed at reducing crime and improving the operation of the criminal justice system, was submitted to the Institute. Subsequently, additional surveys, assessments, and operational analyses of problem areas selected from this candidate list were carried out as part of the Analysis task effort, with results presented at the November 1974 Semi-Annual Program Review.

As a result of the review and discussion of the Candidate Program List, work was initiated in November on the preparation of a preliminary plan of a program to improve police patrol car systems. The thrust of the development was to integrate the vehicle, communications, and data requirements of patrol and to provide a complete system which improved the ergonomics of the system interface with the patrol officer. The plan was briefed to LEAA and the Institute, and approval was received to proceed with detailed program planning. The first draft of the Program Plan was completed in December 1974 and, in January, was briefed to LEAA and to an advisory committee consisting of chiefs of police and other representatives of law enforcement agencies. In February, a summary of the revisions to the program resulting from these reviews was presented to LEAA, and work was initiated on the final draft of the Program Plan in accord with directions received from the GPM. On 1 April, the final draft was submitted to the Institute for approval.

Annual Operating Plan

The Annual Operating Plan presents an overall plan for the Equipment Systems Improvement Program and includes a summary description of the Program Plans previously approved. Basically, the Annual Operating Plan describes the accomplishments planned for the following fiscal year, a schedule for their completion, and project costs by task.

Work on the Annual Operating Plan began early in the fiscal year, in parallel with program planning. The first draft of the FY 76 plan was completed in January 1975, with preparation of the final draft beginning in February to incorporate revisions stemming from the review of Program Plans. The final draft was submitted on 31 March, following the March Semi-Annual Program Review. The FY 76 Annual Operating Plan was released and approved by the LEAA contracting officer in June 1975.

The Annual Operating Plan consisted of the following projects:

- Development Programs

- Cost Effective Burglary Alarm System
- Citizens Alarm System Development
- Speaker Identification
- Cargo Security System
- Blood and Bloodstain Analysis
- Control of Illegal Use of Explosives
- Police Patrol Car System Improvements
- Detection and Analysis of Gunshot Residue

• Evaluation Programs

- Improved Citizen Alarm Field Evaluation
- Body Armor Field Evaluation

These projects constitute the FY 76 equipment development program.

Task Planning

Following approval of the Annual Operating Plan, Task Plans are submitted to the Institute for each project designated in the Annual Operating Plan. Task Plans are also submitted for the supporting tasks of Planning, Special Technical Support, Program Management, and Analysis. The Task Plan provides a detailed statement of work for each subtask to be performed during the current fiscal year, a schedule, a financial plan, and a description of all deliverables.

Task Plans for the FY 75 program were predicated upon a planning guide that was derived in cooperation with the GPM. The guide underwent several revisions to reflect changing program requirements, the most recent being that of October 1974. The purpose of the guide was to provide a consistent format in preparation and to assure that all applicable subtasks were properly defined.

Preparation of the FY 75 Task Plans was initiated April 1974, with the maintenance of these plans to keep them current with changes in program direction continuing throughout FY 75. The submittal of FY 75 Task Plans,

and their revisions, is summarized in Table 2-2. Because of the considerable effort involved in the maintenance of these documents, during the second half of the year a quarterly schedule for the revision of Task Plans was instituted. Preparation of the FY 76 Task Plans was begun in April, and they were submitted to the Institute for approval on 9 May 1975.

Delivered Items

The following items were produced by Planning personnel during FY 75.

Documents

1. Task Planning Guide, October 1974.
2. Candidate Program List, October 1974.
3. Program Plans, January 1975.
4. FY 76 Annual Operating Plan, March 1975.
5. FY 75 Task Plans, Table 2-2.
6. FY 76 Task Plans, May 1975.

Table 2-2. Task Plan Genesis for Fiscal Year 1975

Project No.	Program	Submittal and Approval Dates FY 75													
		Submittal			Approval	Submittal					Approval		Submittal	Approval	Submittal	Approval
		1st	2nd	3rd	1st or Conditional	4th	5th	6th	7th	8th	2nd	3rd	9th	4th	10th	5th
01	Planning	4-19	6-13	6-27	6-28	8-9	8-22	10-28	1-10	3-3	11-15	1-13		3-21		
02	Special Technical Support	4-19	6-13	6-27	6-28	8-9	8-22	1-10			8-27	1-13				
03	Program Management	4-19	6-13	6-27	6-28	8-9	8-22	1-10			8-27	1-13				
04	Burglar Alarm System	4-19	6-13	7-5	7-16	8-9	8-22	10-28	1-10	3-3	10-10	1-13		3-6		
05	Citizen Alarm System	4-19	6-13	7-5		7-16	8-9	8-22	1-10	3-3	10-10	1-13		3-6		
06	Armor Development	4-19	6-13	6-27	6-28	8-9	8-22	10-28	1-10	3-3	10-10	11-7		1-13		3-6
07	Speaker Identification	4-19	6-13	6-28	7-16	7-1	7-3	8-9	8-22	10-28	10-10	11-6	1-10	1-13	3-3	3-5
08	Cargo Security	4-19	6-13	6-28	7-16	7-1	7-3	8-9	8-22	10-28	10-10	11-5	1-10	1-13	3-3	3-4
10	Blood Analysis	4-19	6-13	6-28	7-16	7-1	7-3	8-9	8-22	10-28	11-4	11-6	1-10	1-13	3-3	3-3
11	Explosives	4-19	6-13	6-28		8-9	8-22	10-28	1-10	3-3	10-10	11-6		1-13		3-6
14	Police Car	11-22	1-10	3-3	1-13						3-31					
15	Gunshot Residue	4-19	6-13	7-5	7-16	8-9	8-22	1-10	3-3		10-10	11-6		1-13		3-21
18	Analysis	4-19	6-13	6-27	6-28	8-9	8-22	10-28	1-10	3-3	8-27	11-15		1-13		3-21
19	Energy	4-19	6-13	6-27	6-28	8-9	8-22	1-10			8-27	1-13				
20	Citizen Alarm System Evaluation	4-19	6-13	6-27	6-28	8-9	8-22	1-10	3-3		10-10	11-8		1-13		3-6
21	Body Armor Field Evaluation	4-19	6-13	6-27	6-28	8-9	8-22	10-28	1-10		10-10	11-7	3-3	1-13		3-6

III. DEVELOPMENT PROGRAMS

During FY 75, the Development Group was authorized to proceed with the following programs:

- Cost Effective Burglary Alarm System
- Citizens Alarm System
- Protective Armor Development
- Speaker Identification
- Cargo Security System
- Blood and Bloodstain Analysis
- Control of Illegal Use of Explosives
- Detection and Analysis of Gunshot Residue
- Police Patrol Car System Improvements

The first eight programs on this list are activities continued from FY 74. The last item on the list is a new program initiated during FY 75.

The FY 75 programs represent a mix of development activities aimed at supporting the needs of citizens in reporting and reducing the frequency of crime, as well as the needs of law enforcement agencies for new and improved equipment. Appreciable effort had been previously devoted to the selection of these projects in order to provide, within the necessary budgetary constraints, a balanced development program.

A complete equipment development program is normally a three- to five-year effort and involves the following:

- Problem assessment
- Identification and evaluation of potential solutions
- Prototype feasibility assessment
- Hardware development
- Field testing and evaluation

FY 75 represented the third year of the Equipment Systems Improvement Program. As the year ended, two of the development projects, Citizens Alarm System and Protective Armor Development, went into field testing and evaluation. In addition, two other projects, Speaker Identification and Cargo Security System, were preparing to go into pilot field testing and evaluation. A review of the activities and accomplishments for the nine development projects included in the FY 75 effort is presented in this section. Each project is separately discussed in individual subsections to provide a brief overview of past activities and a summary of the FY 75 progress. Also included in each subsection is a list of all items delivered during FY 75 on each project. Included in this category are Aerospace reports, subcontractor reports, and fabricated hardware. For more detailed information on a specific project, reports listed under "Delivered Items" should be consulted.

A. COST EFFECTIVE BURGLARY ALARM SYSTEM

Burglary continues to increase at an alarming rate and now accounts for almost half of all reported serious crime in the U.S. The arrest clearance rate for these crimes, according to FBI Uniform Crime reports, is less than 15 percent in spite of specific emphasis applied to the apprehension of burglars in certain cities. Investigations conducted by Underwriters Laboratories and LEAA-sponsored organizations (e.g., in Cedar Rapids, Iowa) indicate that alarm systems represent an effective deterrent, perhaps the only effective means presently known. The principal obstacle to their general application is their high false alarm rate (almost 98 percent in some areas) and their relatively high cost, particularly in residential installations.

The objective of the Aerospace effort in this area is to utilize the emerging economic and performance benefits of electronic large-scale integrated (LSI) circuits coupled with improved and simplified do-it-yourself installation methods to reduce cost. A second objective is to reduce false alarms by improving intruder detection sensors, reducing user errors with better human-system interface logic, and requiring tripping of at least two detectors by the intruder. The overall system features are illustrated in Figure 3-1.

In prior years, Aerospace conducted a detailed survey to characterize the crime of burglary. Data obtained from various government and industry sources were used to develop a representative analytical burglary model in which typical police responses to a burglary call were examined. Additional analyses compared the effectiveness of several different burglary alarm systems against potential monetary losses and apprehension rates.

The results of these cost-benefit analyses were used to identify technical requirements for development of an improved burglary alarm system which could provide simple sensors to discriminate a human intruder and yet be relatively immune to other signals such as those common to the residential environment, new concepts for logic control of alarm systems to decrease the number of false alarms, and a means for inexpensively communicating the alarm data from the residence to the police or an alarm company.

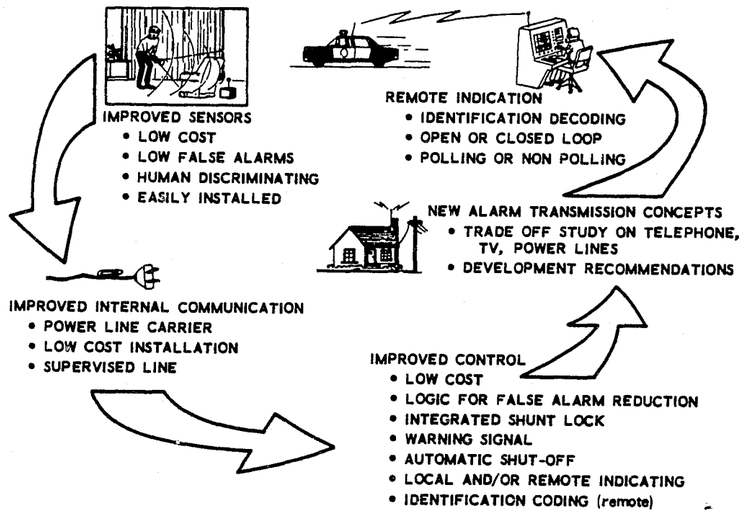


Figure 3-1. Cost Effective Burglary Alarm System Features

Since the cost of installation represents a significant element in the overall system cost, up to 60 percent, a subcontract was awarded to investigate a technique to reduce installation cost by using the existing residential house wiring to communicate signals from various detectors to a central controller. This subcontract concluded that it was feasible to utilize the house power wiring but that additional component development effort would be necessary to overcome power line noise problems.

Procurement packages were prepared in anticipation of the subcontract award in FY 75 for development of an electric field intrusion sensor, for an external alarm transmission media evaluation study, and for development of a low-cost reliable integrated security alarm system to include concepts and equipment resulting from the first two procurements.

Fiscal Year 1975 Accomplishments

During FY 75, a subcontract for an alarm transmission media evaluation study was awarded to and completed by Stanford Research Institute. The study was undertaken because of the decreasing availability and increasing cost of dedicated telephone circuits, which have been the mainstay of existing burglar alarm service. The alternative transmission media were evaluated in terms of cost, availability, reliability, resistance to tampering or jamming, and regulatory and policy constraints. Concepts included new versions of telephone facilities, cable television, radio frequency, and cross-town electric power lines.

The alarm transmission media study focused on two broad categories of alarm service, the conventional commercial service conforming to the requirements of Underwriters Laboratories and a low-cost alarm service such as may be adequate for residential or small-business applications but which does not meet the Underwriters Laboratories' approval specifications.

Several recommendations resulted from this study. Further studies of the cross-town power lines as a potential medium for alarm signal transmission should be discontinued because of technical uncertainties (e.g., bridging over switches and transformers and multipath) and uncertainties arising from the contingent liabilities which may be imposed on electric companies. Since the telephone companies are already engaged in development of multiport bridges for alarm signaling application, no additional external funding of this effort is needed. Some reservations concerning universal adaptations of these devices, however, may be warranted. A study was recommended to establish a set of requirements for telephone autodialers for low-cost alarm signaling applications since telephones are an existing and already paid for media in most homes. Since growth for two-way cable television depends largely on the economic viability of the interactive services (e.g., marketing, information, and entertainment) that have been proposed rather than on the regulatory environment, no specific recommendations regarding the study of this medium can be made. If it can be determined that reliable alarm signal transmission using radio can be accomplished with transmitter power below three watts, it

may be desirable to determine whether some new implementation scheme may offer low equipment cost and improved reliability to the degree that would make this medium cost-competitive with telephone or cable television.

A subcontract was awarded to the Sylvania Division of General Telephone and Electronics in April 1975 for the integrated burglary alarm system including pilot testing and delivery of a prototype system using internal residential power lines as the communication media. The control system will include interfacing techniques with the user to reduce the incidence of false alarms caused by inadvertent or careless use. In the initial phase of this subcontract, performance cost tradeoffs for various alarm system control and communication configurations were performed. Simultaneously, Aerospace efforts supported these analyses using inhouse simulation facilities.

During the last three months of FY 75, an intensive Aerospace inhouse effort was undertaken to investigate all types of sensors which may be applicable to burglary alarm systems. Table 3-1 is a chart of sensor candidates considered. Of these eleven generic types, four were considered worthy of more careful laboratory experimentation at Aerospace on the basis of one or more of the following: potential performance, inherent low cost, or lack of technical data.

The four candidates for inhouse laboratory investigation were ultrasonics, infrared (active and passive), and static electric field (E-field) disturbance sensors. Figure 3-2 is a photograph of a typical E-field detector data gathering trail in a controlled intruder path. Figure 3-3 shows a breadboard of a new type of ultrasonic detector designed, constructed, and tested at Aerospace.

The Aerospace experimentation concluded that the ultrasonic, E-field, and wide-field view infrared sensors are unlikely to achieve the desired level of immunity from false alarms in an unrestricted home environment. If pets are excluded, the E-field sensor may be satisfactory provided that the probability of detection of a human intruder is acceptable. The narrow field of view infrared sensors, both active and passive, appear to be the most

Table 3-1. Burglary Sensor Development Matrix

Parameter	Potential Sensor Candidate										
	Improved Ultrasonic	E-Field (Active)	E-Field (Passive)	Magnetic (Active)	Magnetic (Passive)	IR (Passive)	Point/Strain Vibration	Analog Switchmat	IR (Active)	Biochemical	Optical (Passive)
Requirement											
Cost Effectivity (under $50)	Low	Med	High	Med	High	High	Med	High	Med	Low	High
Human Discrimination	Med	Med	Med	Med	Low	High	High	High	High	High	Med
Maximum Coverage	Med	Med	Med	Low	Low	Med	Low	Low	Med	Med	Med
Ease of Installation	High	Low	High	Low	High	High	Low	High	Med	Med	Med
Aesthetically Acceptable	Med	Low	High	Low	High	Med	Low	Med	Med	Med	Med
Obvious State-of-the-Art Improvement	Low	Med	High	Med	Med	Med	Low	High	High	High	Med
High Reliability (True Alarms and False Alarms)	Med	Med	Med	Med	Low	High	Med	High	High	Med	Med
Adequate Baseline Established	High	Low	Low	Low	Med	High	Med	Med	High	Low	Low
Programmatic Factor											
Probability of Success	High	Med	Med	High	High	High	High	High	High	Med	High
Industry Interest	High	Low	Med	Low	Low	Med	Med	Low	High	Low	Med
Data Rights to LEAA	Med	Med	Med	High	High	Low	High	High	High	Low	High
Scope of Development ($)(000)	<100	100-200	100-200	<100	<100	100	<100	<100	100-200	100-200	100-200
	Development Success Probability										

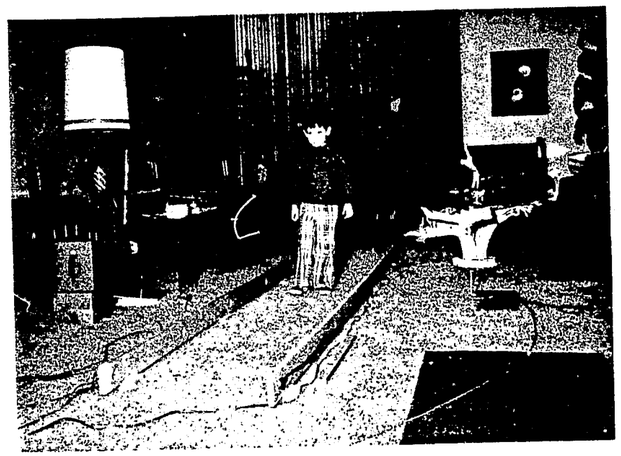


Figure 3-2. Passive E-Field Experiments

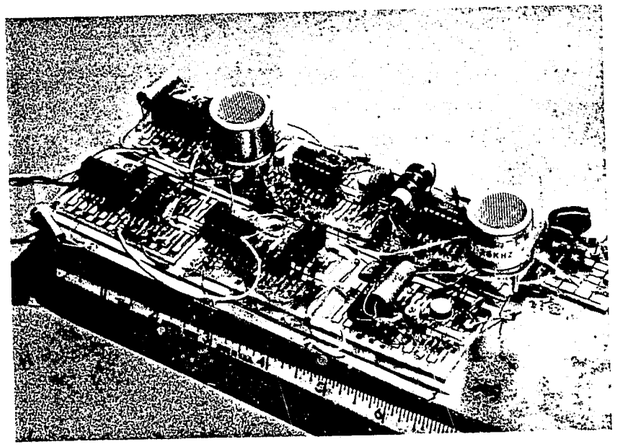


Figure 3-3. Dual-Frequency Dual-Sideband Ultrasonic Alarm Breadboard

promising approaches for meeting all technical objectives. Of these, the active system is subject to fewer installation restrictions but will probably be more expensive than the passive system.

Delivered Items

In addition to subcontract packages and briefing material, a subcontract final report was delivered during this year. Also, numerous meetings and conferences were attended. Individual items of significance are listed below.

Documents

1. Subcontract Package-External Alarm Transmission Media Study, August 1974.
2. Subcontract Package-Burglary Alarm System Development, Integration, and Testing, January 1975.
3. "External Alarm Transmission Media Study," SRI Final Report, June 1975.

B. CITIZENS ALARM SYSTEM

In response to national concern over violent crimes involving personal attacks (rape, robbery, murder, and assault), a project was initiated in FY 73 to develop a miniaturized personal alarm system. This project has as its objective the development of an effective capability with which the individual citizen can summon emergency assistance via a personal alarm at any time within public and private areas.

The citizen alarm concept (Figure 3-4) has been designed to provide the capability of meeting the above objective of signaling for help at the onset of a criminal attack and consists of four principal components: an actuator for initiating the call for help via a radio frequency signal uniquely coded to identify the user; a primary receiver relay to detect an alarm signal and retransmit the actuator code, together with data identifying the location of the primary receiver relay over the 110 VAC utility power lines; a secondary receiver relay to couple many primary receiver relay power line messages to a single telephone line; and a central station to operate on the alarm data and present it in usable form to the response agent.

In FY 73, a breadboard model was assembled and successfully demonstrated by Aerospace. During FY 74, a subcontract for analysis of requirements, system design, prototype hardware fabrication, and pilot feasibility demonstration testing of the concept was awarded to the Compu-Guard Corporation. The resulting pilot feasibility demonstration tests were accomplished in both a middle-income high-rise apartment building and a low-rise government housing project. These tests confirmed that alarm data can be reliably transmitted from the actuator to the primary receiver relay, relayed over the power line, coupled to a dedicated telephone line, and received at the central station for use by the response agent.

In parallel with the development of the conceptual system by Compu-Guard, analysis was completed, supporting the concept definition of an increased utility system for use in public areas as well as within buildings. The results of these analyses were documented in a concept definition report entitled "Improved Citizen Alarm System" and are summarized as follows:

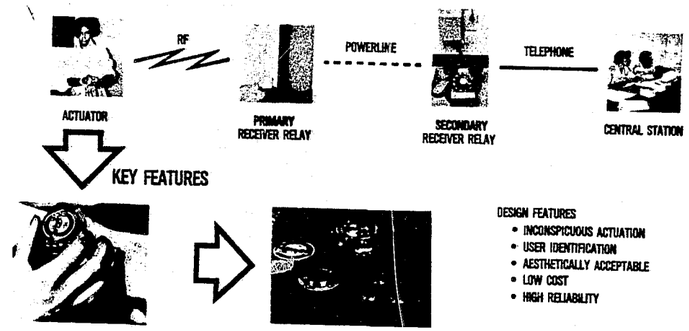


Figure 3-4. Citizen Alarm System Concept

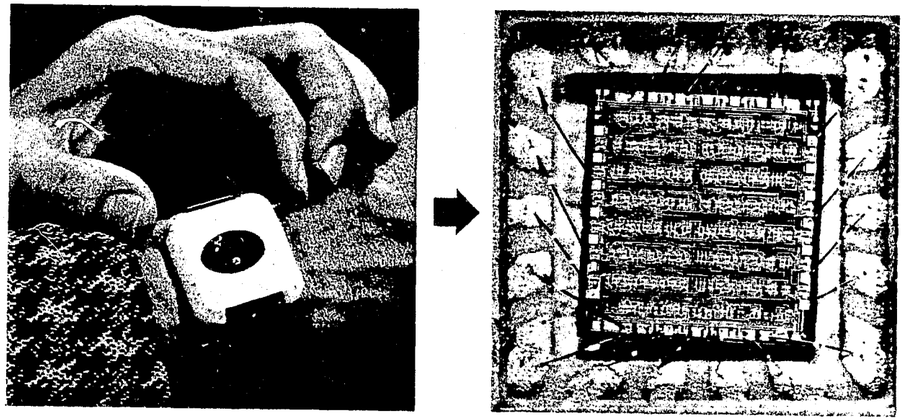
- High system reliability, better than 90 percent.
- Hardware response time of less than 10 seconds.
- Low susceptibility to environmental factors, noise, etc.
- Human engineering for acceptability and ease of use.
- Variable range capability with up to 50 feet required for the in-building application and up to 500 feet required for the out-of-doors scenario.
- Low cost per user (actuator costs less than $100).
- Low probability of accidental false alarms (less than 0.5 per year per user).
- Low susceptibility to interference due to simultaneous multiple actuations.
- 50 percent reduction in the volume of the prototype actuator.

Fiscal Year 1975 Accomplishments

In early FY 75, a followon subcontract was awarded to Compu-Guard for the development of the hardware for the Improved Citizen Alarm System as an extension of the previous conceptual development. This subcontract meets the above requirements with emphasis on increased actuation range, reduced actuator size using LSI electronics, line supervision, and environmental protection of the receiver. The detailed design was completed in June 1975 and is to be followed by the fabrication of test hardware, feasibility demonstration testing, and the final report early in FY 76.

Key features in the design of the Improved Citizen Alarm System are as follows:

- Actuator. A major change in the design approach for the radio frequency transmitter was implemented early in the design phase. The original design for the transmitter circuitry resulted in a wide band transmission system (450 ± 5 MHz). A crystal-controlled, narrow band transmission circuit was designed to improve system reliability and to permit actuation of the system in compliance with the Federal Communications Commission (FCC) nonlicensed requirements. Large-scale integrated electronics were also utilized in the design and have resulted in a reduction in volume of the improved system actuator to 50 percent of the original actuator. Packaging concepts were developed which permit the user to wear the actuator as a watch, pendant, or belt clip or to carry it loosely in a pocket. The actuator is shown in Figure 3-5 along with the LSI timing chip.



ACTUATOR CHIP

Figure 3-5. Actuator and LSI Timing Chip

- Primary Receiver Relay. The design of the primary receiver relay was changed to allow for full system supervision. This supervision will provide to the operator an indication of a malfunctioning unit or one that is disconnected or abused. Implementation of the supervision requirement is done through time division multiplexing. Each primary receiver relay is programmed to respond at a specific time slot from the central station. A two-bit status word is used to indicate the status of the unit, either alarm or no alarm. Failure to receive one of these codes is interpreted by the central station as a malfunction, either hardware failure or tampering, thereby allowing the dispatch of a response agent to determine the cause. The primary receiver relays utilize the power lines within the residence or those from external street lights as the first leg of the transmission to the central station.

- Secondary Receiver Relay. The secondary receiver relay serves as a transmission interface between the primary receiver relay and the central station. The data are received from the primary receiver relay over the power line and retransmitted over a dedicated telephone line to the central station. By utilizing the existing wiring circuits, the secondary receiver relay can couple a number of primary receiver relays (up to 127) to the central station via a single dedicated telephone line. The secondary receiver relay consists of three basic elements: the power line modem to couple to the power line for two-way communication with the primary receiver relay, a timing and control unit for control of data transmission and timing, and a commercial telephone line modem to couple to the dedicated telephone line. The capability will also exist to couple several secondary receiver power line modems together in parallel to maintain the number of primary receivers per dedicated telephone line at or near the maximum of 127.

- Central Station. The central station is the brain of the system. It must accept digital data transmitted from the primary receiver relay via the secondary receiver relay, check for errors, determine the location of the primary receiver relay which received the alarm, identify the actuator and user that transmitted the call for help, and then display this data in usable form to the response agent. The central station uses an off-the-shelf PDP model 11/05 minicomputer manufactured by Digital Equipment Corporation. Off-the-shelf "executive" software routines already developed by Digital Equipment are also being utilized. Data relating the actuator serial numbers and the users, together with the location of the primary receiver relays, are stored on magnetic tape and are accessible by the computer when needed. A teletype keyboard is also available for making changes to this data, i.e., lost or stolen actuators, move-outs, or location changes for the primary receiver relays.

The central station minicomputer is being designed to interface with up to 16 dedicated telephone lines, with the capability to expand to a larger number with hardware and software changes. The supervision of each telephone line and all primary receiver relays connected to that line is done by the central station and is completely independent of data transmissions on the other telephone lines.

Planning has been completed for tests to verify the performance of the hardware and to demonstrate its performance in a real world scenario. The Arlington Apartments will be utilized again for this testing, now scheduled to begin in early FY 76. Figure 3-6 depicts prototype hardware along with key system features.

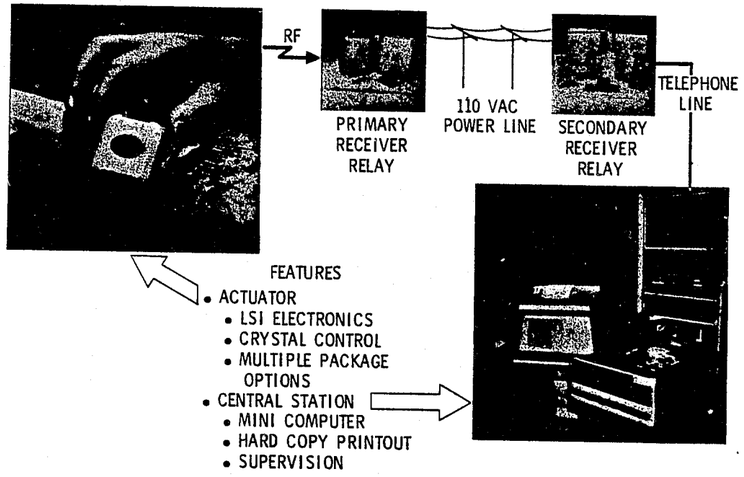


Figure 3-6. Improved Citizen Alarm System Hardware Development

Concurrent with the prototype development of the citizen alarm system hardware, various quantitative analyses were performed by The Aerospace Corporation and subcontractors to better define the operational characteristics desired for such a system. An inhouse operations research study quantified the relationships between system cost and effectiveness and the various operational parameters of the system. This effort was complemented by analyses conducted under subcontract by the J. H. Wiggins Company, which addressed, primarily through survey and opinion research techniques, these and certain other key aspects of the system. The subcontractor effort was initiated in the latter part of FY 75 and will be reported in their final report, due in early FY 76.

In the analyses conducted inhouse, two quantitative measures of system cost-benefit were defined, the annual system cost per user and the cost per successful interdiction of a violent crime. The values of the parameters describing system design and operation were then varied to permit a systematic examination of their effect on the measures of system cost-benefit.

The two baseline scenarios selected for the analysis consisted of the apartments, corridors, and immediate areas surrounding the Pioneer-Migliore public housing project in Elizabeth, New Jersey, and the public streets in an inner-city portion of Washington, D.C. Key summary observations from these calculations are as follows:

- It was observed that the total annual system cost on a per-user basis was not a strong function of the cost of the actuator hardware. This was because the amortized cost of the signaling device is only a small portion of the total system costs associated with the actuators, receivers, support personnel, installation, and maintenance. In contrast, the annual system cost per user and per crime interdicted can become unacceptably high if only a small fraction of the population residing in the area covered by receivers chooses to (or can afford to) participate as users of the system. Thus, it was observed that potential increases

or decreases in the cost of the actuator affect the cost-benefit of the system primarily in terms of the level of market acceptance which corresponds to each level of cost of the actuator. In support of the analysis of this issue, several market surveys were initiated under subcontract to determine user demand as a function of cost to purchase. These surveys were not yet completed by the end of FY 75.

- The system must locate the victim with a degree of certainty so that the arrival of law enforcement agents will be timely. Three factors were determined to be of equivalent importance in determining the cost effectiveness of the system: (1) the cost of the location system, (2) the duration of the crime, and (3) the number of users in the protected area. However, relevant data on the duration of the crime are few, and the number of participants in the protected area cannot be accurately predicted at this time. Consequently, it was concluded that hardware development efforts to optimize the cost and performance of the location hardware system would be inappropriate until better definition of these variables was available.

- A citizen alarm system deployed to protect citizens in public streets appears to be cost-competitive with other law enforcement measures only in areas with high population density, high police patrol density, and average-to-high crime rates. This implies that a public area system will likely be deployed only in core city areas and that it should consequently be designed for acceptance by users residing or working in such areas.

- A certain number of false alarms are, of course, inevitable. If it is assumed that the system pays for the additional law enforcement personnel required because of the demands of answering false alarms, the calculations indicate that the

system can remain cost-competitive if the false alarm rate does not exceed about 10 per year per user. However, such a rate produces a ratio of false alarms to real alarms (for an actual murder, rape, assault, or robbery) approaching 100 per year. This suggests that the false alarm problem may be one of the psychology and motivation of the law enforcement authorities in continually providing rapid emergency response to calls which are predominately unwarranted and that the increased expenditures of the system for operational procedures or equipments to limit false alarms are justified on this basis.

- The effect of other parameters investigated in the analysis, i.e., response agent costs and tactics, receiver deployment locations, and location system performance, are reported in the final report of this portion of the task, which will be available in early FY 76. Preliminary analyses of the safety of using the device and of the likelihood of false alarms and of alarms for fire and medical assistance are also documented in this report.

Delivered Items

The following key technical documents and hardware were delivered during FY 75, in addition to functional documentation such as progress reports and procurement packages.

Documents

1. "Survey and Concept Definition for an Improved Citizen Alarm System, Volume II: Appendices," Aerospace Report No. ATR-74(7905)-2, Vol. II, June 1974.
2. "Survey and Concept Definition for an Improved Citizen Alarm System Volume I: Technical Summary," Aerospace Report No. ATR-74(7905)-2, Vol. I, Reissue A, August 1974.

3. "Feasibility Demonstration of the Citizen Alarm System, Volume I: Final Report," Compu-Guard Report, 11 February 1975.
4. "Feasibility Demonstration of the Citizen Alarm System, Volume II: Appendices to the Final Report," Compu-Guard Report, February 1975.

Hardware

Actuators, receiver relays, and two central stations were delivered by Compu-Guard, closing out their initial subcontract for conceptual development.

C. PROTECTIVE ARMOR DEVELOPMENT

A program was initiated in FY 73 to determine the feasibility of developing lightweight, protective garments for law enforcement agencies. It was concluded from a threat assessment that the newly developed lightweight, high-strength, synthetic fibers offered great potential for improving existing protective armor designs.

The development program was divided into two phases. The initial phase successfully addressed the feasibility of improved lightweight protective garments and included a preliminary threat assessment, ballistic tests for penetration protection, and an initial evaluation of the damage to the body behind protective armor. The second phase was initiated in FY 74 and was devoted to developing and testing a variety of protective garments, additional blunt trauma investigations, and laboratory studies of the ballistic protective process.

Fiscal Year 1975 Accomplishments

One of the major analytical efforts of the program included an assessment of the parameters identified in Figure 3-7.

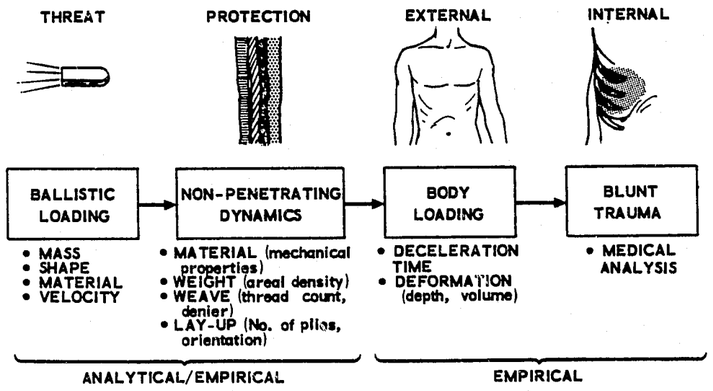


Figure 3-7. Technical Parameters

Impact attenuation provided by the protecting fabric, body loading, and blunt trauma (damage to internal body organs) were all considered in evaluating the effectiveness of such armor. The objective of this part of the program was to combine both the analytic and experimental procedures into a systematic approach to lightweight protective garment development by acquiring a better understanding of the processes involved in protecting the wearer, incorporating those processes in garment design, and then undertaking wearability and field tests of prototype garments. High-speed photographs (Figure 3-8) show the development of the backface cavity in geletin-backed Kevlar material as penetration of a .38 caliber bullet is prevented by the armor test sample.

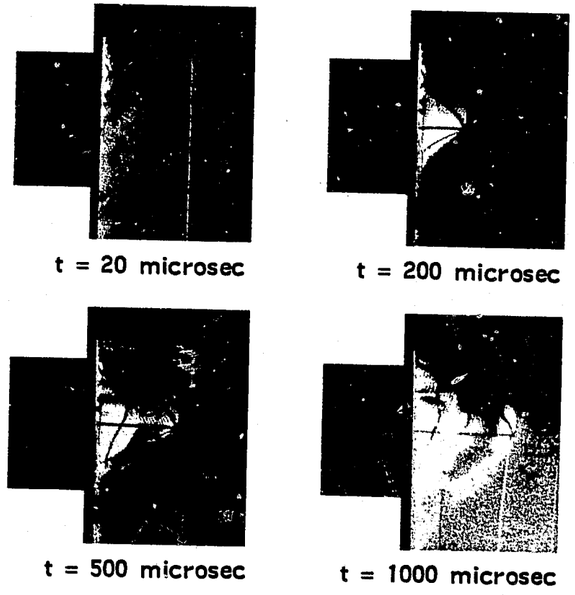


Figure 3-8. Backface Cavity Formation

The resulting protective undergarments completed in FY 75 were established as the most widely applicable protective garments for law enforcement personnel. Two different short undergarment designs were ultimately developed for the bulk of the field evaluation: the closed-side design and the open-side design (Figures 3-9 and 3-10, respectively). The former provided side as well as front and back protection and included a shirttail to aid in anchoring the garment and to keep it from riding up on the wearer. The latter design was a much looser fitting garment to provide for improved wearer comfort. It consisted of front and back panels connected by shoulder straps and featured side openings for cooling air circulation.

In response to the need for providing protection to the increasing number of policewomen, the design and fabrication of a protective undergarment for women was also undertaken. Assessment of the resulting garment shown in Figure 3-11 resulted in requirement changes of a pastel color and improving the comfort in the bust area. Design of a fully satisfactory garment has yet to be completed, however.

Figure 3-9. Style I Garment: Closed Sides with Cotton Skirt

Figure 3-10. Style II Garment: Open Sides

Figure 3-11. Women's Prototype Undergarment

Visual inspection of the sample woven Kevlar 29 fabric obtained earlier in the program showed major flaws resulting from poor quality control in the weaving operations. In conjunction with Dupont and the U.S. Army Natick Laboratories, a weaving specification was written which incorporated both visual and mechanical inspection techniques to ensure consistent quality control. Revisions were made to the specifications to include provisions for Zepel water proofing treatment of the scoured fabric and to specify mechanical properties of both 400 and 1000 denier fabric. Specifications were also prepared for fabricating the protective undergarments. These specifications identified the material requirements and quality assurance provisions for the finished garments.

A major concern in the use of Kevlar 29 fabric was the effect on the mechanical and ballistic protective qualities when exposed to wetness conditions. Tensile tests of 400/2 (36 × 36) fabric immediately after quenching in water indicated an approximate 6 percent degradation in both the warp and fill

direction. A series of firings that were made with both .38 and .22 caliber weapons against 7 plys, 400/2 (36 × 36) samples by both The Aerospace Corporation and U.S. Army Edgewood Arsenal Bio-Physics Laboratory showed significant degradation to the penetration resistance of the Kelvar 29 fabric. Examination of the fabric samples that failed when wet did not reveal any fracture of individual fibers. Instead, adjacent fibers had been spread and a hole created for the penetrating bullet. The wetting by water appeared to lubricate the individual fibers, reducing the friction between fibers and allowing sufficient fiber displacement to accommodate bullet penetration. Since it was established that wetting of the Kevlar-29 fabric was undesirable an ad hoc committee consisting of personnel from Edgewood, Natick Laboratories, Dupont, and Aerospace was established to evaluate and test various waterproof coatings. Results from these efforts concluded that a waterproofing application called Zepel D did minimize the wet fabric ballistic degradation to acceptable levels with minimum change in the material stiffness characteristics.

A Body Armor Industry/User Symposium was conducted by Aerospace in conjunction with the International Association of Chiefs of Police Conference in Washington, D.C., on 22-25 September 1974 to dissiminate the available development technology. The symposium was conducted in six sessions over a three-day period. Seventy-eight persons representing various law enforcement groups and body armor manufacturers and distributors registered and attended these sessions. Data packages were issued to all attendees. The data covered the pertinent information and experience acquired during the development program and represented a summary overview of the material published in the development phase of the program final report. In addition to formal briefing and film presentations, a variety of protective garments developed under the LEAA-sponsored program were displayed including uniform components, civilian garments, and special accessory garments. Samples of different types of Kevlar fabric and examples of clay backface signatures from ballistic tests of Kevlar fabric were also exhibited.

Although not completed under this development program, development recommendations were made to industry including Kevlar coatings, stress balanced weaves, and alternate weaving concepts that should further improve ballistic protection properties.

The baseline material for the protective garments was changed from Kevlar 29, 400/2 denier (36 × 36) to Kevlar 29, 1000 denier (31 × 31) at the end of the development program. Comparative evaluations and test results performed by both Edgewood Arsenal Biophysics Laboratory and The Aerospace Corporation showed that the Kevlar 1000 denier fabric's physic , mechanical, and ballistic resistance characteristics were at least as good as and, in some instances, possibly superior to that of the 400/2 fabric. The cost of the 1000 denier fabric is only about 70 percent of that of the 400/2 denier fabric.

A comprehensive final report was prepared that summarized the results of the multiagency effort for the development of a lightweight body armor to protect law enforcement personnel. The described activities included identifying operational requirements, conducting ballistic tests, assessing a variety of candidate materials, performing medical assessments, investigating the mechanics of bullet penetration, and subjecting selected materials to environmental testing. The report was divided into three parts: "Executive Summary" (Volume I), "Technical Discussion" (Volume II), and "Appendices" (Volume III). The "Executive Summary" presented a brief, concise review of the activities on the development phase of the program during FY 73 and FY 74, and summarized the principal conclusions and recommendations. The purpose of the "Executive Summary" volume was to provide a condensed, easily assimulated overview of the program effort and progress achieved. The "Technical Discussion" was the principal part of the series. It provided a comprehensive discussion of the program objectives and protective garment development and wearability test activities. "Volume III, Appendices," contained detailed technical material supporting Volume II.

Delivered Items

The items delivered under this program during FY 75 included published reports; other documentation, such as briefings, meeting minutes, procurements and data packages; and a variety of manufactured protective garments. In addition, numerous meetings and conferences were conducted. Individual items of significance are listed below.

Documents

1. "Data Package for the Industry User Symposium on Light Weight Body Armor," Aerospace Report, September 1974.
2. "Final Report - Protective Armor Development Program: Volume I, Executive Summary, Volume II, Technical Discussion, Volume III, Appendices," Aerospace Report No. ATR-75(7906)-1, December 1974.

Hardware

Eighteen prototype protective garments of different types and styles to be considered for use in the field evaluation tests.

D. SPEAKER IDENTIFICATION

The Speaker Identification program was undertaken to develop and test a computer-aided speaker identification system and to foster techniques for improving the use of voice samples in criminal investigations. A secondary objective is to identify other applications of the speaker identification technology developed in the program.

The program was initiated in FY 73. A subcontract was awarded to Rockwell International, Inc., for the development of a Semi-Automatic Speaker Identification System. Selected Aerospace studies were conducted and resulted in publication of a voiceprint applications manual and a system study of a concept for recording illegal telephone calls (Figure 3-12).

In FY 74, the subcontract effort involving the development of the Semi-Automatic Speaker Identification System was completed. The detailed analysis required to develop the speech processing and comparison algorithms was also completed during FY 74. This included the collection and utilization of a speaker data base, including general American, Black urban, and Chicano

Figure 3-12. Semi-Automatic Speaker Identification System

dialects and telephone conditions from diverse caller locations. The data base was randomly partitioned into three segments: The first was used to design the algorithms; the second segment was used for optimization; and the third was reserved for performance testing.

The inhouse Aerospace effort in FY 74 included an independent assessment of the speech processing algorithms and speech comparison features developed by Rockwell. The discriminating power of the chosen features was confirmed for the data base, and the overall design of the system was validated. In addition, Aerospace prepared and submitted a procurement package to the Institute for laboratory and pilot testing of the system in accordance with the overall program plan.

Fiscal Year 1975 Accomplishments

In FY 75, the portion of the data base previously reserved was used to obtain system performance data. Using the high-speed data processing facility in their speech recognition laboratory, Rockwell exercised the feature extraction and comparison algorithms with a total of approximately 12 million separate speech sample comparisons. The data obtained verified the effectiveness of the system software and provided a statistical reference whereby the measured quantity of difference between speech samples may be compared to equivalent measures obtained from the sample population of speakers. In this manner, the likelihood that two speech segments were uttered by the same or different people may be calculated. Figure 3-13 shows plots of performance data for several sets of possible phonetic event categories and the decision limitations on the system by the availability of comparable sounds (events) between two speech samples. The performance data are expressed in terms of the speaker distance (calculated by the system) which is a composite measure of the degree of similarity between two speech samples. The larger the speaker distance, the more dissimilar the two samples are.

Since a total of 1023 sets of the ten possible event categories can occur in a given speech sample, the performance data are described by a set of 1023 such plots. As the figure shows, the system calculates significantly

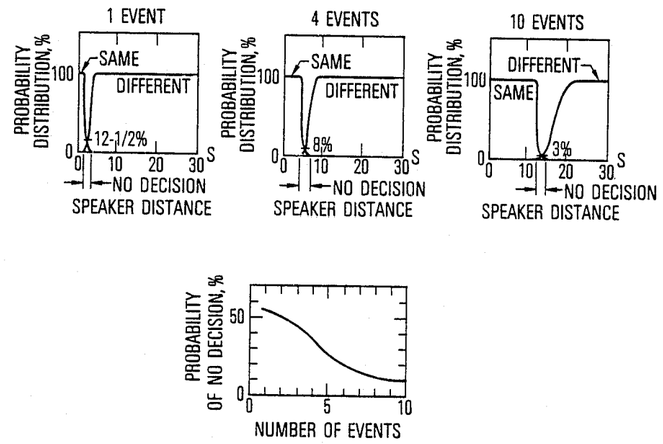


Figure 3-13. No-Decision Probability for Speaker Identification

smaller speaker distances for repeated utterances by the same speaker than for utterances by different speakers. The figures also show that the separation of the values of speaker distances for same or different speakers increases as the number of events compared increases. The degree of overlap is such that if decisions regarding a match or an elimination were made on the basis of at least a 99 percent probability of the choice being correct, the percentage of cases in which no decision could be made (the uncertainty region) is as shown in the lower curve.

Concurrent with the completion of the development effort on the brassboard Semi-Automatic Speaker Identification System, a followon subcontract was awarded to Rockwell International for the conduct of laboratory and pilot field test activities. The purpose of the laboratory test effort was to provide information regarding the performance of the system when processing speech samples different from those of the data base used in the development phase. These include female voices of various dialects, speech containing effects of intentional disguise and emotional stress, and speech recorded under simulated real-world conditions.

An actual case sample from the police department of a major city was processed on the Semi-Automatic Speaker Identification System at the request of the Institute. The noise background and unlike texts violated current system constraints but pointed to improvements required in the system.

Test planning was completed for the pilot field test of the brassboard system with a law enforcement group having voice print capability and interest. The test plan was delivered to the Institute in early June, and the system was installed at the pilot test site (Los Angeles Police Department) in late June. Several national voiceprint experts are involved in the pilot test.

Independent Aerospace analysis of the voice features selected for use in the computer-aided system showed that as few as 14 individual voice features selected from 6 phonetic events (sounds) could provide classification accuracies of over 99 percent for noise-free similar text samples.

Other Aerospace activities included conduct of a study to assess the potential applications of the computer-aided speaker identification system. Preliminary and final reports were prepared which covered present and future uses of voice identification in the law enforcement and criminal justice community and problems with current methods. Estimates were made regarding how the use of voice identification can be expected to change as a consequence of supplementing the manual examination of spectrograms with the computer-aided system. Technical requirements were defined for applications such as computer access security, area access security, identity verification for check and credit card usage, and remote identity verification by police in the field. The principal technical factors addressed were verification accuracy of the equipment when used for automatic identification and the requirements for generating and maintaining a data base of individual speech characteristics for use in identification.

Delivered Items

The items provided under the program during FY 75 include a brassboard equipment system, formally published reports, and documentation such as briefings, meeting minutes, and procurement packages. In addition, appropriate meetings and conferences were attended. Individual items of significance are listed as follows:

Documents

1. "Preliminary Investigation of Applications of the Computer Aided Speaker Identification System," Aerospace Report No. ATR-74(7907)-1, August 1974.
2. Procurement Data Package - Laboratory and Pilot Field Test for the Semi-Automatic Speaker Identification System, August 1974.
3. Subcontract Data Package - Laboratory and Pilot Field Test for the Semi-Automatic Speaker Identification System, November 1974.
4. "Semi-Automatic Speaker Identification System (SASIS) Final Report," Rockwell International Report No. C74-1185/501, December 1974.
5. "Applications of Semi-Automatic Speaker Identification Techniques," Aerospace Report No. ATR-75(7907)-1, March 1975.
6. "Pilot Test Plan - Semi-Automatic Speaker Identification Systems," May 1975.
7. "Analytical Studies Final Report - (SASIS)," Rockwell Report No. C74-1184/501, December 1974.

Hardware

1. SASIS brassboard available for pilot test.

E. CARGO SECURITY SYSTEM

The multibillion dollar losses to the national economy resulting from the theft of cargo has led to a program to provide security for cargo in the trucking industry. Emphasis is on local pickup and delivery operations, which are the principal targets of the cargo thief.

Initial project tasks beginning in FY 73 showed that hijacking of a complete vehicle represented only a small proportion of the total problem. The most frequent type of loss is the theft of one or more cartons of cargo from the vehicle. Accordingly, the scope of the program was broadened to encompass the detection of all categories of vehicle-related thefts. The concept of a vehicle location and status reporting system was developed; performance requirements were defined; and cost bounds were established. Procurement action for the design, development, fabrication, and testing of a brassboard system to be installed in five trucks for pilot testing was initiated.

Fiscal Year 1975 Accomplishments

Feasibility analyses and testing of both a hybrid dead-reckoning and hyperbolic grid (AM phase lock) location concepts were completed. These showed the technical feasibility of a hybrid system comprised of an odometer, directional gyroscope, and proximity units deployed in a low-density configuration. However, a life cycle cost analysis performed by Aerospace and the manufacturer of the gyroscope found that annual maintenance costs would place such a system beyond the established cost bounds. The concept of a solid-state acoustic ring gyroscope was investigated. However, the development required was not commensurate with program funding and schedules.

AM phase lock specifications were developed, and equipment was installed in Stations KFI, KNX, and KPOL in Los Angeles to stabilize their frequencies to better than 1 part in 10^{11}. Mobile receivers were installed in a battery-operated vehicle (Figure 3-14). The lines of position of the grid were measured, and basic system accuracy was determined to be a root mean square location distance of 19 feet (corresponding to a 95th percentile location

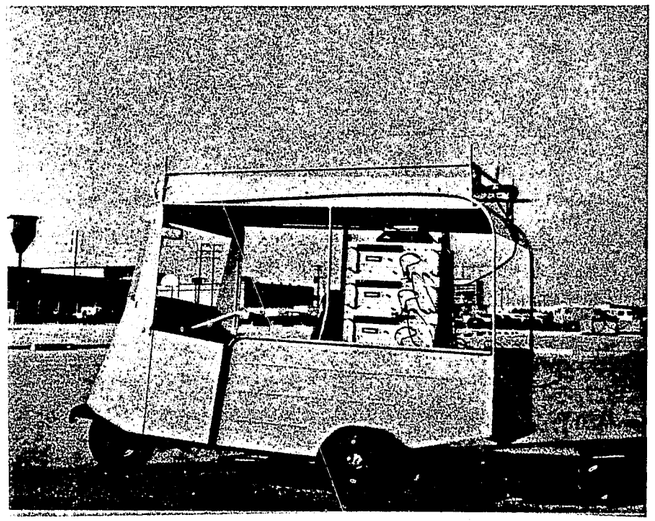


Figure 3-14. AM Phase Lock Experiment

accuracy of 47 feet). Tall buildings, power pylons, and such result in warpages of the lines of position. However, the warpages are stable, and mapping of street intersections could provide a system accurate to approximately 300 feet (against a requirement of 600 feet for the cargo security system). Further development of the concept was recommended.

Aerospace conducted a study of both the security and the dispatching procedures of a typical pickup and delivery trucking operation to determine the impact of introducing the cargo security system into such an operation and to establish operational design requirements. It was found that the input data required for the operation of the cargo security system, e.g., vehicle route assignments and authorized stops, will require the establishment of a new manual procedure on the part of the dispatcher. Much of the data generated for the cargo security system are applicable to the normal dispatch operations, and the security and dispatch data formats should be integrated to enable the dispatch and security monitoring operations to be performed by existing personnel. An operational design report was completed by Aerospace and is in the final publication cycle.

A subcontract was awarded to Hoffman Navcom, El Monte, California in December 1974 for the design, development, fabrication, and testing of the brassboard Cargo Security System. The initial tasks of establishing system design requirements and identifying candidate location technologies was completed in April 1975 with publication of a design requirements report. The report found an overlapped proximity system, the AM phase lock system, and LORAN-C to be the only location systems capable of meeting cost and performance goals. Because of inadequate LORAN-C signal coverage in most of the continental U.S. in early 1976 when the pilot test is to begin, overlapped proximity and AM phase lock systems were recommended for development and fabrication. This does not preclude the use of LORAN-C in the future if its planned additional coverage is implemented. In June 1975, the recommended location technologies were approved for the brassboard system, and a 16-square mile area of Los Angeles (Figure 3-15) encompassing 5 pickup and delivery routes involving theft-prone cargo was selected for the pilot test of the brassboard system to be conducted in mid FY 76.

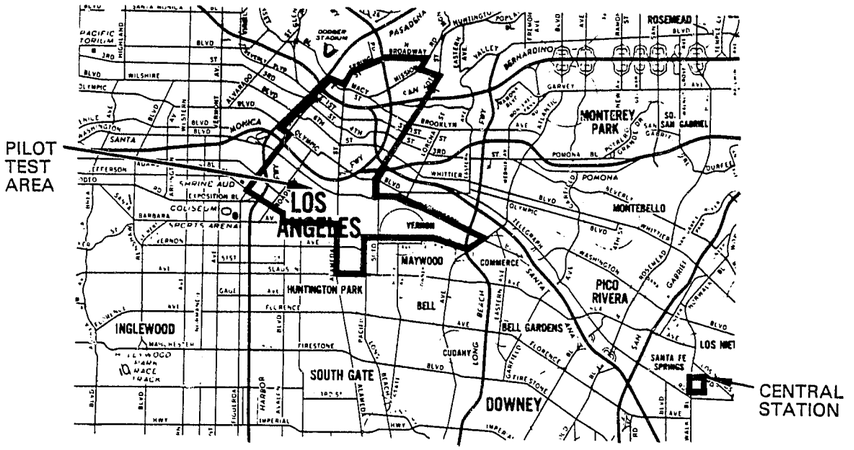


Figure 3-15. Cargo Security System Pilot Test Area

Delivered Items

The following key deliverables were made on the Cargo Security Program during FY 75.

Documents

1. "Survey and Technical Assessment Report, Cargo Security System," Aerospace Report No. ATR-75(7908)-1, July 1974.
2. Procurement Package - Design, Development, Fabrication and Test of a Brassboard Cargo Security System, August 1974.
3. Feasibility Analysis Report "Hybrid Dead Reckoning and Hyperbolic Grid Location," Aerospace Report No. ATR-75(7908)-2, April 1975.
4. "Design Requirements Report on the Cargo Security System," Hoffman Report, April 1975.

Hardware

1. Digital gyroscope interface and display unit (breadboard).
2. TRACOR Model 308A Rubidium Standard (modified for 640 kHz operation).
3. Phase Lock Test System (modified Time and Frequency Technology Model 713 AM Frequency and Modulation Monitors):
   - Two stationary units
   - Three vehicle units

F. BLOOD AND BLOODSTAIN ANALYSIS

The objective of this program is to facilitate utilization of modern techniques of blood individualization by developing reliable, easy-to-use blood analysis equipment and methods for crime laboratories; a statistical data base; a blood data bank; and reliable sera. The main objective is to be accomplished by developing methods that require less operator skill and less time than those currently used and which lend themselves to automation, thus reducing subjective judgments. The development of supporting instrumentation is an integral part of the program.

In FY 74, a survey was conducted to assess the state of the art of forensic blood analysis, to define the problems to be overcome in increasing the use of blood analysis for identification purposes, and to define promising solutions to these problems. It was concluded that a need exists for improved analysis procedures which allow a reduction in required operator skills and analysis time. It was further concluded that some genetic marker systems which are present in blood but not commonly used for identification purposes are worthwhile candidates for investigation.

Fiscal Year 1975 Accomplishments

The study of the persistence of genetic markers in dried blood was completed by Aerospace, and a report was written for publication in early FY 76. Six red cell antigen systems involving 15 separate factors and 4 protein-enzyme systems were included in the study. With currently available methods, seven of the antigens and two of the enzymes could be determined after persisting for six months under both low and high humidity conditions. Two additional antigens persisted for six months at low humidity but only two weeks at high humidity. One antigen persisted for three months at low humidity but only two weeks at high humidity. The two remaining enzymes were detectable after three months but not after six. The remaining factors had detectability lifetimes of from one to four weeks. These results are summarized in Figures 3-16 and 3-17. The initial discrimination probability using current analysis methods and the resulting decline with time are shown in Figure 3-18.

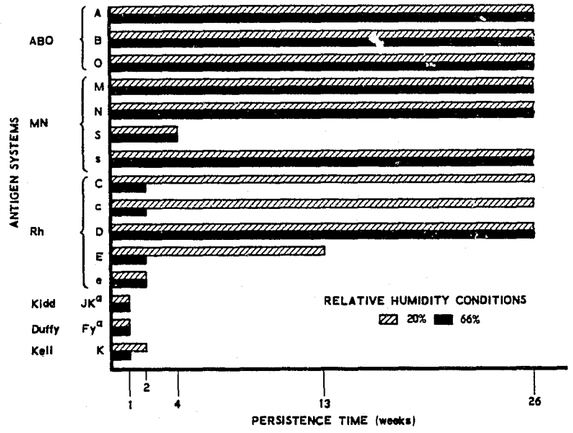


Figure 3-16. Persistence of Red Cell Antigens in Dried Blood at Ambient Temperature

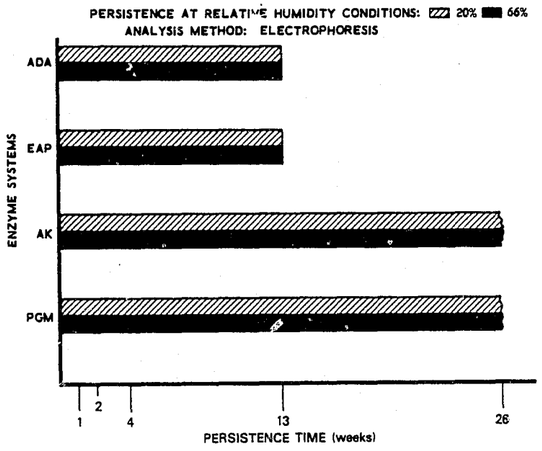


Figure 3-17. Persistence of Enzymes in Dried Blood at Ambient Temperature

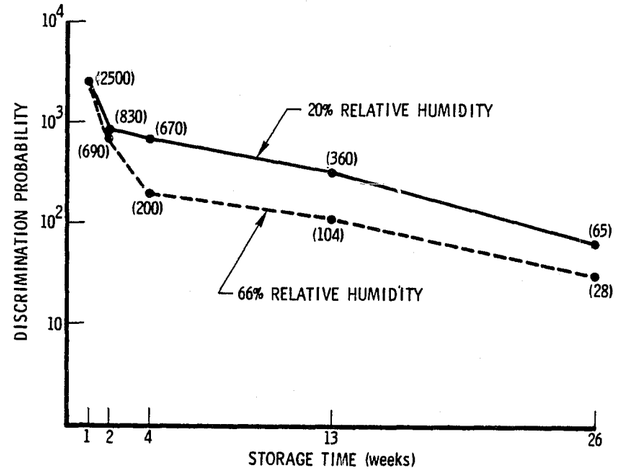


Figure 3-18. Discrimination Probability with Age of Dried Blood

Discrimination probability is defined as the probability that two randomly selected individuals will have the same phenotype.

Most blood evidence reaches at least the local crime laboratory within one week or less, and under these conditions all of the systems included in the study would be useable for identification. For older stains, the study points out those systems for which it would still be fruitful to conduct tests. The results of the study can also be utilized to identify those systems for which a more sensitive method would be especially useful.

A necessary proficiency in the immunological typing of blood and bloodstains and in the electrophoretic separation of blood proteins on a number of different substrates has been acquired by Aerospace in order to evaluate candidate methods and procedures.

The conceptual design of a blood data file has been completed by Aerospace, but no actual software has been developed. A number of sources for statistical information of blood factor frequency distributions have been

located. However, in the majority of cases information on ethnic backgrounds and place of birth is missing, thereby reducing the value of the information. In addition, many of the collections are in the form of raw data, and the agencies involved are unwilling to release them or unable to provide them without some further processing for which funds generally are not available.

In November 1974, a subcontract was awarded to Mason Research Institute and Ortec, Inc. Mason was to modify conventional immunochemical methods of antigen typing and electrophoretic methods of enzyme typing in such a way as to adapt them to reading of the results instrumentally. Ortec was to undertake the development of instrumentation specifically designed for these new methods. The desired objective of this approach was to improve reliability and lessen the time involved by a reduction in required operator skills and the elimination of human judgment for the interpretation of the results.

Mason proposed three alternative but related immunofluoremetric approaches, all of which depended on the attachment of fluorescent tags to one or the other of the reagents and reading the results with a fluorimeter. Immunofluorometric staining had already been applied successfully to the detection of antigenic material on tissue cells so that the extension of this concept to antigenic material on blood cells appeared attractive. The subcontractor was cognizant of the difficulties experienced by previous investigators but believed such procedures could be overcome by proper instrument design and modifications to the technique.

Because of the potential problems inherent in the fluorescent-tag immunological methods proposed by the subcontractor, the contract was structured to begin with a preliminary four-month feasibility study of these methods alone. Mason was authorized to proceed with full development of this approach, as well as the less controversial electrophoretic procedures, only if they could satisfactorily demonstrate the feasibility of immunofluorimetry for the more common antigen systems.

For the first half (two months) of this preliminary phase, Mason pursued all three of the interrelated immonufluorometric techniques and, for the second half, concentrated on one of these for use in the scheduled demonstration of feasibility. The demonstration took place but was unsatisfactory; the success rate (i.e., the ratio of correct to incorrect results) was not high enough to suggest a good probability for achieving the necessary reliability without further system improvements.

A one-month extension was given to improve the reliability of the subcontractor's method for a second feasibility demonstration, but the demonstration had to be cancelled on the basis of the subcontractor's estimate that he could not complete the demonstration within error allowables.

The subcontractor submitted a short-term study plan for resolving the technical difficulties. Aerospace supplied the subcontractor with a counter proposal for his consideration. At the end of the fiscal year, the subcontractor was in the process of submitting an experimental plan which could be conducted with minimum time and expense to determine the future direction of the subcontract efforts.

Delivered Items

All deliverables for FY 75 are documentation items.

Document

1. Subcontract Data Package - Bloodstain Analysis System, September 1974.

G. CONTROL OF ILLEGAL USE OF EXPLOSIVES

Explosives have been involved in skyjackings, letter and parcel bombs, extortion, and militant attacks upon public and private property. The general objective of this program is to develop new and improved methods and equipment for detecting and identifying explosives. Numerous principles exist upon which explosives detection and identification systems can be based. These include those in which a tagging principle is employed and those based on the sensing of inherent physical properties such as vapors of the explosive cartridge itself, the detonator, or the lead wires. In some cases, commercial detection devices with limited capabilities are available. However, explosives detection systems which are reliable and sensitive to a variety of explosives have yet to be demonstrated.

In FY 74, Aerospace initiated a project for meeting the above objectives. The initial effort on this program involved a survey of user agency needs and currently available commercial devices for explosives detection and identification. An assessment of those explosives control concepts requiring further development was conducted, and the results were reported in November 1973. Based on the conclusions reached and the priorities specified by an Interagency Explosives Subcommittee, effort on three separate system concepts was initiated in FY 74, namely:

- A system for detecting explosives by the sulfur hexafluoride (SF_6) vapors emanating from a tag of this compound added to the explosive at the time of its manufacture.
- A system to be used with detonated explosives involving taggants added to the explosive during manufacture which identify the manufacturer and source of the explosive.
- A system for detecting untagged explosives by sensing vapors which are inherently characteristic of explosives.

Fiscal Year 1975 Accomplishments

During FY 75, Aerospace continued the program for developing new and improved equipment for explosives detection and identification. This activity involved two subcontracts, two Institute-Atomic Energy Commission (AEC) interagency agreements, and an inhouse research study. In addition, continued support to the Technical Subcommittee of the Advisory Committee on Explosives Tagging of the U.S. Treasury's Bureau of Alcohol, Tobacco, and Firearms was provided in FY 75.

Taggant detection investigations by Brookhaven National Laboratory under an Institute-AEC interagency agreement were completed during FY 75 under the technical management and evaluation of The Aerospace Corporation. A final technical report will be delivered to the Institute during early FY 76. The objective of the Brookhaven work was to demonstrate the feasibility of using sulfur hexafluoride (SF_6) as a taggant for the detection of blasting caps in their use as detonators for explosives. The extreme sensitivity for detection of SF_6 (a few parts in 10^{13} parts of air without preconcentration) indicates that SF_6 as a taggant may offer the best current approach for predetonation detection.

Results revealed by this program are the following:

- Ambient levels of SF_6 do not pose a problem in the detection of tagged blasting caps.
- Inconsistent results regarding SF_6 takeup and release for a number of different polymeric substrates must be resolved.
- Barriers do not appear to be a significant problem with the possible exceptions of polyethylene bottles or Teflon-taped pipes.
- Detection feasibility of SF_6 as a taggant has been shown, but taggant implementation concepts acceptable to blasting cap manufacturers have not been demonstrated.

Identification taggant investigations by Lawrence Livermore Laboratory under an Institute-AEC interagency agreement were completed during FY 75 under the technical management and evaluation of The Aerospace Corporation, and a final technical report was delivered to the Institute in April 1975. The objective of this effort was to investigate, test, and determine the feasibility of adding various coded taggant materials to explosives during manufacture for the purpose of being able to identify the use of explosives in both predetonation and postdetonation scenarios. Three different taggants were considered during the course of this program:

- Minnesota Mining and Manufacturing Company (3M) polyethylene microspheres containing iron oxide for magnetic onsite retrieval and taggant elements at three different possible concentration levels for code identification. The particles were separated from the magnetic debris in the laboratory via floatation or through microscopic means and analyzed by an electron beam microprobe.
- Westinghouse Electric Corporation polyethylene spheres containing coded phosphor chips retrieved onsite by visual detection when exposed to ultraviolet light. The chips when excited by laser energy emit a spectrum characteristic of the rare earth coding elements present.
- Ames Laboratory rare earths added to explosives as oxides (or in solution in ethanol as nitrates) at three different concentration levels recovered onsite by cotton swipes of debris. The rare earths are separated from the swabs by ion exchange techniques and analyzed by x-ray excited optical luminescence techniques.

As a result of this program, the feasibility of tagging explosives for postdetonation identification was proven. Each of the three proposed methods of tagging explosives may be safely added to nitroglycerine-based dynamite.

Following detonation, enough of each tag survives to permit collection and preparation for analysis, and collecting tags at the site of a bombing is relatively easy, requiring a few rapidly learned skills. The Ames and 3M Laboratory analytical techniques require well-trained laboratory technicians, but the Westinghouse method requires a lesser degree of technical competence. The time required to extract the code from the tags in the laboratory range from 15 minutes (Westinghouse) to 8 hours (Ames and 3M). The code was successfully extracted from each of the tested Westinghouse chips. Background interference made identification of some of the Ames samples difficult. None of the 3M microspheres was successfully analyzed.

The unit cost of the tags varies with the quantity produced and the level of coding required. The optimum level of coding appears to be "plant-quantity." At this level, direct costs of tags would range from 0.25 to 1.38 cents per pound of explosives produced. Indirect production costs vary according to coding level and the explosives manufacturers' practices. Available codes for all three methods of tagging are in excess of 100,000 each.

Implementation recommendations have been made by Lawrence Livermore Laboratories, but there are no plans for the continuation of this program beyond FY 75. Followon implementation will be decided by the U.S. Treasury's Bureau of Alcohol, Tobacco, and Firearms.

Analytical Research Laboratory, Inc., was awarded a subcontract for an explosives vapor characterization program in March 1975. In performing these studies, the total vapor mixture is to be characterized with respect to types and amounts of the different components present, and promising explosives vapors will be identified. This program will be completed by April 1976. The output of this applied research is expected to provide the sensitivity, specificity, and selectivity requirements for the development of explosives vapors detecting equipment.

A subcontract awarded to Case Western Reserve University in the field of laser optoacoustic spectroscopy was completed during FY 75, and a final

technical report was delivered to the Institute in May 1975. The objective of this subcontract was to determine the feasibility of utilizing laser optoacoustic spectroscopy for detecting vapors that emanate from explosives. The central task for Case Western Reserve University was to obtain optoacoustic spectra for various explosives vapors in the 6-11 micron region, along with the spectra for selected interference species including water vapor. Optoacoustic signatures were obtained for nitroglycerine, ethylene glycol dinitrate, and dinitrotoluene at 30 different wave lengths covering regions around 7, 9, and 11 microns. Interference from water vapor and nitrogen dioxide was found to experimentally hamper the detection sensitivity for these explosives vapors in the 6-micron region. However, interference from these molecules was negligible in the 9 and 11 micron regions. It was concluded that a portable, field-operable, long-lived laser optoacoustic explosives vapor detector could be developed. Preliminary estimates indicated that the unit would consume less than 200 watts of power and weigh less than 100 pounds. A representative system concept is shown in Figure 3-19.

During FY 75, an inhouse research program was undertaken to apply counterpropagating-beam two-photon spectroscopy to the detection of explosives molecules in the gas phase. This method offers promise for an explosives vapor monitor that employs commercially available lasers, is highly selective, and is extremely specific. Results to date have provided a counterpropagating-beam two-photon signal which has definitely been observed from nitric oxide. This is believed to be the first time that such a signal from an ultraviolet transition of a molecule has been recorded with the spectral width of the laser narrower than the Doppler width of 3 GHz. The spectral width of the incident radiation was approximately 250 MHz. Consideration during this phase of the program was also given to expanding the function of the counterpropagating-beam two-photon detector to include the monitoring of toxic gases and smoke in the air as well as explosives vapors. This program will continue through FY 76 toward the ultimate goal of equipment development of an explosives detector.

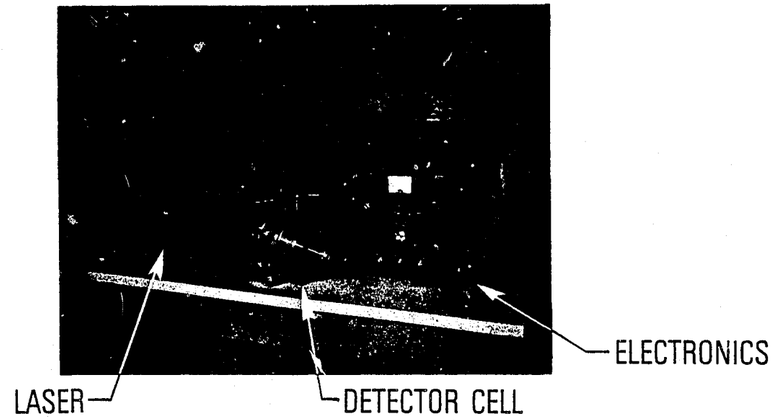


Figure 3-19. Laser Optoacoustic Trace Vapor Detector Concept

Delivered Items

All key items delivered during the period covered by this report fall into the document category.

Documents

1. Subcontract Package - Explosives Vapor Characterization, January 1975.
2. "Final Report - Feasibility and Test of Coded Taggant Materials for the Identification of Explosives," Lawrence Livermore Laboratory, April 1975.
3. "Final Report - An Investigation of the Feasibility of Use of Laser Optoacoustic Detection for the Detection of Explosives," Case Western University, April 1975.

CONTINUED

1 OF 3

H. DETECTION AND ANALYSIS OF GUNSHOT RESIDUE

The purpose of this program is to develop fast, reliable, and inexpensive techniques to detect gunshot residue which can have widespread application in the criminalistic laboratories for investigations of gun-related crimes.

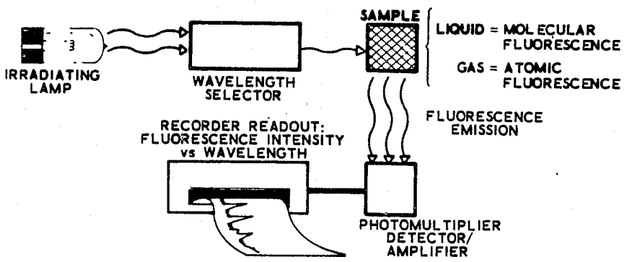
Although this program was formally initiated in January 1974, work was already being performed in The Aerospace Corporation laboratories toward the development of a photoluminescence method for gunshot residue detection. This ongoing work was subsequently incorporated into the Institute-sponsored program.

Molecular luminescence for elemental analysis was developed as a rapid and inexpensive residue detection method (Figure 3-20). It was shown that hand-samples could be analyzed simultaneously for lead and antimony. Analysis of firing hand-samples for a .38 Browning semi-automatic pistol were highly successful, and it was shown that ordinary handblanks do not introduce sufficient additional luminescence to interfere with the required elemental detection. A report on the photoluminescence efforts was issued in FY 74. However, the same threshold problem that has limited the older neutron activation analysis method also applies to molecular luminescence elemental analysis. Therefore, other approaches were considered, and an initial attempt was made to apply particle analysis methodologies to residue analysis. It was shown that individual residue particles could be characterized both morphologically and in terms of elemental composition using instruments such as the scanning electron microscope equipped for x-ray elemental analysis.

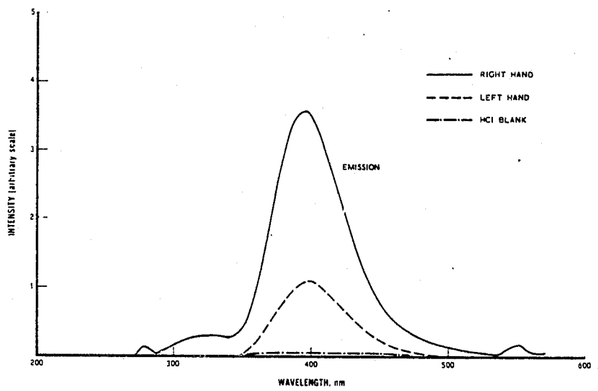
A preliminary survey of crime laboratories which assessed their practices, capabilities, and needs in the area of gun-related crimes was conducted. This was followed by a more extensive survey and assessment activity, which was begun in May 1974 and completed in FY 75.

Fiscal Year 1975 Accomplishments

The survey of criminalistic practices and problems associated with gunshot residue detection, completed during FY 75, pointed out possible



(a) Molecular Luminescence Analysis Method



(b) Results Showing Analysis of Handwashings for Pb

Figure 3-20. Molecular Luminesence Method and Results

techniques for improving detection capability. Although it was established that the ability to identify residue on a suspect's hands would be a highly valuable criminalistic tool, it was found that the methodologies in use were unsatisfactory due to the excessively large number of false negative tests obtained even from known firings. Figure 3-21 contains FBI statistics for 1972 and shows the large number of crimes committed with guns and the small number of analyses performed because of their low utility. It seems clear that improving the conclusiveness of detection procedures would enable gunshot residue analyses to become a major criminalistic tool.

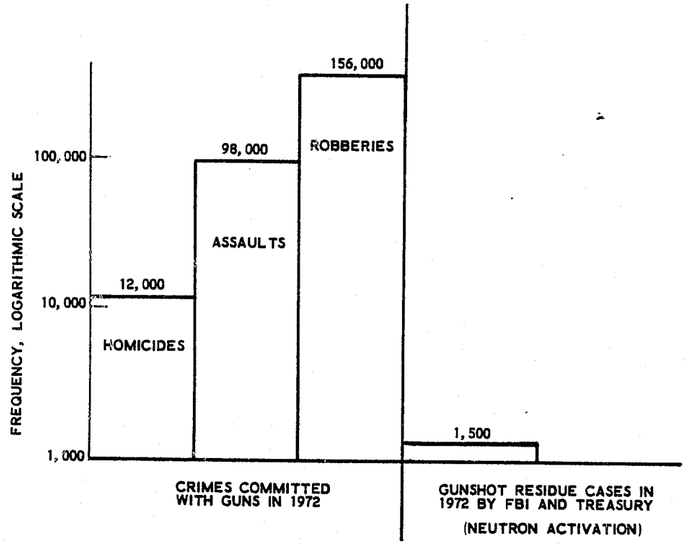


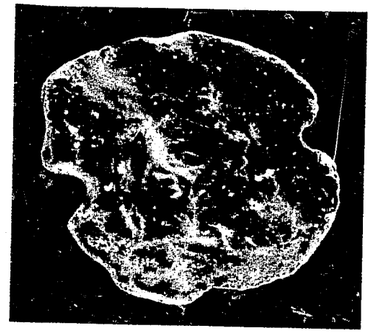
Figure 3-21. Significance of Gunshot Evidence (FBI Crime Statistics)

Methodologies were identified that have the potential to overcome the key problem of environmental contamination which interferes with current elemental detection schemes. These methodologies include the particle analysis technique (which was found to be a highly feasible candidate for improving detection), chromatography, microchemistry, and molecular luminescence analysis of organic compounds in residue.

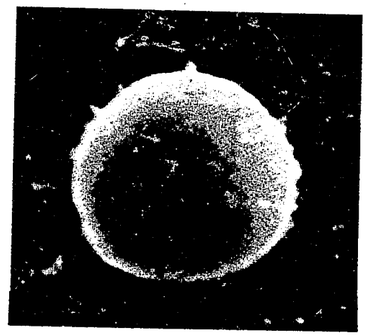
The feasibility of the particle analysis method of gunshot residue detection was subsequently established, and the results were found to be conclusive. Out of 150 tests conducted to date, there were no false positives. Also, there were no false negatives immediately after firing and only 2 (out of 38 tests) within 3 hours after firing.

The particle analysis method depends for its specificity upon particle morphology combined with elemental analysis, which needs to be qualitative only. The particles which are highly characteristic of gunshot residue are of two kinds. There are flakes of partially burned gunpowder with a rather characteristic appearance which yield induced x-ray signals of low intensity for lead, barium, and often antimony. The size of these flakes is variable but clusters around 0.1 mm.

Embedded in the surfaces of these flakes are a number of nearly spherical globules that appear bright in the scanning electron microscope. These are typically 0.001 mm in diameter and yield intense induced x-ray signals for lead, barium, and usually antimony. These particles are found also separately from the flakes. If a gun has been fired, they are almost invariably found on the hand, even in those cases where the flakes are absent, e.g., when the gun was a very clean .38 revolver. The combination of the visual appearance of these spherical particles with their x-ray analysis appears to provide a unique identification of gunshot residue. Figure 3-22 illustrates both types of characteristic particles as seen in the scanning electron microscope, together with their x-ray spectra as they appear on the face of the cathode-ray tube of the x-ray analyzer.

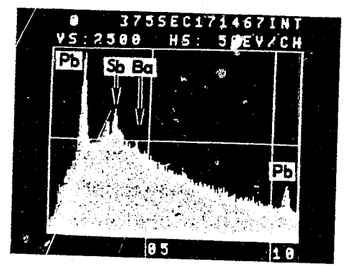


(a) ELECTRON MICROGRAPH OF PARTIALLY BURNED PARTICLE OF SMOKELESS POWDER
100 x

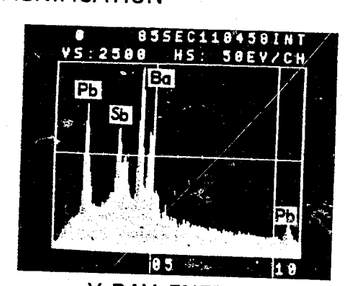


(b) ELECTRON MICROGRAPH SPHEROIDAL RESIDUE PARTICLE, FOUND SEPARATELY OR EMBEDDED IN POWDER FLAKES
10,000 x

NOTE DIFFERENCE IN MAGNIFICATION



X-RAY ENERGY



X-RAY ENERGY

Figure 3-22. Subparticle Analysis (Browning .38 Residue)

The sample collection method employed for the particle analysis consists solely in lifting the particles off the hand with a layer of tape adhesive that is subsequently mounted directly in the scanning electron microscope. The same simple collective method was also found suitable for a luminescence detection method (discussed later). Its simplicity and ease of application further recommend it for consideration for other methods, such as neutron activation or atomic absorption analysis.

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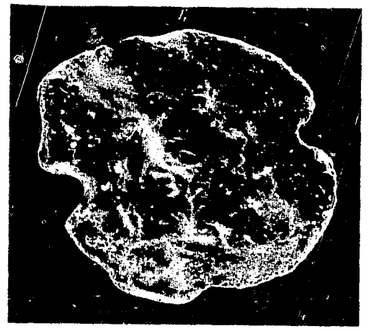

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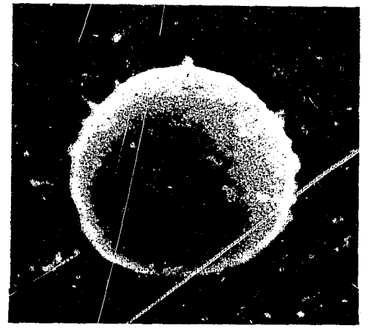
100 x



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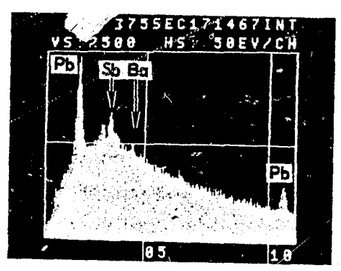
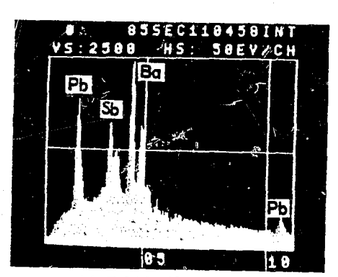
10,000 x

NOTE DIFFERENCE IN MAGNIFICATION



X-RAY ENERGY



X-RAY ENERGY

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A report was issued on this particle analysis work in December 1974. Preliminary planning has been accomplished for a program to transfer the technology to crime laboratories in early FY 76 using a workshop format.

The total success of particle analysis must be compared with the results of the currently used elemental analysis. Because the elements involved also occur as environmental or occupational contaminants, a high threshold must be adopted for elemental analysis results. For this reason, the current elemental analyses, i.e., neutron activation or atomic absorption, give 60 percent false negatives for .38 caliber revolvers and 80 percent false negatives for .22 caliber revolvers, even when the samples are collected immediately after firing.

Since the particle analysis technique is restricted to those laboratories having a scanning electron microscope, a screening technique is needed for local crime laboratories. If elemental analysis were used for preliminary screening instead of conclusive detection, lower thresholds could be set. Elemental analysis schemes could then be of significant value if they were rapid, simple, and inexpensive enough to be used near the scene, such as in the local crime laboratory. These conditions rule out the neutron activation method for most crime laboratories and make the atomic absorption method marginally acceptable. An elemental luminescence analysis method would better meet the stated conditions. Work along these lines was pursued, and it was concluded that the previously researched low-temperature method for lead and antimony reported last year was feasible for screening purposes. However, room-temperature luminescence methods for these elements would require a substantially larger development effort than could be justified.

Luminescence may be attractive as a low-cost means of detecting organic constituents of gunshot residue. These would be much more characteristic than the mere presence of certain elements such as lead, barium, or antimony, and positive identification would depend much less on quantitative considerations. Accordingly, efforts along these lines were initiated in FY 75 for completion in FY 76. Preliminary results consist of the identification

of the components of various brands of smokeless powder and the detection of some of them in residue by the use of a computerized gas chromatograph - mass spectrometer combination.

Delivered Items

The inhouse investigations by Aerospace on this project yielded the following key documentation deliverables.

Documents

1. "Gunshot Residue Detection, Survey and Assessment and Identification of Alternative Concepts," Aerospace Report No. ATR-75(7915)-1, September 1974.
2. "Conclusive Detection of Gunshot Residue by the Use of Particle Analysis," Aerospace Report No. ATR-75(7915)-2, December 1974.

I. POLICE PATROL CAR SYSTEM IMPROVEMENTS

This program was initiated in FY 75 and has the objective of applying currently available technology to enhance the capabilities, safety, and effectiveness of the patrol officer and to improve vehicle economy, safety, and utility. That both effective police communications and police mobility are critical factors in any attempt to reduce crime has long been recognized. Since 1931, every major crime commission that has studied the police communications problem has called for substantial improvements and modernization. In consonance with an effective communications link, the police professional must also be provided with the means to get him where he is needed--safely, quickly, and economically. Although the demand for police services has increased dramatically in recent years, no parallel emphasis has been placed on applying new equipment technology to the heart of police operations: patrol.

In formulation of specific program plans, guidance was obtained from an advisory conference held at The Aerospace Corporation, El Segundo, California, on 13 January 1975. In attendance were police chiefs from several major U.S. cities and representatives of other law enforcement agencies. The conference was sponsored jointly by the LEAA and The Aerospace Corporation to exchange ideas with and solicit comments from the police community on the program under consideration. Program plans were then prepared to develop improvements which can be made to existing patrol cars in the near term and to conduct studies on the feasibility of system configuration improvements for the longer term.

Work was initiated on the development and study of the improvements illustrated in Figure 3-23. The effort included preparation of subsystem functional and interface requirements, interview of prospective suppliers for information on products and services available, survey and evaluation of available subsystems and components, and procurement actions for a brassboard system to include the following features:

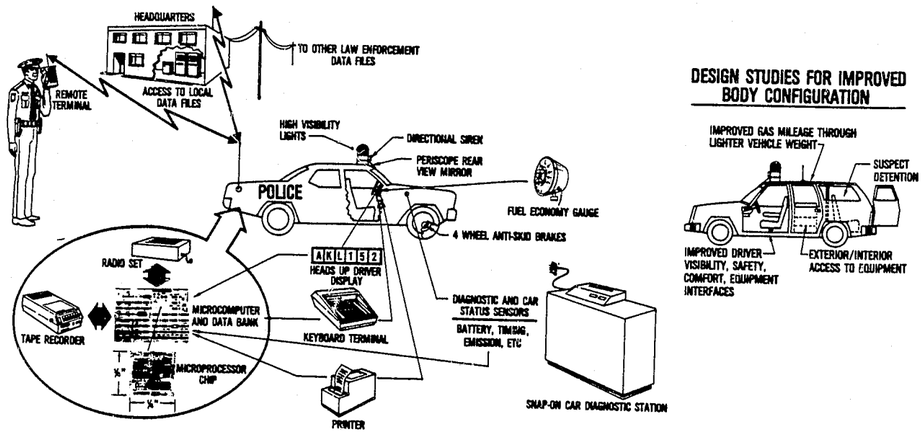


Figure 3-23. Development of Improvements to Existing Patrol Cars

Data-Communications	Safety and Economy
Digital display/keyboard	Fuel economy gauge
In-car microcomputer	Vehicle condition monitors
In-car printer	Directional siren
Heads-up display	Red-white flashing lights
Voice recorder	Four-wheel antilock brakes
Hand-held remote terminal	Periscope rear view mirror
In-car data storage	Improved front seat
	Hands-free communication

A procurement package was prepared for subcontractor support in the integration of the data-communications components and development of required software for system operation. In addition, a procurement package was prepared for subcontractor support on alternate police patrol car body designs. As depicted in Figure 3-23, this limited design study is intended

to result in vehicle configurations which offer significant weight reduction while enhancing human and equipment interfaces functionally. Other improvements to be studied include a vehicle locator capability and a dual-mode vehicle performance (high fuel economy and high power) capability.

In consideration of system operational requirements and candidate police departments participation in the eventual demonstration and evaluation of retrofitted patrol cars, interviews were held with a number of police departments. These in-person interviews were conducted to establish which police departments would be interested in participating in the program and would have the required minimum base station data system capabilities to interface with the planned vehicle data-communications improvements. The police departments interviewed included Los Angeles, Los Angeles County Sheriff, St. Louis, Kansas City, New Orleans, Miami, Miami Beach, Dallas, Colorado State Patrol, New York City, Las Vegas, Washington, D.C., and Indianapolis. Prospects for final selection were narrowed to Dallas and New Orleans.

Delivered Items

Documents

1. Preliminary Program Plan for Police Patrol Car System Improvements, 31 December 1974.
2. Briefing - "Police Car Improvement Program," presentation to planning conference held on 13 January 1975, El Segundo, California.
3. "Final Program Plan for Police Patrol Car System Improvements," 26 March 1975.
4. Procurement Package - Alternate Police Patrol Car Body Design, May 9, 1975.
5. Procurement Package - Police Patrol Car Integrated Data System, 13 May 1975.

IV. EVALUATION PROGRAMS

IV. EVALUATION PROGRAMS

As each new equipment system completes its development cycle, it generally enters the field evaluation phase. The intent of the field evaluation program is to determine not only the technical performance of an equipment system but, more importantly, to evaluate the degree to which it meets the overall objectives. As appropriate, the evaluation considers the social, psychological, medical, human, and economic factors, as well as the technical, and essentially tests the system as an operating entity in its intended environment. Those items to be field test evaluated during FY 76 are the improved protective body armor and the citizen alarm system.

In order to avoid bias and assure objectivity, the evaluation group is staffed by engineers and scientists different from those responsible for the development of the equipment system.

A. BODY ARMOR FIELD EVALUATION

The field evaluation of the improved lightweight body armor measures the effectiveness of the lightweight, inconspicuous, continuous-wear, limited protection body armor in its law enforcement application. As a measure of the overall evaluation, four areas have been defined for field test and analysis:

- Acceptability of continuous-wear limited protection garments
- Impact of garments on law enforcement operations
- Garment performance
- Cost and manufacturability of quality garments

Conclusions and recommendations concerning these areas are the goals of the evaluation.

Objectives have been developed which delineate the information to be collected to achieve the stated goals. Table 4-1 shows the relationship between the goals and objectives.

The field evaluation portion of the body armor program began unofficially with the wearability tests in April through September of 1974. Although a part of the development program, the wearability tests provided the baseline upon which the field evaluation program planning was developed. Experience gained and lessons learned in this series of tests helped to formulate the approach and to scope the effort to be implemented in the full field evaluation program. In addition, the comments and reactions of the participants to the prototype garments tested in the wearability program provided guidance in the definition of design modifications required to the garments to make them more comfortable and acceptable to the users.

Preliminary planning for the field evaluation program began during 1974 with a detailed analysis of the threat to which law enforcement personnel were exposed in terms of weapons and expected injuries and fatalities. From this analysis, it was determined that approximately 5000 garment years of wear were required to evaluate the performance of the garments in actual operational situations. This number also allows statistically valid evaluation

Table 4-1. Body Armor Program Goals and Test Objectives

Program Goal	Test Objective
Evaluate acceptability of continuous-wear limited protection garments	Determine attitude of the individual officers to the protective garments Determine acceptability by the individual officer to the protective garments Determine acceptability by the departments of the protective garments
Evaluate impact of garments on law enforcement operations	Obtain data on the psychological change of officers while wearing protective garments Obtain data on the physiological effect on officers while wearing protective garments Obtain data on the benefit of the protective garments to the individual and the department
Evaluate garment performance	Obtain data on the inconspicuous appearance of the garments Obtain data on the comfort of the garments
Evaluate manufacturability and cost	Obtain data on the acceptable methods and procedures of manufacturing the protective garments and the associated costs involved.

of other test objectives such as wearability, acceptability, and attitudinal factors of both nonwearers and wearers.

It was upon this basis that the detailed planning for the Body Armor Field Evaluation test program was initiated. In April 1974, the basic approach to planning the Body Armor Field Evaluation program was presented to the Institute, and this approach has formed the basis for all test planning activities.

Fiscal Year 1975 Accomplishments

With the establishment of the general objectives and desired site criteria, activities were initiated in early FY 75 to select candidate cities to participate in the test program. In order to provide the maximum protection to law enforcement personnel with the required minimum number of garments, cities with a history of high assault rates were identified. The selection also required that the candidate cities have facilities for professional treatment of blunt trauma injuries in the event that an officer is injured while wearing the test garments. Table 4-2 shows the candidate cities on the basis of assault data from the FBI Uniform Crime Reports in cities of over 250,000 population. Also indicated is the availability of a recognized trauma surgeon in each of the cities. On the basis of this data, the 16 cities were contacted by mail to ascertain their interest in participating in the program. All cities responded affirmatively.

During July 1974, visits were made by Aerospace and Institute personnel to all 16 candidate cities. The purpose of these visits was to brief the city police departments on the total program, ascertain their interest, and obtain additional data on police assaults. As a result of these meetings, 15 cities were selected in November for participation. All the initial cities contacted will participate with the exception of Oakland, California. The decision was made not to provide garments in Oakland since they had elected to purchase their own vests. It is, however, intended to use Oakland as well as other cities for comparison of results. In addition, off-the-shelf commercial garments will be introduced into the tests as control garments. Two hundred garments from each of four manufacturers will be tested.

Table 4-2. Police Assault Statistics

(Assaults with Injury per 100 Officers; National Average = 0.47)

City	Firearms or Cutting Weapons		Firearms Only		Registered Trauma Surgeons
	1971	1972	1971	1972	
Group I					
Miami	3.92	2.73	3.22	1.09	×
Oakland	2.34	-	1.52	-	×
Jacksonville	1.91	-	0.96	-	
Austin	1.91	-	1.27	-	
Wichita	0	1.88	0	1.17	
New Orleans	0.70	1.90	0.70	0.96	×
Atlanta	1.29	1.53	0.69	0.89	×
St Louis	1.39	0.49	0.94	0.49	×
Richmond	1.13	1.24	0.57	0.18	×
Birmingham	1.22	0	0.70	0	×
Philadelphia	1.10	0.34	0.12	0.07	×
El Paso	1.07	0	0.86	0	
Albuquerque	1.06	-	0.80	-	×
Tampa	1.06	0.18	0.18	0.18	×
Tucson	1.04	0.23	1.04	0	×
Newark	1.03	0.61	0.27	0.55	×
Seattle	0.50	1.02	0.42	0.60	×
Akron	0.38	0.99	0.19	0.99	
Portland	0.14	0.97	0	0.41	×
St Paul	0.20	0.86	0	0.17	×
Group II					
Denver	0.83	0.82	0.75	0.41	
Baltimore	0.47	0.77	0.26	0.31	
Memphis	0.38	0.75	0.19	0.19	
Minneapolis	0.50	0.73	0	0.73	
Cleveland	0.52	0.52	0.35	0.43	
Houston		0.63	-	0.43	

In the November 1974 through February 1975 time period, additional visits were made to the participating cities. The major topics of discussion during these visits were the following:

- Detailed method of implementing test
- Proposed garment distribution
- Review of
  - Training program and proposed film
  - Interview questionnaire
  - Disclosure statement
  - Medical plan
  - Memorandum of understanding

All departments continued to exhibit an interest in the program, and no major problems were encountered. Table 4-3 shows the currently planned distribution of garments within the test program.

Within FY 75, the detailed test planning activities have continued. The training film has been completed and copies have been delivered to the Institute and the U.S. Army (Edgewood Arsenal). The test plan has been completed and delivered to the Institute.

Coordination meetings have been held with the Army on implementing the medical plan. The medical plan has been reviewed and approved by the Army and the Aerospace consultant, Dr. John Benfield. Data packages are being prepared for the local trauma surgeons and local hospitals containing information on blunt trauma wound characteristics. A meeting is planned for early September 1975 to provide an opportunity for the Army to brief the medical personnel.

One of the major tasks associated with the field evaluation test program will be the processing and analysis of the data derived from the tests. For implementation of this function, a subcontract will be negotiated for data processing, analysis, and evaluation. Procurement actions have been initiated for this subcontract.

Table 4-3. Proposed Garment Distribution

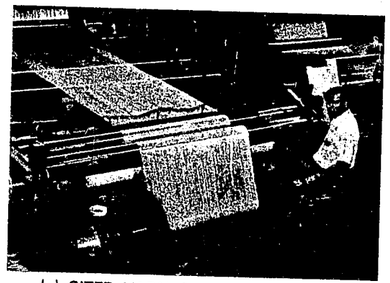
City	Undergarments	Women's Garments	Integrated Uniform Garments	Commercial Garments
Albuquerque, N. M.	120		(50)	110
Atlanta, Ga.	222			
Birmingham, Ala.	168			
Detroit, Mich.	346		50	380
Miami, Fla.	245			
Newark, N. J.	365	Minimum of 50 Distribution TBD	50	47
New Orleans, La.	288			133
Philadelphia, Pa.	340			
Portland, Ore.	251			
Richmond, Va.	500			
St. Louis, Mo.	200		-	
St. Paul, Minn.	165		50	
Seattle, Wash.	355		50	
Tampa, Fla.	300			95
Tucson, Ariz.	140		50	

Procurement actions are under way for all of the hardware required to support the field evaluation test program. Key subcontracts were awarded to J. P. Stevens for Kevlar material weaving and to Protective Materials for undergarment fabrication. All procurements for LEAA garments are based on the new baseline material of 1000 denier yarn in a plain weave of 31 × 31 threats per inch. All garments incorporate 7 plys of material except 300 style II undergarments which have 10 plys. Figures 4-1 and 4-2 illustrate the Kevlar weaving methods and the quality control used in the Kevlar manufacturing process. All deliveries are scheduled for the August to September 1975 time period.

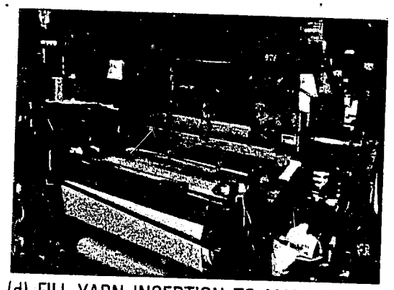
A subcontract was awarded to Tyler Research Associates, San Francisco, California, to conduct a market survey on body armor, citizen alarm, and improved burglary alarm systems. The objective is to determine potential user

(a) WARP ENDS ONTO SECTION BEAM

(b) WINDING PROCESS



(c) SIZED YARN ONTO LOOM BEAM



(d) FILL YARN INSERTION TO MAKE CLOTH

Figure 4-1. Kevlar Weaving

acceptance. The scheduled period of performance is 15 April through 1 September 1975.

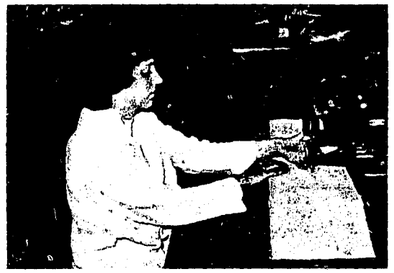
Delivered Items

The items delivered under this program in FY 75 include formally published reports, other documentation (such as briefings and meeting minutes) and procurement packages. In addition, numerous meetings and conferences were attended. Individual documents are listed below.

Documents

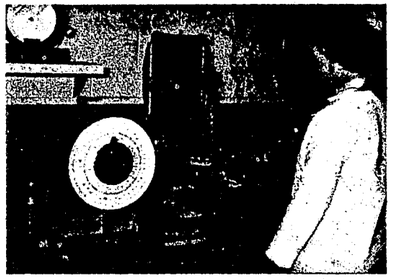
1. Preliminary Test Plan - Body Armor Field Evaluation, October 1974.
2. "Body Armor Field Evaluation Test Plan," Aerospace Report No. ATR-75(7921)-1, June 1975.

(a) PICK COUNT



(b) FABRIC THICKNESS

(c) AIR PERMEABILITY



(d) TENSILE TEST

Figure 4-2. Kevlar Quality Control

3. Procurement Package - Kevlar Material for Body Armor Field Evaluation, July 1974.

4. Subcontract Data Package - Kevlar Material for Body Armor Field Evaluation, November 1974.

5. Subcontract Data Package - Kevlar Material for Body Armor Field Evaluation, May 1975.

6. Procurement Package - Protective Undergarment for Body Armor Field Evaluation, September 1974.

7. Subcontract Data Package - Undergarment Procurement for Body Armor Field Evaluation, May 1975.

8. Procurement Package - Market Survey of New Law Enforcement Equipment (Body Armor Field Evaluation), August 1974.

9. Subcontract Data Package - Market Survey of New Law Enforcement Equipment (Body Armor Field Evaluation), March 1975.

10. Procurement Package - Protective Garments for Body Armor Field Evaluation, May 1975.

11. Procurement Re-Bid Package - Weaving of Kevlar-29 Fabric, March 1975.

B. IMPROVED CITIZEN ALARM FIELD EVALUATION

The Citizen Alarm System is a new concept for crime reduction based on providing citizens with miniature alarms to use in signaling for help when threatened with criminal attack. Acceptance of such a system by police and the general public will depend greatly on a number of factors including its reliability, control of false alarms, and most importantly its impact on crime in the community. The objective of the Citizen Alarm Field Evaluation program is to perform a field test of adequate dimensions so that the effects of the system can be quantitatively evaluated and its performance capabilities established. The effectiveness of the system will be assessed from the viewpoints of both the response agent and the user. The program is expected to provide quantitative answers to the following questions: Is the Citizen Alarm System a viable concept? Will the equipment reliably transmit a message from an endangered citizen to a response agent? Is the actuator carried by the citizen easy to purposely operate but difficult to accidentally trigger? Can a high percentage of citizens in a normal adult population mix confidently use the actuator at time of need?

Fiscal Year 1975 Accomplishments

The program goals and test objectives identified during the FY 75 test planning effort and listed in Table 4-4 were analyzed and quantified. An initial estimate of the data requirements necessary to evaluate each goal was developed.

Aerospace was assisted by a subcontractor, the J. H. Wiggins Company, in a comprehensive data gathering effort in support of the test planning activity. Experts in the field of evaluation research, police programs, and citizen participation programs were visited or contacted by telephone to allow the test planners to profit by the experience others have gained in the implementation of similar evaluation programs. Survey methods and measurement techniques used on other programs were reviewed with respect to their applicability to the Improved Citizen Alarm Field Evaluation program.

Table 4-4. Citizen Alarm Program Goals and Test Objectives

Program Goal	Test Objective
Provide rapid crime reporting to summon early assistance.	Determine user acceptance Determine actuator handling capability Determine response agent acceptance Determine level of user/response agent communication Determine probability of alarm usage Determine number of calls-for-service Determine crime reporting time Determine response agent response time
Reduce the effects of violent crime.	Determine change in user fear level Determine user assistance in response agent operations Determine change in actual and reported crime rate Determine deterrent effects Determine displacement effects Determine changes in arrest rate Determine changes in number of persons injured Determine changes in property loss due to crime

Table 4-4. Program Goals and Test Objectives (Continued)

Program Goal	Test Objective
Determine hardware operability	Determine hardware reliability Determine transmission reliability Determine transmission limitations
Provide benefits analysis	Determine total costs Determine measurable benefits Determine implementation limitations

In addition to the data gathering effort, the methods and procedures necessary to implement an evaluation of the system in four distinct applications were defined. The applications considered included institutions such as schools, prisons or hospitals; small businesses such as liquor stores or convenience stores; residences such as public housing or apartment complexes; and outdoor public areas such as streets and parks. A list of potential test sites was prepared for each of the evaluation scenarios by analyzing data obtained through city visits and/or Institute contacts. This list of potential test sites is shown in Table 4-5.

Table 4-5. Potential Test Sites

Scenario	Location	Type
Institution	Jackson, Mich.	Prison
	Tracy, Calif.	Prison
	Chino, Calif.	Prison
	Statesville, Ill.	Prison
Small Business	Detroit, Mich.	Small businesses
	Kansas City, Mo.	Small businesses
	Houston, Tex.	Small businesses
Residence	Elizabeth, N. J.	Public housing
	Kansas City, Mo.	Public housing
	Dade County, Fla.	Public housing
	Pittsburgh, Pa.	Public housing
	New Orleans, La.	Senior citizen housing
Public Area	Kansas City, Mo.	Downtown streets
	Seattle, Wash.	Downtown streets
	Washington, D. C.	LEAA headquarters
	Hyde Park, Ill.	University area

The residential scenario was selected for initial evaluation with testing expected to begin in the latter part of FY 76. Figure 4-3 summarizes the planned implementation concept for the Citizen Alarm Field Evaluation. Formal contacts were established with the City of Elizabeth, New Jersey, to determine the suitability of two low-income Federal housing projects and a senior citizen complex as test sites as shown in Figure 4-4. Figure 4-5 depicts additional detail on the Pioneer Homes test area.

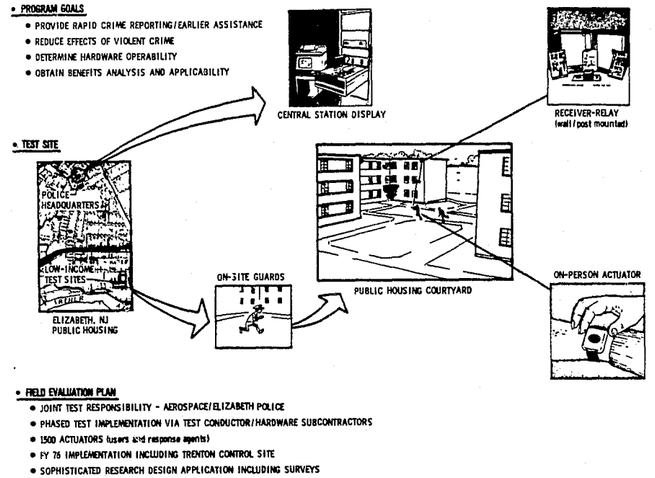


Figure 4-3. Citizen Alarm Residential Field Evaluation Summary

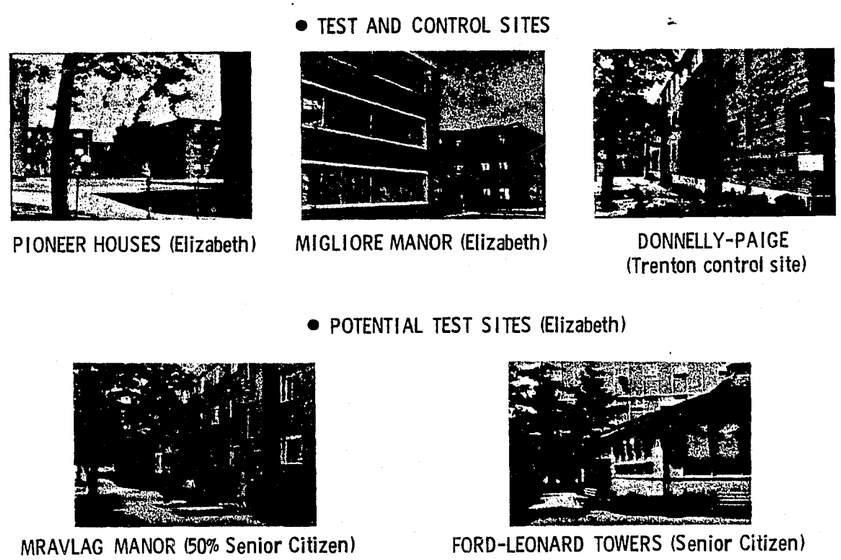
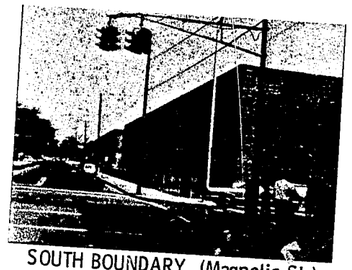
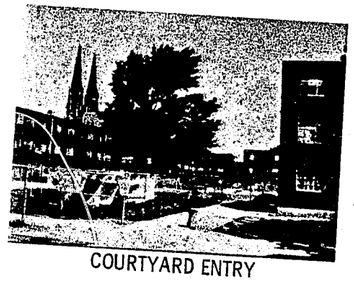


Figure 4-4. Residential Test Sites



SOUTH BOUNDARY (Magnolia St.)



COURTYARD ENTRY

APARTMENTS (corner stairwell)

STAIRWELL (third floor)

Figure 4-5. Pioneer Homes Test Site

The results of the formal test planning activity are documented in the "General Field Evaluation Test Plan for the Citizen Alarm System," which was submitted as a final draft to the Institute in June 1975.

Several meetings were held with Elizabeth police and housing representatives. The Elizabeth Police Department supplied Aerospace with photographs and maps of the areas along with crime data for the years 1969-1974. In addition, they provided copies of police incident reports for all crimes occurring in the low-income housing projects during the 1971-1972 time period. These data were analyzed at Aerospace using the Statistical Program for Social Sciences computer program. The computerized process is utilized to provide insight into the following questions: Who are the most likely victims of crime? Who are the assailants? Where do the crimes occur? In how many instances would a citizen alarm conceivably be of value?"

In June, a brief tour of the anticipated Elizabeth test sites was conducted for the prospective bidders on two contracts. Precautions were taken to minimize any impact on the attitude and impressions of the test site residents. Questions on the details of the program were answered, and pertinent documentation was made available for review, including construction details of the proposed test site.

In addition to analyzing the crime statistics, other aspects of the Elizabeth housing projects were subjected to considerable scrutiny. For example, efforts were initiated to identify suitable control sites for each of the residential test areas. The city has three low-income housing projects: Pioneer Homes, Migliore Manor, and Mravlag Manor. The latter, although some distance away from Pioneer and Migliore, does not appear to be acceptable as a control site since it has a significantly different demographic composition and much less of a crime problem. Attention was thus directed toward nearby cities which may have a more suitable control area. The city of Newark has several similar housing projects; however, none of these has an on-premise housing authority security force. Trenton, New Jersey, which is 40 miles south of Elizabeth, appears to have a project which will make an acceptable control site although final selection of the low-income control site has not yet been made.

The Elizabeth authorities also provided Aerospace with construction plans and wiring diagrams for the housing projects. These plans were used to develop detailed hardware cost estimates and a preliminary installation plan for the candidate test sites. Figure 4-6 depicts possible alarm transmission schemes and installation concepts.

Two procurement packages, one for field evaluation hardware and another for a test conductor, were completed, approved by the Institute, and requests for proposals sent to the industry. The hardware subcontract encompasses tasks for fabrication, installation, and maintenance for approximately 1500

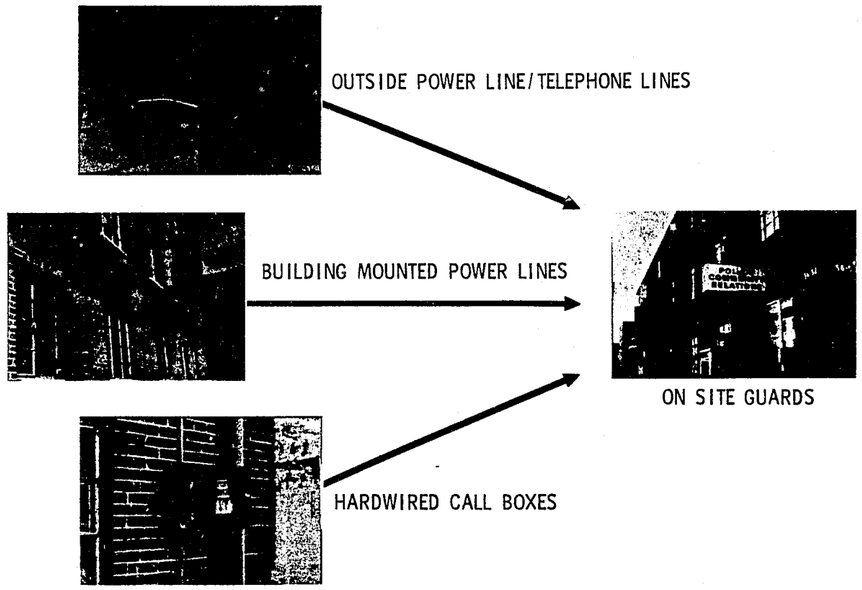


Figure 4-6. Potential Alarm Transmission Paths

citizen units in the Elizabeth residential scenario. The test conductor subcontract covers tasks for detailed test planning, pretest surveys, test implementation, and data analysis and evaluation for the same scenario. Subcontract awards are expected in the first half of FY 76.

Delivered Items

The items delivered under this program in FY 75 include formally published reports, other documentation (such as briefings and meeting minutes), and procurement packages. In addition, numerous meetings and conferences were attended. Documents of significance are listed below.

Documents

1. Procurement Package - Citizens Alarm Field Evaluation Test Planning Support, July 1974.
2. Subcontract Data Package - Citizens Alarm Field Test and Evaluation Plan, September 1974.

3. "Final Draft - General Field Evaluation Test Plan for the Citizen Alarm System," Aerospace Report No. ATR-75(7902)-1, June 1975.
4. Procurement Package - Citizen Alarm Field Evaluation Hardware, May 1975.
5. Procurement Package - Test Conductor for the Citizen Alarm System Field Evaluation, June 1975.

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V. SPECIAL TECHNICAL SUPPORT

A. SPECIAL TECHNICAL SUPPORT PROJECTS

The activity in this category of effort covers special tasks requested by the GPM and normally authorized through the formal issuance of Technical Instructions (T.I.'s). Included are tasks such as special development and/or testing of designated equipment; technical review, evaluation, or monitoring of various Institute grants; evaluation of proposals under consideration for support by Institute grant or contract; and review of equipment-related technical reports submitted to the Institute for evaluation and comment. In addition, special short-term technical support to the Institute for which an unanticipated need arises during the contract period is also provided under this category of effort.

Technical Instructions are especially useful when a rapid evaluation response is required. Their use permits rapid authorization to proceed, and the response, usually in letter form to the GPM, is also designed to permit a rapid input to the Institute. In some cases and at the option of the Institute, formal reports for wide distribution are submitted for certain selected Special Technical Support activities which either involve a large technical effort or are of wide interest.

In addition to 8 Technical Instructions carried through from FY 74, 40 were authorized during FY 75. At present, 8 Technical Instructions remain for completion in FY 76. The effort covered by the remaining 40 instructions are discussed in the following section. In addition to the title, number, and date of each individual instruction, a short summary of the effort involved and the responding Aerospace correspondence are included. Frequently, a draft response letter was provided in the case of concept and proposal evaluations.

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B. SUMMARY OF TECHNICAL INSTRUCTIONS

T.I. No. 74-056A (30 July 1974)

Proposal Evaluation: Personal Pulse Rate Monitor

This Technical Instruction requested Aerospace support to aid in the evaluation of a proposal from Display Systems Associates entitled "Personal Pulse Rate Monitor." Aerospace was asked to determine if data from NIH and other medical sources showed a relationship between pulse rates and heart attacks and correlations between parameters such as blood pressure, respiration, and cholesterol levels just prior to heart attacks. In addition, Aerospace was requested to discuss heart attack probabilities and comment on methods of display for monitoring purposes and the unique technological capability of Display Systems Associates.

The data are inconclusive in establishing a relationship between pulse rates and heart attacks. The pulse rate may increase or decrease as a heart attack develops. Although a risk develops whenever high rates are induced through physical exertion or emotional stress, a predetermined "threshold rate" cannot be established wherein an attack would be imminent in any given individual. Blood pressure, respiration, and cholesterol levels do not follow a fixed pattern prior to heart attack; cholesterol level changes are particularly slow, requiring several days to develop variations. Since no relationship can definitely be established between pulse rate and heart attacks, no conclusions can be made in regard to probability of an attack if the pulse rate is abnormal (high or low with respect to long-term average "at rest" value). For display purposes, it is recommended that either transmissive liquid crystal display (LCD) or light emitting diode (LED) display be used in preference to the type described in the subject proposal. In regard to the question of unique technological capability, the findings indicate that Display System Associates is a small engineering firm with a good reputation for performance but with limited experience. It has a unique technological capability in that it has been considering ways of performing pulse rate monitoring at the wrist and has sorted out several promising ways. Letter 3330-JOE-75-537, dated 23 August 1974.

T.I. No. 75-001
(11 July 1974)

Concept Evaluation: Prospectus for an Individual Crime Alarm System

The Institute requested an evaluation of a prospectus for an Individual Crime Alarm System submitted by the Newark College of Engineering. The proposed concept for the individual crime alarm system involves a portable, pocket-size transmitter which is carried by the individual. By depressing the alarm button the unit would transmit an identification and location signal to a central receiving unit for action by a response agent. The victim's location would be obtained via the retransmission of data received by the actuator from a nearby signpost or building-mounted transmitter, or alternately by triangulation, ranging, or by possibly other means determining the location of the RF signal. It was suggested, in order to minimize the impact on police from false alarms, an intermediary organization would receive and evaluate the alarm before transmission to the police.

As a result of the review, it was concluded that the proposed system showed no significant advantage over the Improved Citizen Alarm System. Accordingly, approval of the proposal was not recommended. Letter 3330-JOE-75-540, dated 20 August 1974.

T.I. No. 75-002
(5 July 1974)

Report Evaluation: Blunt Trauma Data Correlation

A review of the Edgewood Arsenal Bio-Physic Laboratory report, "Blunt Trauma Correlation (draft)" was made by Aerospace and Dr. John Benfield, Aerospace Medical Consultant. The purpose of the Edgewood Arsenal task was to assemble and correlate currently available blunt trauma data with primary emphasis on the relevancy of the data to the goals and objectives of the overall lightweight Body Armor Program, with secondary emphasis on the applicability of these data to projectile-induced blunt trauma generalization.

The draft report was considered to be a good attempt to define several multiplicative models using both predictive and physiological parameters.

The available blunt trauma data base was admittedly weak, and reasonable assumptions were used in developing the four parameter model. Comments pertaining to the context of this report and recommendations were provided both in person and by letter to Edgewood Arsenal and the Institute. Letter 3330-JOE-75-028, dated 14 August 1974.

T.I. No. 75-003
(7 November 1974)

Proposal Evaluation: Edgewood Proposal to Develop Predictive Models for Protective Armor Evaluation; Review of

An evaluation was made of a proposal, submitted by the Edgewood Arsenal Bio-Physic Laboratory, to develop predictive models of the probability of mortality and morbidity of blunt trauma behind protective body armor which has "defeated" a ballistic projectile. Since a major portion of the subject proposal involved animal testing, expert medical opinions were obtained from the U.S. Army Human Engineering Laboratories at Aberdeen Proving Grounds and Dr. John Benfield, an Aerospace Corporation medical consultant.

Aerospace concurred that a model based upon nonbiologic backface signature tiein to animal-human medical results was desirable. The proposal attempted to define a body of effort to achieve such modeling coupled with an assortment of lesser tasks. The proposal did not provide sufficient detail on the methods of analysis or animal testing to allow confident estimates of the probability of success. In particular, there was a lack of justification for the 200 pound test species chosen (steers) and there was question whether a model could be developed within funding limitations for anything more sophisticated then the live-die criteria previously developed by the Army. Letter 3330-JOE-75-078, 19 November 1974.

T.I. No. 75-004
(7 August 1974)

Proposal Evaluation: Evaluation of Martin Marietta Proposal

This Technical Instruction requested that Aerospace review a Martin Marietta Corporation proposal for a Personal Communications Technology

Program Development. In addition, Aerospace was asked to prepare an evaluation report and draft a response from LEAA to Martin.

The Aerospace review found that the Martin proposal presented a program of development, design, and test of a police-portable radio communication system which represents the nucleus of a worthwhile technology improvement program. Many new and worthwhile features were included in the proposal. A multichannel trunked radio network interconnecting portable radio handsets that possess both voice and digital message capability is computer-controlled from the dispatch center. The radio trunking feature provided improved channel utilization as does the inclusion of patrolmen digital status messages. A full voice capability is provided in the handset. Use of microcircuitry fabrication techniques, including large scale integration subassemblies, is proposed to reduce handset size and power consumption and, thereby, its weight. Modular construction is recommended, and specialized features are recommended as optional modular sections.

Although Martin had already invested $930,000 of corporate funds into the system and proposed to invest another $1,440,000, the additional cost to LEAA as proposed would be $1,720,000. Vehicle-based transmission is considered to be of higher priority, and LEAA is beginning an integrated program to improve police patrol car communications. Thus, in view of this more general police vehicle program and because of budget limitations, support of the proposed program is deemed inadvisable at the present time and is, therefore, not recommended. Letter 3330-JOE-75-124, dated 27 February 1975.

T.I. No. 75-005
(18 August 1974)

Grant Monitoring: Variant Polypeptides in Hair; Semen; Semi-Automated Single Fingerprint System; New Fingerprint Method

This Technical Instruction covers the monitoring of the following grants:

1. 74-NI-99-0032 Variant Polypeptides in Hair

2. 74-NI-99-0041 Semen
3. NI-70-095 and 73-NI-99-02 Semi-Automated Single Fingerprint System
4. NI-71-089 New Fingerprint Method (Fiber Optics)

Work on item 4 was discontinued per agreement reached at March 1975 Program Review; see letter 3330-JOE-75-751, dated 14 April 1975. The review of each subject grant follows below.

Grant 74-NI-99-0032. The title of this grant is "Variant Polypeptides in Hair" and covers the period from 1 July 1974 to 30 June 1976. The grantee is Howard Baden, M.D., Department of Dermatology, Harvard Medical School and Massachusetts General Hospital. The principal aims of the research conducted under this grant are the forensic individualization of hair as related to genetic markers consisting of polymorphic polypeptides in hair.

The grant monitoring efforts to-date have consisted of a visit to the grantee's laboratory at the Massachusetts General Hospital, several conferences, and review of his progress reports. It was found that Dr. Baden's research complied well with the program objectives. Although his electrophoresis procedure initially showed some lack of reproducibility, satisfactory progress is being made on the program. The lack of reproducibility has been remedied to a large extent in Dr. Baden's innovative, 15 percent gel technique for resolving the single electrophoretic band of hair matrix polypeptides into several bands. With the improved 15 percent gel electrophoresis technique, a difference was shown between the matrix proteins of nail compared to hair. He is applying the new technique to Caucasian hair and to non-Causasian hair to investigate whether the technique distinguishes between ethnic groups. In a continuation of his previously reported research on a variant in the alpha protein of hair from Negro Americans (using conventional electrophoresis with 7-1/2 percent gel), 50 samples of Japanese hair were examined to look for the variant, but none was found. Future research will involve electrophoresis of individual hair specimens in

15 percent gels using aminoethyl derivatives as well as S-carboxymethyl derivatives. Included in monthly reports. Letter 3330-JOE-75-751, dated 14 April 1975.

Grant 74-NI-99-0041. The title of this grant is "Characterization and Individualization of Semen." The grantee is Dr. George Sensabaugh, School of Criminology, University of California, Berkeley, California. The principal aim of this research is the determination of the presence of semen in rape cases. Several approaches are being investigated for the identification of semen. These include (1) the isolation and purification of different fractions of acid phosphatases for immunochemical studies, (2) the identification of seminal ribonucleases from those present in other tissues using a method based on molecular weight homogeneity and difference in enzymatic properties, (3) the separation of fluorescent components in seminal fluids, and (4) the preparation of antisera against whole human seminal plasma.

Satisfactory progress has been made on this grant. For the identification of semen, efforts have concentrated on the isolation and purification of enzymes, acid phosphatases, and ribonucleases, which are present in human seminal fluids and in tissues. The seminal enzymes have been found to be distinct from those obtained from tissues. Additionally, a new enzyme polymorphism in sperms has been discovered. These results are preliminary as yet, and if substantiated the genetic basis for the polymorphism must be confirmed. Semen samples were observed to become intensely fluorescent upon standing. This fluorescent factor could be useful for the identification of semen if it is naturally present in stains. The separation and identification of the fluorescent components in seminal fluid are in progress. Antiserum against whole human seminal plasma has been prepared in rabbits. In addition, blood sera from nonfertile women are being collected since a significant proportion of these individuals possess antibodies against sperms. When adequate quantities of these antisera have been collected,

they will be tested for identification and/or individualization of semen samples. Included in monthly reports. Letter 3330-JOE-75-751, dated 14 April 1975.

Grants NI-70-095 and 73-NI-00-992. These grants are entitled "Semi-Automated Single Fingerprint System" and were awarded to the Division of Criminal Justice Services of the New York State Identification and Intelligence System (NYSIIS). As currently implemented, the system encodes fingerprints on three levels. One level is compatible with the Henry system; the second level is compatible with the Finder approach; the third level is a unique system devised by NYSIIS. This last encoding system is operational with a number of local cooperating police agencies, and identifications based on actual latent prints lifted at crime scenes are being made.

The grant monitoring effort included telephone conversations with Mr. James Daley, Staff Consultant and Project Director for the subject grants and a visit to the grantee in Albany, New York. Demonstration of the system operation indicated that, while the man-machine interaction for locating and coding fingerprint features is well developed, the system capabilities – particularly the computer processor – are deficient for the required tasks. Computer data input is by means of the teletype paper tape reader resulting in very slow data input rates. The computer itself is limited in core storage, and the data processing is slow due to low memory cycle speed. Despite these drawbacks, the system does appear to operate effectively and has the capability to process even poor quality latent prints. From the limited test data available, it appears that in large file search a reliability of 80 percent could be achieved when extracting about 4 percent of the file for manual verification. This can be compared with data from the tests on the New York City system where the extraction of a 20 percent subset is required to achieve an 80 percent reliability. Included in monthly reports. Letter 3330-JOE-75-751, dated 14 April 1975.

Grant NI-71-089. The grant is entitled "New Fingerprint Recording Method." The grant was awarded to the Division of Criminal Justice Services of the State of New York. This grant involves the development of a fingerprint recording system using fiber optics techniques. The fiber optic system, as currently implemented, uses a polaroid film as the fingerprint recording medium. The fingerprint image is transferred to the film by means of the fiber optic slug. The slug is shaped so that, in effect, a rolled print image is obtained without requiring motion of the finger. This technique has the advantage of avoiding the smudges and plastic deformations which frequently occur when inked impressions of rolled prints are obtained.

The monitoring effort on this grant involved telephone conversations with the Project Director, a visit to the grantee in Albany, New York, and an evaluation of the final report. Examination of the equipment found it to be compact, rugged, and apparently reliable. In general, the images produced with the polaroid camera lack the contrast between ridges and valleys normally obtained with traditional inking methods. However, when the polaroid picture was inserted into the Semi-Automated Fingerprint Encoding System (SAFES), the resulting closed-circuit television image was clearly adequate for minutiae encoding. An evaluation of the final report found it to be thorough and accurate. The discussion of the solution to the problems encountered in the program is necessarily incomplete since the engineering models described in the report did not incorporate the ultimate optimized imaging system and recording medium deemed to be essential for operational usage of the technique. It was recommended that the report be published in an appropriate journal or other forum since it represents new accomplishments in the fiber optic technology which may benefit other workers in this field. Included in monthly reports. Letter 3330-JOE-75-751, dated 14 April 1975.

T.I. No. 75-006
(22 August 1974)

Proposal Evaluation: Naval Ordnance Laboratory Magnetic Intrusion Alarm Proposal

An evaluation and comments were requested of an unsolicited proposal from the Naval Ordnance Laboratory, White Oak. The proposed program was for the development of a commercial version of the Brown magnetometer for passive intrusion detection in the residential scenario.

The concept proposed by the Naval Ordnance Laboratory appears very interesting because of the low-cost potentiality of the concept; however, there are concerns about the distributed and varying magnetic fields inherent in buildings due to wiring and electrical noise produced by appliances. The U.S. Army MERDC further believed these effects so detrimental that they stated that the only way the magnetic sensor could be used with any surety was by generating an artificial field using energized wires in the surveillance zone.

In response to the Technical Instruction, Aerospace recommended that a residential magnetic field measurements program by the Naval Laboratory would be appropriate before any hardware development is initiated, but that due to the limited funding available at the Institute for these efforts it may not be appropriate to initiate this research work at this time. Letter 3330-JOE-75-675, dated 3 January 1975.

T.I. No. 75-007
(27 August 1974)

Proposal Evaluation: Evaluation of Program to Evaluate Clinical Applications of Biofeedback for Control of Hypertension

The proposal to be evaluated was for a program for the development, refinement, and testing of clinical procedures for the voluntary control of essential hypertension using biofeedback techniques and yoga exercises. The proposal was submitted by Mankind Research Foundation of Washington, D.C. The subject matter of this proposal is of great interest to members

of the medical community because high blood pressure is a serious medical problem for 15 to 30 percent of the U.S. population. However, very little is known about the effectiveness of the techniques that are being proposed and the use of such techniques.

The Aerospace evaluation found that not only were there serious technical deficiencies in the proposal but also the proposed research is not germane to the LEAA mission. Letter 3330-JOE-75-058, dated 30 October 1974.

T.I. No. 75-008 (6 September 1974) — Proposal Evaluation: Tagging of Explosives with Nitro Compounds

An unsolicited proposal was submitted from Thermo Electron Corporation entitled "Tagging of Explosives with Nitro Compounds - A Selective and Sensitive Approach." It was found that this proposal was similar in most respects to a previous proposal by the same company. Both proposals were based upon the tagging and subsequent detection of organic nitro compounds using chemiluminescent detectors. While the concept is theoretically feasible, funding of the proposed program was not recommended since the concept does not compete favorably with the electron capture method in regard to sensitivity, economy, or convenience. (Refer to T.I. No. 74-014; 24 October 1974.) Letter 3330-JOE-75-063, dated 4 November 1974.

T.I. No. 75-009 (10 September 1974) — Proposal Evaluation: Automatic Handwriting Verification System

An unsolicited proposal was submitted to the Institute from Veripen, Inc., to demonstrate the accept/reject criteria for an automatic handwriting system. The Signature Access Control System, trademarked as SIGNAC, is based on the apparent uniqueness and consistency of the pressure pattern obtained as a person signs his name. Certain characteristics of this pressure pattern, measured by means of a pressure transducer imbedded in a

pen, are determined by a combination of logic circuitry and software. The system was proposed for use as an unattended access control system.

The evaluation concluded that the proposed system is similar to other automatic access systems which are based upon discriminating personal characteristics such as fingerprints, facial features, hand geometry, or voice patterns. Detailed technical information was not contained in the proposal; however, a patent search revealed several other devices existed which used the pressure pattern concept. It was recommended that, if such systems were to be developed by the Institute, an evaluation should be performed for all competing concepts and that the Veripen approach should be considered. Letter 3330-JOE-75-591, dated 25 November 1974.

T.I. No. 75-010 (6 October 1974) — Concept Evaluation: Semantic Analysis of Threat Communication

A request was made to review and evaluate the concept for a research program proposed by Syracuse University to identify characteristics of the sociopathic personality such as the skyjackers, bank robbers, political terrorists, and kidnappers who threaten democratic processes. The purpose of this study would be to extend understanding of all who threaten so that it need not be necessary to return violence with counter-violence, with the terror of helplessness, or with the indecisiveness of reactions resulting from no prior plan. The proposal involves the concept of utilizing existing computer programs which analyze the content of verbal communication (written or spoken) to extract information from criminal threats. The concept is based on the assumption that threat communications contain information regarding the identity, background, and psychological motivation of the writer or speaker and that detailed computer-assisted analysis can enable trained personnel to extract and interpret this information.

Various individuals having specific, relevant fields of expertise were interviewed to ascertain characteristics of criminal threat messages, the feasibility of obtaining psychological information from these messages, and

the potential accuracy and usefulness of such information. In addition, the support data and the descriptions of the statistical processes used in the employment of the proposed technique were evaluated. It was found that neither the proposal nor other information obtained in the review effort support the contention that the proposed concept is within the current state of the art. The data presented in the proposal were found to be either inconclusive or irrelevant to the problem at hand. In addition, insufficient attention was given to the potential application of the proposed concept. It was recommended that this proposal not be funded by the Law Enforcement Assistance Administration at this time. Letter 3330-JOE-75-067, dated 4 November 1974.

T.I. No. 75-011 (2 October 1974) — Report Evaluation: FCC Docket 18302 Impact on Vehicle Locator Systems

A request was made to examine and comment on FCC Docket 18302, originated in 1968, to ascertain the status and requirements of vehicle location technology. As a result of the initial responses to this docket, the Commission made provision for authorization of radio spectrum usage on an experimental or developmental basis in support of technology development. In recent years, improvements in technology and increased government sponsorship influenced development, which finally reached the stage where the Commission considered that authorization for operational vehicle location systems was justified.

The Aerospace Corporation examined the subject docket as it pertained to Task Plan 7908, "Cargo Security System," and the findings, in summary, were that the revised rules for land-mobile communications encouraged the development of vehicle location technology while making the most efficient use of the allocated frequency channels. The impact of the revised rules on the Cargo Security System was minimal, affecting only the technical design of proximity units. Letter 3330-JOE-75-079, dated 25 November 1974.

T.I. No. 75-012 (16 October 1974) — Concept Evaluation: Truck Anti-Hijacking and Cargo Security System

This Technical Instruction requested Aerospace to contact Mr. Currie of Texas Instruments concerning a Truck Anti-Hijacking and Cargo Security System which Texas Instruments reportedly had developed. There was concern that this system was similar to that being developed by Aerospace. The Technical Instruction also required a written report of findings and recommendations.

The findings and recommendations were as follows: Texas Instruments has developed a robbery and burglary deterrent system which it plans to install in the principal cities of the U.S. within the next three years. The system concept is that of a covert tracking system similar to the Wackenhut "Bloodhound." The location of concealed transmitters can be determined by vehicle-mounted detection equipment on police vehicles. The transmitter operates at the high end of the VHF frequency band. No transmitter identification code is provided, but the frequency/modulation characteristics are unique to the system. Consequently, the detection of a signal with these unique characteristics is indicative of a theft situation. The receiver unit, which may be installed in fixed or mobile locations, provides outputs for a three position (left, ahead, right) relative azimuth indicator and a relative range indicator. Although location and interception of an active transmitter can be achieved, the operational characteristics of the system, i.e., no transmitter identification and manual activation in a theft situation, make it inapplicable as a primary element in Task 7908, "Cargo Security System," which requires that the location and status of each vehicle in a trucking fleet is available at all times to the fleet dispatcher. In summary, the forecast availability of this system has no impact on the Cargo Security Program at this time, and we recommend no action other than to maintain cognizance of its operational status. Letter 3330-JOE-75-80, dated 25 November 1974.

T.I. No. 75-013 (16 October 1974)

Proposal Evaluation: EIKONIX Corp. Printing Paging System; Evaluation of

This Technical Instruction was a request for the evaluation of a Printing Paging System proposal submitted by Eikonix Corp. This proposal involves extending the concept of personal radio paging systems to a more elaborate configuration employing digital transmission and printing the received messages on a strip of heat sensitive paper. The proposal states that EIKONIX has completed preliminary design and breadboard fabrication of the system. There was no detailed technical design or test data included, however.

The proposal offers the following possible advantages: it will eliminate lost messages; it will promote more efficient channel usage; it will provide message privacy; and it will produce permanent hard copy records of messages. While the use of digital transmission would promote a measure of communication privacy, the low data rate (30 characters per second) would not appreciably improve present levels of efficiency.

It was recommended that the subject proposal not be funded since there is no demonstrated need for such equipment and because a significant level of funding is required for further development. Letter 3330-JOE-75-088, dated 3 December 1974.

T.I. No. 75-014 (16 October 1974)

Proposal Evaluation: Medium Frequency Phase Trilateration for Automatic Vehicle Monitoring

A request was made for an evaluation of the Lear Siegler, Inc., proposal for Medium Frequency Phase Trilateration for Automatic Vehicle Monitoring. This proposal was to perform a feasibility study of a RF phase multilateration technique usable for Automatic Vehicle Monitoring in cities

the size of Grand Rapids, Michigan, or larger. The proposed approach employed phase tracking of the continuous carrier of three or more medium wave stations such as AM broadcast. The basic position determination involved either hyperbolic or circular lane counting as in a system called Decca, with the various carrier phases being tracked in each vehicle via separate tuned RF amplifiers, mixers, narrowband filters, and phase to digital converters.

The concept described in the proposal was neither new nor novel. It was fully described in U.S. Patent 3,747,106, filed in July 1971 and issued to Electronic Communications, Inc., St. Petersburg, Florida in July 1973. During this same time period, Hansen of the Jet Propulsion Laboratory and Martinex of The Aerospace Corporation independently described alternative methods of using AM broadcast transmitters for vehicle location. The wraping of the lines of position by multipath effects was not considered. Similarly, proposed recovery methods following signal loss and data transmission techniques indicated a lack of familiarity with the practical implementation of a vehicle location system.

The proposed study was considered to be a subset of the concept feasibility task conducted by The Aerospace Corporation, and the tasks described by Lear Siegler would not determine the practical feasibility of the system. In summary, the proposal reflected a lack of familiarity with the progress made in vehicle location technology during the past 18 months and the practical aspects of system implementation. It was recommended that no further action be taken by the Institute on this proposal. Letter 3330-JOE-75-081, dated 25 November 1975.

T.I. No. 75-015
(4 November 1974)

Proposal Evaluation: Remote Control Vehicles

A proposal and concept paper from the University of Kentucky to develop remote control machines for law enforcement purposes was received by the Institute. Its specific application was to remove bombs and confront armed criminals. Since the proposal had no technical information describing the design or major subsystem, a technical evaluation aimed at determining the acceptability of the proposed development was not possible.

The evaluation consisted of analyzing the concept in the framework of operational requirements, projected capabilities, and the implication of these requirements and capabilities on the system design. It was concluded that the development of this relatively complex hardware did not appear warranted because (1) low-priority law enforcement requirements, and alternate means to remove bombs and confront cornered criminals are relatively safe; and (2) other government agencies are currently developing remote control machines. Letter 3330-JOE-75-647, dated 9 December 1974.

T.I. No. 75-016
(1 November 1974)

Proposal Evaluation: Evaluation of Intrusion Detection Concepts

An evaluation was requested of an unsolicited proposal to LEAA from the U.S. Army Mobility Equipment Research and Development Center (MERDC). The proposal was for the development of several intrusion sensor concepts for civil systems use. These concepts were derived from research work currently being carried on at MERDC for the development of sensors for counter-intrusion, arms room protection, and other military applications. The five developments proposed by MERDC were (1) an analog switchmat sensor, (2) an improved ultrasonic motion sensor, (3) a passive infrared sensor, (4) an electrostatic (E-field) sensor, and (5) strain vibration sensors.

The Aerospace recommendation was that the Institute consider funding the development of the passive infrared sensor since this device as described appears to possess features which are felt to be desirable and directly applicable to the Institute's objectives. These include the possibility for human discrimination, low false alarms, and low potential cost. Letter 3330-JOE-75-104, dated 2 May 1975.

T.I. No. 75-017
(20 November 1974)

Concept Evaluation: Lansing, Michigan Police Department

Evaluate concept submitted by the Lansing, Michigan Police Department (L,MPD) for planning, researching, and developing the integration of three systems for the following:

1. Automatic Vehicle Locating
2. Two-Way Digital Communications
3. Mobile Communication Terminals with Input/Output Capability to a Computer and Hardcopy Production.

The L,MPD believes that such a system will improve the efficiency, effectiveness, and expediency of police services rendered to the citizens of the community through basic operational improvements if designed for future expansion and flexibility in operations based upon current and future needs and priorities. Further, the successful development of a basic system design in Lansing, Michigan, can provide similar operational benefits to any law enforcement agency. Preliminary contacts made by L,MPD with representatives of manufacturing concerns producing automatic vehicle locater and monitoring systems, two-way digital radio communications, and electronic data processing systems have resulted in an expressed interest and desire to become involved in the research, planning, and development of a basic system design concept coordinated by the L,MPD.

Aerospace considers that the approach proposed would encounter technical management and interface problems and would not yield technical or operational data of value to the law enforcement community in general. For this reason and for other considerations, Aerospace recommends that no funding be considered for the Lansing program. This program request is symptomatic of an increasing demand for federal funding of patrol car command and control systems. However, in view of the fact that the technology proposed is but one part of the overall needs of the police community and is in part duplicative of efforts undertaken elsewhere, it is believed that the planning and development for a more complete Police Car Improvement Program are warranted. Sufficient experience has been gained with related programs to enable the establishment of hardware, software, interface, and test specifications, yet provide system modularity such that individual requirements could be met within the system framework. Although a significant amount of LEAA funding has been expended in the development of the indicated system elements, the system design proposed is such that transfer of technology to other potential users is impractical, and the interfacing of the remaining elements of an integrated system poses severe technical problems. Letter 3330-JOE-75-107, dated 9 January 1975.

T.I. No. 75-018 (21 November 1974) — Technical Support: Evaluation of Capabilities of Clement E. Furlong, et al.

In accordance with the Institute's request, biographical material and technical reports forwarded with this Technical Instruction were reviewed. Dr. Furlong proposed to develop analytical methods for "fingerprinting" various physiological fluids.

Our evaluation of the information submitted by Dr. Furlong resulted in the following conclusions. This group appeared to be knowledgeable and innovative in their field of study and possessed the fundamental academic capability to perform the proposed work. Although their past experience had some applications in the proposed study, they had not been actively

engaged in the determination of genetic markers in physiological fluids. They conducted studies on the gross separation of protein fractions using electrophoresis techniques. Analysis of forensically important physiological fluids will entail research in a somewhat different, albeit related, field from their past work. It appeared, therefore, that initially the group would require some time to become familiar with current techniques involved in the individualization of genetically derived determinants in body fluids. They were qualified to move into this new but closely allied area, and Aerospace did not anticipate that they would experience major difficulties. Letter 3330-JOE-75-110, dated 23 January 1975.

T.I. No. 75-019 (22 November 1974) — Grant Monitoring: Personal Pulse Rate Monitor

This Technical Instruction instructed Aerospace to technically monitor a contract between LEAA and Display System Associate. This contract (Letter Contract No. J-LEAA-014-75) is for design and development of a prototype personal pulse rate monitor. This Technical Instruction was subsequently cancelled. Letter 3330-JOE-75-662, dated 17 December 1974.

T.I. No. 75-020 (12 December 1974) — Grant Monitoring: Individualization and Identification of Forensically Important Physiological Fluids

A request was made to monitor the grant entitled "Individualization and Identification of Forensically Important Physiological Fluids." The grantee is Dr. Robert Shaler of the Pittsburg Allegheny County Crime Laboratory. This grant is divided into three major tasks: (1) the determination of blood type frequency-of-occurrence data; (2) the development of dried blood analysis techniques for peptidase A, glutathione reductase, GM, and Inv systems; and (3) the determination of the sexual origin of blood.

In general, satisfactory to excellent progress has been made in this study. For the collection of blood frequency data, no major problem has been encountered. Analysis procedure for the determination of peptidase A

polymorphs has been developed, but to date the electrophoretic separation and identification of glutathione reductase has not been successful. Partial success has been achieved in the GM typing of stains, and an alternative approach utilizing antibody attached to latex particles will be attempted. For the latter task, ABO system will be utilized as a model to investigate the applicability of the technique. For the sexual origin of dried blood, the testosterone level has been determined by competitive radioimmunoassay method and analysis of the estradiol concentration will be investigated. Letter 3330-JOE-75-659, dated 16 December 1974.

T.I. No. 75-021 (3 January 1975) — Technical Support: FCC-LEAA Coordinating Committee

As a result of direction received on 16 January 1975, it was agreed that technical support would be provided the FCC-LEAA Coordinating Committee. A proposed charter was prepared for the committee which defined its scope, activities, organization, and operation. In addition, agenda items for the early meetings of the committee were prepared, and technical precis of candidate, current issues to be studied and resolved by the committee were provided. Letter 3330-JOE-75-116, dated 28 January 1975.

T.I. No. 75-022 (10 January 1975) — Technical Support: Review of Shoe Alternative

The Institute requested a survey of the work related to the foot problem of patrol officers as well as an assessment of the suitability of different types of shoes for police use. In preparing the response to this request, approximately 35 public and private organizations were contacted. These included representatives from health and safety agencies, police departments, police union officials, shoe industry executives, the U.S. Army Natick Laboratory, the U.S. Postal Service, and practicing podiatrists from several major colleges.

The general consensus was that police officers do not perceive foot and shoe problems as significant issues. It appears that little is known

about any foot problems that are unique to police officers, and it was recommended that a medical survey be made to determine if such problems exist and if they can be remedied by the design of special footwear. Current medical opinion is that unless officers have congenital foot problems or an unusually shaped foot, shoes marketed through conventional retail processes are adequate. Letter 3330-JOE-75-716, dated 19 February 1975.

T.I. No. 75-023 (23 January 1975) — Report Evaluation: New Fingerprint Recording Method

This Technical Instruction requested the evaluation of the subject report prepared by the New York State Division of Criminal Justice Services to document the results of this work under Institute Grant NI 71-089. The work that resulted in the development of an engineering prototype for a fingerprint recording device utilizing fiber optic techniques was monitored and subsequently reported in TI 75-005.

In general, the report was found to be thorough and accurate. It provides a thorough description of the problems associated with applying a new concept (fiber optics) to an existing problem (fingerprint recording). The discussion of the solution to these problems is necessarily incomplete since the engineering models described in the report did not incorporate the ultimate optimized imaging system and recording medium deemed to be essential for operational usage of the technique.

The discussion of basic concepts for fiber optics appears too abbreviated for all but a specialized technical group. Since the report could be expected to be of interest to a wider audience, more background information would be useful. Definition of terms and concepts would be helpful.

One of the principal benefits of the fiber optics approach is that it reduces the amount of distortion normally associated with rolled fingerprints. The data summary presents quantitative measures of the errors introduced by the engineering prototype system. These errors are not related, however, to the degree of distortion error typically found in rolled fingerprints obtained

by standard techniques. If data of this type are available (resulting from work on the FINDER or SAFES systems), it would be useful to compare it with the errors measured from the fiber optics system.

It was recommended that the report be published in an appropriate journal or other form since it represents new accomplishments in the fiber optic technology which may benefit other workers in the field. Letter 3330-JOE-75-133, dated 18 March 1975.

T.I. No. 75-024 (24 January 1975) — Proposal Evaluation: Tidel Cash Controller

A proposal was submitted to the Institute by the Tidel Company through the Seattle Law and Justice Planning Office. The Tidel concept is a cash disbursement system to control the amount of cash in a small store by having it deposited in the safe with a vending capability. (The concept is also referred to as a hardened cash register.) The machine will only dispense relatively small amounts of cash after a predetermined time period has elapsed (two to three minutes). It is expected that few robbers will be willing to wait around for small amounts of money to be produced in increments of time, particularly if deterring signs advertise that a silent alarm is an integral part of the system.

As part of the evaluation, a visit was made to the Tidel Company to inspect a prototype of the device; principals of the company were present to conduct a demonstration and provide additional information. From operational considerations, it was concluded that restricting the availability of cash in small stores should reduce robbery losses and deter prospective robbers. The Tidel System appeared to be one approach which is technically feasible and well within the present state of the art of electro/mechanical technology and can be produced at a reasonable cost. It was recommended that if the Institute decided to pursue the development of hardened cash registers, an operational test of the system is in order. Letter 3330-JOE-75-736, dated 24 March 1975.

T.I. No. 75-025 (24 January 1975) — Proposal Evaluation: Electron Microscope/ Spectrometry

The Institute received a proposal from the Georgia Institute of Technology to research the utility of a Scanning Electron Microscopy System equipped with Auger Electron Analyzer for forensic applications. Basically, this concept performs a similar function to a scanning electron microscope with an x-ray attachment. Notably, the Auger attachment has potential for increased sensitivity in determining the presence of elements lighter than sodium which are within a few molecular layers of the surface of an object.

It was concluded that there was relatively little potential difference in the system over the Scanning Electron Microscope/X-ray System for forensic applications. No obvious unique applications of the proposed device surfaced as a result of the analysis and evaluation of the concept. However, since this is an exploratory-type research program, from a technical standpoint, no categorical statements can be made that this device is without application. As a result, it was not recommended for funding considering the Institute's limited funding resources since there is a relatively low probability of the development of a new forensic analysis technique. Letter 3330-JOE-75-776, dated 13 May 1975.

T.I. No. 75-026 (26 February 1975) — Concept Evaluation: Evaluation of Diax Explosives Detector

An evaluation was requested of the Diax Corporation laser opto-acoustic spectroscopy system based on a demonstration of the system given to Dr. J. A. Gelbwachs of the Aerospace Laboratory Operations by Dr. Barry Block of the Diax Corporation. The system appeared to be well engineered and contained several state-of-the-art components which may provide instrument compactness, ruggedness, longevity, and ease of operation. However, demonstration using water vapor and other nonexplosive vapors implied that interference could be a problem. The intracavity design may improve system sensitivity as claimed by Diax, provided that

nonintracavity system noise levels are not increased. A complete technical assessment must await completion of the evaluation of the final report for the laser optoacoustic feasibility investigation which was performed by Case Western Reserve University and detailed performance data for the Diax system. Tests were proposed to facilitate the determination and evaluation of the claimed superior performance of the Diax system. Letter 3330-JOE-75-168, 4 June 1975.

T.I. No. 75-027 (19 March 1975)

Technical Support: LEAA-Supported Science and Technology Activity

Support was requested in the preparation of input material for the House Committee on Science and Technology. Rough draft material was generated covering the background, scope, and level of effort of technology-oriented equipment programs currently under Institute sponsorship. A copy of the draft was delivered to the Institute on 28 February 1975. Letter 3330-JOE-75-158, dated 8 April 1975.

T.I. No. 75-028 (19 March 1975)

Technical Support: The Effect of Daylight Saving Time on Crime

A study of the possible effects of daylight saving time was undertaken as a result of a request received by LEAA from the Department of Transportation, which had the responsibility for reporting to Congress on the overall effects of the Emergency Daylight Saving Time Energy Conservation Act of 1973, as amended in 1974. The study was based upon crime statistics obtained from Los Angeles and Washington, D.C., covering the period from 1973 through the first quarter of 1975. Within the limited time available, the Los Angeles data obtained lacked sufficient detail to allow a reliable estimate to be made of the possible dependence of crime on daylight saving time. On the other hand, very detailed crime data were obtained from Washington, D.C., specifying each crime by hour of the day and by type for a 27-month period.

An analysis of these indicated a 10-13 percent reduction in violent crime during daylight saving time periods as compared with similar periods of standard time. Similarly, for five transition periods of standard to daylight time and vice versa, between January 1973 and March 1975, it was observed that, for the two weeks before and after the transition, there was a lower incidence in violent crime during the daylight saving time periods. No generalization was made since the data analyzed were for only one city, and it is not known whether this reduction is transient or persists in the long run. Letter 3330-JOE-75-802, dated 30 June 1975.

T.I. No. 75-032 (8 April 1975)

Concept Evaluation: Proposed HUD/LEAA Field Evaluation of Door and Window Security Standards

A request was received from the Institute to assess the feasibility of a joint effort being considered by NILECJ and HUD to field test the benefits of hardening doors and windows. The proposed tests were to be part of extensive renovations and modifications planned for the Arthur Capper public housing dwellings in Washington, D.C.

Documentation previously prepared was reviewed. Also, extensive discussions were held with NILECJ, HUD, NBS, and National Capital Housing Authority personnel. It was concluded that although the field tests were feasible, the numerous other physical improvements being planned for simultaneous implementation could mask the individual contribution of hardening the doors and windows. Nevertheless, results of interest to the Institute should be possible and a conditional endorsement was provided. Letter 3330-JOE-75-165, dated 15 April 1975.

T.I. 75-033 (8 April 1975)

Technical Support: Summary of the State of the Art of Alarm Systems

In support of an Institute request, a review was made of the types of alarm systems which are available, their functions and approximate costs. The state of the art of sensors, communications, and control and processing

subsystems was described. It was noted that cost and false alarms are the greatest obstacles to widespread use of alarms by residences and small businesses. Purchase costs were found to be about $3000, with operating costs ranging up to $50 per month. False alarm rates were found to range from about 2.5 per year up to 10 per year, with the majority of installations having rates on the high side of this range. Estimates of the impact on police resources of the widespread installation of alarms with these rates were made for New York City Precinct 103. It was found that with a 20 percent coverage of residences, the false alarm rate must be no greater than 2 per year if no increase in police resources is countenanced.

Estimates of the increase in the probability of on-site arrest found that, at a 20 percent alarm coverage it would nearly double from 18 to 32 percent probability of arrest. At 50 percent coverage, this probability increases to 53 percent. It was noted that the ESIP alarm development, if successful, would allow a 20 percent alarm coverage with no increase in police resources. A summary of the performance objectives of this development and the system design concept was provided. Letter 3330-JOE-75-754, dated 18 April 1975.

T.I. No. 75-034 (8 April 1975) — Technical Support: State of the Art of Citizens Alarm System

At the request of the Institute, a summary report on the current status of the Citizens Alarm System, including its present use and problem areas, was prepared. Letter 3330-JOE-75-754, dated 18 April 1975.

T.I. No. 75-037 (29 April 1975) — Proposal Evaluation: Cargo Security

A letter dated 17 April 1975 from Benjamin O. Davis, Jr., of the Department of Transportation proposed that LEAA and the Department of Transportation jointly fund additional development of an electronic tag system.

Following a review of the proposal, the technical concepts, and the development status of the electronic tag system, it was concluded that while the system could complement the Institute's cargo security system, its principal application would be as a covert tracking device for law enforcement operations. The system represents a significant advance over current tracking devices, and it was recommended that a survey of potential users be undertaken. If this survey revealed a genuine need for the device, funds should be allocated for this joint development task. Letter 3330-JOE-75-190, dated 23 May 1975.

T.I. No. 74-046 (22 April 1974) — Technical Support: Information Dissemination Techniques

The Institute requested an analysis of alternative methods to disseminate information about the research findings of the Law Enforcement Development Group. In particular, the objectives of the technical response were to identify Aerospace topics for possible dissemination and indicate the alternative formats and costs needed to disseminate this information, to identify LEAA information dissemination techniques and recommend ways to more fully utilize these mechanisms to disseminate information and to identify other mechanisms which are potentially useful for disseminating information about the Advanced Technology Division.

In preparing this response, a number of Aerospace and LEAA personnel was interviewed. Aerospace project directors were contacted to gain information about how the Development Group might encourage the dissemination of significant research findings. LEAA personnel in the Office of Technology Transfer and the Public Information Office described the information systems available to the Agency and suggested ways that the Advanced Technology Division might better utilize these systems. Finally, a number of research newsletters published by other federal agencies were reviewed, and an assessment was made concerning the adoption of such a publication by the Advanced Technology Division.

The general recommendations of this Technical Response were that Aerospace should prepare summaries of significant research findings for inclusion in LEAA publications, that LEAA has an excellent information dissemination system that is not being fully utilized by the Advanced Technology Division, and that the publication of an Advanced Technology Research newsletter appears unwarranted. Letter 3330-JOE-75-665, dated 18 December 1974.

T.I. No. 74-047A (10 July 1974) — Proposal Evaluation: Voiceprint, Field Conditions

This Technical Instruction amended T.I. 74-047, which was to evaluate and comment on a Stanford Research Institute Proposal for Evaluation of Voiceprint Examiner Under Field Conditions. The Aerospace evaluation of the Technical Proposal suggested that a greater emphasis should be placed on data collection in the proposed test effort. The amendment transmitted suggested contractual provisions reflecting the changed emphasis.

Aerospace has reviewed this revised proposal and has concluded that the study represents a cost-effective approach to meeting the objections currently being raised in opposition to the use of voiceprint evidence. Letter 3330-JOE-74-187, dated 2 August 1974.

T.I. No. 74-052 (13 June 1974) — Proposal Evaluation: State of Florida 900 MHz Use

A review and evaluation were made on the State of Florida proposal based on the 17 June 1974 Federal Communication Commission (FCC) action to release that portion of the radio spectrum lying between 806 and 947 MHz for land mobile radio communications. The use of these frequencies requires communications equipment which is presently not available on the market. Several of the major manufacturers of communications equipment have been performing research and development in this field; however, the present stage of development is not known. Additionally, these

frequencies will have different propagation characteristics which must be identified, measured, and evaluated in order to be able to design land mobile communications systems. The rules resulting from this action will cause a definite impact on the present system of frequency coordination and the allocation of frequencies to the public safety services. Therefore, this study will briefly identify these problems, the research and development needs, and the methodology the Florida Division of Communications (DIVCOM) would apply investigating, testing, and using the 900 MHz spectrum for police communications systems.

Based on the review of the relevant documents, it was concluded that a research effort designed to achieve the results suggested in this proposal would yield results which are needed at the present time in view of current FCC rulings and related considerations in progress. It should also be noted that there are, in fact, two almost separate programs being proposed: One is for the investigatory theoretical and empirical effort, and the second relates to the design, installation, and procurement of a 900 MHz system. Only the first effort appears justified at this time. A program such as this was suggested to the Institute during August 1973. The program was disapproved in favor of higher priority efforts because of lack of funds. If funding should become available in the future, then it was felt that an effort such as this should be supported. Since the proposer is not uniquely qualified to conduct this effort, a competitive procurement was suggested. Letter 3330-JOE-75-007, dated 18 July 1974.

T.I. No. 74-053 (13 May 1974) — Report Evaluation: IACP Model Ordinances; Alarms and Building Security

A review and comments were requested on Ordinances No. 3, "Model Burglar and Holdup Alarm Systems Ordinance," and No. 4, "Model Security Ordinance," developed by the International Association of Chiefs of Police. These model ordinances are for the purpose of establishing minimum standards and regulations for alarm systems and users and physical security of mercantile establishments.

The model ordinances were found to have realistically addressed a history of security problems among the alarm industry, alarm users, and the police. Overall, the ordinances were found to be constructive and helpful. There was, however, a number of questions raised relative to the restrictive nature of the ordinances, and many specific comments were made to further improve the ordinances. Letter 3330-JOE-75-015, dated 30 August 1974.

T.I. 74-054 and T.I. 74-054A (19 June 1974)

Technical Support: Technology Transfer

A request was made to develop a Technology Transfer Guideline which would include strategies and methodologies. This Technical Instruction was subsequently cancelled by a letter from the Government Project Monitor, dated 15 October 1974.

T.I. No. 74-055 (20 June 1974)

Report Evaluation: Test of Coded Taggant Materials for the Identification of Explosives

A request was made to review the progress report of the Lawrence Livermore Laboratory, dated 10 June 1974 and to make recommendations on any redirection of effort required. The report is entitled "Feasibility Investigation and Test of Coded Taggant Materials for the Identification of Explosives Program," and the work is being performed under Interagency Agreement LEAA-J-IAA-012-4.

A review of the Lawrence Livermore Laboratory's Progress Report was accomplished, and the requested assessment of progress and recommended redirection of effort was provided. Progress on this program was judged as being minimal due to internal Lawrence Livermore Laboratory delays in implementing the necessary subcontracts with the 3M Company, Westinghouse, Ames Laboratories, and the Institute of the Makers of Explosives. As a result, initiation of the test portion of the program, which constitutes the bulk of the program, was delayed. Only a token effort in the

area of experimental design of the test and threat models had been initiated. The only redirection of effort that was required was accomplished by the Aerospace technical management relationship with the Lawrence Livermore Laboratory. As a result of a meeting with the Institute of Makers of Explosives, it was concluded that the program be structured on the feasibility of adding coded tags only to dynamite. The tagging of blasting caps, primercord, and other types of explosives will only be treated analytically and not by actual test. Letter 3330-JOE-74-188, dated 18 July 1974

APPENDICES

APPENDIX A

FISCAL YEAR 1975 CORRESPONDENCE

Letter Number	Subject	Date
3330-JOE-74-760	Task Plan Errata Sheets (7907, 7908, and 7910)	1 July 74
3330-JOE-74-180	Citizen Alarm Field Evaluation, Technical Instruction 74-051	2 July 74
3330-JOE-74-762	Revised Task Plans transmittal (7907, 7908, and 7910)	3 July 74
3330-JOE-74-763	Revised Task Plans transmittal (7904, 7905, and 7915)	5 July 74
3330-JOE-74-761	Transmittal of Executed Technical Instructions 74,052, 74-053, 74-054, and 74-055	10 July 74
3330-JOE-74-178	Publication of Sylvania Final Report	11 July 74
3330-JOE-75-765	Evaluation of Proposal, Technical Instruction 74-056	11 July 74
3330-JOE-75-766	Evaluation of Unsolicited Proposal from Display Systems Associates, TP-203-74, Technical Instruction 74-056	11 July 74
3330-JOE-74-151	Evaluation of Alabama A&M Proposal, "Planning Policy for Specteum Utilization", Technical Instruction 74-037	15 July 74
3330-JOE-75-001	Mission Research Proposal on Gunshot Residue Clarification	15 July 74
3330-JOE-74-177	Program Review of the Speaker Identification Project Held on 17 May 1974	15 July 74
3330-JOE-75-764A	Revised Task Plan Transmittal (7905)	16 July 74
3330-JOE-74-183	Rockwell Internation Request for Additional Funds	17 July 74

Letter Number	Subject	Date
3330-JOE-74-158	Evaluation of AVCON Concept Papers, Technical Instruction 74-042	18 July 74
3330-JOE-74-161	Review of Concept Paper and Proposal, "Evaluating an Implemented Automatic Vehicle Monitoring System", Technical Instruction 74-039	18 July 74
3330-JOE-74-172	Federal Communications Commission Regulations Affecting the Law Enforcement Assistance Administration, Department of Justice and Law Enforcement Agencies, Technical Instruction 74-045	18 July 74
3330-JOE-74-182	Electric Vehicles Study Subtask for Development Group General Planning Task Plan - Technical Instruction 74-044	18 July 74
3330-JOE-74-185	Transceiver Development Program, Technical Instruction 74-043	18 July 74
3330-JOE-74-188	Response to Technical Instruction 74-055 - Lawrence Livermore Laboratory's Progress Report for the Feasibility Investigation and Test of Coded Taggant Materials	18 July 74
3330-JOE-75-007	Evaluation of 806-947 MHz Radio Spectrum, Technical Instruction 74-052	18 July 74
3330-JOE-75-004	Burglary Alarm System Statement of Work Review Meeting, 2-3 July	22 July 74
3330-JOE-75-008	Validation Test Project - Speaker Identification Program	22 July 74
3330-JOE-75-500	Transmittal of Executed Technical Instructions 74-047A, 74-054A, 74-055, 74-058 and 74-059	22 July 74

Letter Number	Subject	Date
3330-JOE-75-501	Technical Assistance Requests from Mr. Velde	23 July 74
3330-JOE-74-143	Review of Proposed Fingerprint Classification System, Technical Instruction 74-036	24 July 74
3330-JOE-75-503	Task Plan Data Transmittal (Cargo Security 7908)	24 July 74
3330-JOE-75-504	Proposed Acoustic Phased Array Riot Control System, Technical Instruction 74-021	24 July 74
3330-JOE-74-184	University of Florida Proposal for Speaker Identification, Technical Instruction 74-050	25 July 74
3330-JOE-75-009	Citizen Alarm Test Planning Contract	25 July 74
3330-JOE-74-186	Evaluation and Comments Re: Remotely Piloted Mini-Blimp, Technical Instruction 74-048	
3330-JOE-75-509	Request for Consent to Subcontract, Compu-guard Security Systems, Inc.	26 July 74
3330-JOE-75-510	Citizen Alarm System, Preliminary Production Hardware Data Package Available for Information Exchange	26 July 74
3330-JOE-75-502	Response to Antihijack RFP	29 July 74
3330-JOE-75-013	Kevlar Material for Field Evaluation	30 July 74
3330-JOE-75-511	Support to ONPP	30 July 74
3330-JOE-75-512	Transmittal of June Progress Report	30 July 74
3330-JOE-74-187	Proposal for Evaluation of Voiceprint Examiners Under Field Conditions, Technical Instruction 74-047A	2 Aug. 74

Letter Number	Subject	Date
3330-JOE-75-514	Task Plan Changes/Composite Delivery Schedule/Program Plans	2 Aug. 74
3330-JOE-75-016	Improved Citizen Alarm Contract Approval	6 Aug. 74
3330-JOE-75-017	Citizen Alarm Cost Overrun Approval	6 Aug. 74
3330-JOE-75-020	Citizen Alarm Documentation Delivery	7 Aug. 74
3330-JOE-75-516	Pulse Rate Monitor, Technical Instruction 74-056A	7 Aug. 74
3330-JOE-75-520	Review of Edgewood Proposal for Protective Armor Evaluation, Technical Instruction 74-060	7 Aug. 74
3330-JOE-75-521	Transmittal of Delivery Schedule	7 Aug. 74
3330-JOE-75-024	Overrun Approval Subcontract No. 40109V, Semi-Automatic Speaker Identification System	8 Aug. 74
3330-JOE-75-025	Payment of Albuquerque Data	9 Aug. 74
3330-JOE-75-026	Printing of Lightweight Body Armor Brochure	9 Aug. 74
3330-JOE-75-027	Procurement of Second Chance Vests	9 Aug. 74
3330-JOE-75-525	Transmittal of Unused Fiscal Year 74 Monies Table	9 Aug. 74
3330-JOE-75-526	Transmittal of Task Plans/Composite Delivery Schedule	9 Aug. 74
3330-JOE-75-522	Accounting of Expenditures	12 Aug. 74
3330-JOE-75-528	Cost Overruns/Transmittal of Information	12 Aug. 74

Letter Number	Subject	Date
3330-JOE-75-531	Technical Instruction 74-061 (75-004)	12 Aug. 74
3330-JOE-75-532	Citizen Alarm Demonstration at Southern Michigan Prison	13 Aug. 74
3330-JOE-75-028	Review of Blunt Trauma Draft, Technical Instruction 74-059	14 Aug. 74
3330-JOE-75-029	Return of Final Report Masters - GTE Sylvania, Inc.	14 Aug. 74
3330-JOE-75-534	Subcontract No. 44365V - Stanford Research Institute	20 Aug. 74
3330-JOE-75-540	Prospectus for an Individual Crime Alarm System, Technical Instruction 74-058	20 Aug. 74
3330-JOE-75-030	Distribution of Effort for Rockwell International Follow-on	21 Aug. 74
3330-JOE-75-032	Report Transmittal of Technical Report Under the Gunshot Residue Detection and Analysis Program	21 Aug. 74
3330-JOE-75-034	Printing of Lightweight Body Armor Brochure	21 Aug. 74
3330-JOE-75-035	Stop Order on Body Armor Material Procurement	21 Aug. 74
3330-JOE-75-036	Officer Body Armor Assaults	22 Aug. 74
3330-JOE-75-535	Protective Body Armor Material Development, Technical Instruction 74-049	22 Aug. 74
3330-JOE-75-536	Revised Task Plans (FY 75)	22 Aug. 74
3330-JOE-75-536A	Statement of Work Approval, Market Survey	22 Aug. 74

Letter Number	Subject	Date
3330-JOE-75-537	Pulse Rate Monitor, Technical Instruction 74-056A	23 Aug. 74
3330-JOE-75-533	Technical Assistance Requests from Mr. Velde	27 Aug. 74
3330-JOE-75-538	Subcontract No. 53119-V, Request for Consent to Subcontract	27 Aug. 74
3330-JOE-75-539	Transmittal of July 1974 Monthly Report	28 Aug. 74
3330-JOE-75-541	Transmittal of Executed Technical Instruction 75-006	29 Aug. 74
3330-JOE-75-542	FY 74 Deliverables	29 Aug. 74
3330-JOE-75-015	Comments on IACP Model Ordnances; Alarms and Building Security	30 Aug. 74
3330-JOE-75-543	Transmittal of Executed Technical Instruction 75-007	30 Aug. 74
3330-JOE-75-544	Transmittal of Executed Technical Instruction 75-005	30 Aug. 74
3330-JOE-75-546	Task 7906, Technology Transfer Plan	4 Sept. 74
3330-JOE-75-548	Subcontract No. 44366-V, Request for Consent to Subcontract	4 Sept. 74
3330-JOE-75-019	Burglary Alarm Documentation Delivery - "Survey and Systems Concepts for a Low Cost Burglary Alarm System for Residences and Small Businesses"	4 Sept. 74
3330-JOE-75-551	Transmittal of "Preliminary Investigation of Applications of Computer-Aided Speaker Identification System - June 1974"	9 Sept. 74
3330-JOE-75-552	Transmittal of Task Plans 7905 and 7911	9 Sept. 74

Letter Number	Subject	Date
3330-JOE-75-553	August Deliverables	9 Sept. 74
3330-JOE-75-554	Body Armor CBD Announcements	10 Sept. 74
3330-JOE-75-555	Industry Inquiry	10 Sept. 74
3330-JOE-75-557	Citizen Alarm Demonstration Program	10 Sept. 74
3330-JOE-75-758	Revised Briefing Outline for LEAA/ Aerospace Body Armor Symposium at the IACP Annual Conference	11 Sept. 74
3330-JOE-75-759	Transmittal of Executed Technical Instruction 75-008	12 Sept. 74
3330-JOE-75-560	Transmittal of Executed Technical Instruction 75-009	13 Sept. 74
3330-JOE-75-561	Transmittal of Lightweight Body Armor Brochure	13 Sept. 74
3330-JOE-75-042	Postponement Lightweight Body Armor Program Review	13 Sept. 74
3330-JOE-75-562	Annual Briefing Materials	17 Sept. 74
3330-JOE-75-040	Citizen Alarm Documentation Delivery	18 Sept. 74
3330-JOE-75-563	Distribution of FY 75 Budget	18 Sept. 74
3330-JOE-75-564	Subcontract 53122-V, J.H. Wiggins Co.	20 Sept. 74
3330-JOE-75-565	Annual Progress Briefing	20 Sept. 74
3330-JOE-75-039	Projected Costs for Industry/User Symposium	25 Sept. 74
3330-JOE-75-567	CBD on Citizen Alarm Data Package	25 Sept. 74
3330-JOE-75-047	Protective Undergarment Procurement Package	25 Sept. 74

Letter Number	Subject	Date
3330-JOE-75-040A	Citizen Alarm Documentation Delivery	26 Sept. 74
3330-JOE-75-046	Aerospace Consultant Comments - Dr. John Benfield	26 Sept. 74
3330-JOE-75-570	Disclosure of Program Information to Rand Corp.	30 Sept. 74
3330-JOE-75-052	Request for Citizen Alarm System Data Package	3 Oct. 74
3330-JOE-75-571	Revision to Planning Guide	4 Oct. 74
3330-JOE-75-572	Transmittal of FY 75 Annual Operating Plan and FY 74 Annual Progress Report	7 Oct. 74
3330-JOE-75-576	Action Item Log	7 Oct. 74
3330-JOE-75-573	Technical Instruction 74-054A	9 Oct. 74
3330-JOE-75-578	Transmittal of August Monthly Report	9 Oct. 74
3330-JOE-75-569	Transmittal of Analysis, Survey & Assessment Document	10 Oct. 74
3330-JOE-75-574	Reaction TMX	10 Oct. 74
3330-JOE-75-579	Industry/User Symposium Costs	11 Oct. 74
3330-JOE-75-580	Technical Instruction 75-004, Delay in Completion	11 Oct. 74
3330-JOE-75-581	Request for Grant Data for Evaluation of Technical Instruction 75-005	11 Oct. 74
3330-JOE-75-580	TI 75-004 - Delay in Completion	11 Oct. 74
3330-JOE-75-581	Request for Grant Data for Evaluation of TI 75-005	11 Oct. 74
3330-JOE-75-582	Preliminary Response to TI 74-003	11 Oct. 74
3330-JOE-75-584	Transmittal of July Progress Report Addenda	11 Oct. 74

Letter Number	Subject	Date
3330-JOE-75-583	Review of Technical Instruction 75-006 Dealy in Completion	14 Oct. 74
3330-JOE-75-585	Technical Instruction 74-046, Delay in Completion Date	14 Oct. 74
3330-JOE-75-588	Transmittal of July Progress Report Addendum	15 Oct. 74
3330-JOE-75-568	Request of Relief from FY 74 Requirements on Various Items	16 Oct. 74
3330-JOE-75-587	Response to Institute letter requesting review of deliverables	16 Oct. 74
3330-JOE-75-051	Body Armor Field Evaluation Cities Selection Recommendations	17 Oct. 74
3330-JOE-75-586	Transmittal of Candidate Program Listing - Planning Task Plan Deliverables	17 Oct. 74
3330-JOE-75-590	Transmittal of Executed Technical Instructions 75-010 and 75-011	17 Oct. 74
3330-JOE-75-592	Transmittal of Executed Technical Instruction 75-012	17 Oct. 74
3330-JOE-75-055	Kochanski letter 3 Oct. 74, "Annual Progress Report"	21 Oct. 74
3330-JOE-75-593	Transmittal of September Monthly Report	21 Oct. 74
3330-JOE-75-589	Citizen Alarm Demonstration	22 Oct. 74
3330-JOE-75-059	Data Dissemination	23 Oct. 74
3330-JOE-75-594	Additonal Funding for Compu-guard Subcontract	23 Oct. 74
3330-JOE-75-598	Transmittal of Executed Technical Technical Instructions 75-013 and 75-014	23 Oct. 74
3330-JOE-75-062	Letters for Body Armor Candidate Cities	25 Oct. 74

Letter Number	Subject	Date
3330-JOE-75-595	Information Relative to Citizen Alarm System	25 Oct. 74
3330-JOE-75-596	Subcontract Procurement Packages	25 Oct. 74
3330-JOE-75-600	Errata sheets for July Addendum Report	25 Oct. 74
3330-JOE-75-064	Citizen Alarm System Schedule Options	28 Oct. 74
3330-JOE-75-602	Transmittal of Body Armor Letters	28 Oct. 74
3330-JOE-75-066	Coordination Draft of Preliminary Body Armor Field Evaluation Test Plan	29 Oct. 74
3330-JOE-75-058	TI 75-007, Program to Evaluate Clinical Applications of Biofeedback for Control of Hypertension	30 Oct. 74
3330-JOE-75-601	FY 75 Task Plan Revisions	30 Oct. 74
3330-JOE-75-605	July Progress Report Data	31 Oct. 74
3330-JOE-75-608	Monthly Progress Reporting for Task 7915	31 Oct. 74
3330-JOE-75-611	Revised Technical Instruction Delivery Dates	1 Nov. 74
3330-JOE-75-045	Review of Frankford Arsenal Intrusion Detection Research Work	4 Nov. 74
3330-JOE-75-049	Technical Instruction 75-006, Comments on NOL Proposal for a Magnetic Intrusion Alarm Study	4 Nov. 74
3330-JOE-75-057	Review of LWL Technical Memo 73-02, Evaluation of the Dual Channel Bio-luminescent Sensor System	4 Nov. 74
3330-JOE-75-054	E-Field Intrusion Sensor Status	4 Nov. 74

Letter Number	Subject	Date
3330-JOE-75-063	Thermo Elect on Corpo. Proposal - Tagging of Explosives with Nitro Compounds - A Selective and Sensitive Approach, Technical Instruction 75-008	4 Nov. 74
3330-JOE-75-067	Syracuse University Proposal (5/73) - Semantic Analysis of Threat Communications	4 Nov. 74
3330-JOE-75-068	Cargo Security Program - Documentation Deliverables	4 Nov. 74
3330-JOE-75-069	Additional Requests for Body Armor Information	4 Nov. 74
3330-JOE-75-070	Transmittal Report of "Review of Methods for the Detection and Identification of Explosives"	Nov. 74
3330-JOE-75-071	Body Armor Final Report	4 Nov. 74
3330-JOE-75-072	Citizen Alarm System Cost Option	4 Nov. 74
3330-JOE-75-609	Action Item Log and Meeting Schedule	4 Nov. 74
3330-JOE-75-612	Citizen Alarm for Prisons	4 Nov. 74
3330-JOE-75-073	Subcontract 55402, Burlington Industries Fabrics Company	7 Nov. 74
3330-JOE-75-075	Body Armor Information Requests	12 Nov. 74
3330-JOE-75-614	TI 75-015, Transmittal of Executed Copy	12 Nov. 74
3330-JOE-75-619	TI 75-016, Transmittal of Executed Copy	12 Nov. 74
3330-JOE-75-623	Action Item Log and Meeting Schedule	12 Nov. 74
3330-JOE-75-624	Revised TI Delivery Dates	12 Nov. 74
3330-JOE-75-615	CBD Announcement for Citizen Alarm	13 Nov. 74

Letter Number	Subject	Date
3330-JOE-75-620	Grant Monitoring for Pulse Rate Sensor	13 Nov. 74
3330-JOE-75-076	City Selection - Body Armor Field Evaluation	14 Nov. 74
3330-JOE-75-077	Disclosure Requirements to Participating Departments and Police Personnel	14 Nov. 74
3330-JOE-75-616	Telecon with Mr. Gorski	14 Nov. 74
3330-JOE-75-625	Task Plan 7903 - Program Management	14 Nov. 74
3330-JOE-75-626	Restricted Information - LEAA Contract	15 Nov. 74
3330-JOE-75-604	Additional Information Re: August Monthly Progress Resport	15 Nov. 74
3330-JOE-75-631	Revised Technical Instruction Delivery Dates	18 Nov. 74
3330-JOE-75-632	Action Item Log and Meeting Schedule	18 Nov. 74
3330-JOE-75-078	Review of Edgewood Modeling Proposal, Technical Instruction 75-003	19 Nov. 74
3330-JOE-75-086	Rescheduling of Final Report Delivery for the Semi-Automatic Speaker Identification System	22 Nov. 74
3330-JOE-75-627	October Monthly Progress Report	22 Nov. 74
3330-JOE-75-629	E-Field Sensor Program	22 Nov. 74
3330-JOE-75-634	Task 7907 - Semi-Automatic Speaker Identification System Hardware	22 Nov. 74
3330-JOE-75-079	Review of FCC Docket 18302, TI 75-011 Technical Instruction 75-011	25 Nov. 74
3330-JOE-75-080	Review of Texas Instrucments Cargo Security and Antihijacking System Technical Instruction 74-012	25 Nov. 74

Letter Number	Subject	Date
3330-JOE-75-081	Review and Evaluation of Lear Siegler Proposal, Technical Instruction 75-014	25 Nov. 74
3330-JOE-75-083	Body Armor Symposium Participants	25 Nov. 74
3330-JOE-75-591	Evaluation of Proposal for Demonstration of Automatic Handwriting Verification System, Technical Instruction 75-009	25 Nov. 74
3330-JOE-75-633	Response to Mr. Velde's Request	25 Nov. 74
3330-JOE-75-635	Transmittal of October Monthly Progress Report	25 Nov. 74
3330-JOE-75-642	Action Item Log and Meeting Schedule	25 Nov. 74
3330-JOE-75-085	Integrated Garment Procurement Schedule	26 Nov. 74
3330-JOE-75-636	Transmittal of Executed Copy of Technical Instruction 75-017	26 Nov. 74
3330-JOE-75-637	Transmittal of Executed Copies of Technical Instructions 75-018 and 75-019	26 Nov. 74
3330-JOE-75-640	Transmittal of Report by Professor T. Orsagh, "The Potential Effect of Recession and the Energy Shortage on Crime Rate"	26 Nov. 74
3330-JOE-75-089.	Citizen Alarm Stop Work Impact	2 Dec. 74
3330-JOE-75-643	Action Item Log and Meeting Schedule	2 Dec. 74
3330-JOE-75-087	Evaluation of Martin Marietta Proposal, Technical Instruction 75-004	3 Dec. 74
3330-JOE-75-088	Evaluation of EIKONIX Corp. Proposal - Printing Paging System, Technical Instruction 75-013	3 Dec. 74
3330-JOE-75-644	ESIP Projects - Task 7918	3 Dec. 74
3330-JOE-75-094	Technical Evaluation Packages for the Fabrication of Ballistic Protective Undergarments	5 Dec. 74

Letter Number	Subject	Date
3330-JOE-75-091	Livermore Final Report - Soft Armor Test Matrix 1	6 Dec. 74
3330-JOE-75-093	LEAA Explosives Plan	9 Dec. 74
3330-JOE-75-618	Technical Instruction 74-046	9 Dec. 74
3330-JOE-75-646	Task Plan No. 7914	9 Dec. 74
3330-JOE-75-647	Request for Evaluation of Remote Control Vehicle Concept Paper and Proposal, Technical Instruction 75-015	9 Dec. 74
3330-JOE-75-650	Action Item Log and Meeting Schedule	9 Dec. 74
3330-JOE-74-166	Protective Armor Action Items Response (Transmitted as attachment to 3330-JOE-75-648)	10 Dec. 74
3330-JOE-75-645	Early Field Tests - Citizen Alarm System	10 Dec. 74
3330-JOE-75-648	Retransmittal of 3330-JOE-74-166	10 Dec. 74
3330-JOE-75-649	Citizen Alarm System Development	10 Dec. 74
3330-JOE-75-651	Semi-Annual Review	12 Dec. 74
3330-JOE-75-655	Lear Siegler Proposal	12 Dec. 74
3330-JOE-75-084	Citizen Alarm Operational Requirements	13 Dec. 74
3330-JOE-75-092	Transmittal of Final Report, Equipment Options and Cost in 911 Emergency Phone System	13 Dec. 74
3330-JOE-75-652	Subcontract Funding Status	13 Dec. 74
3330-JOE-75-656	Proposed Stellar Subcontract for Burglary Alarm System	13 Dec. 74
3330-JOE-75-657	Transmittal of Preliminary Copy of the Final Report for the Semi-Automatic Speaker Identification System	13 Dec. 74

Letter Number	Subject	Date
3330-JOE-75-658	Reconciliation of FY 75 Budget	13 Dec. 74
3330-JOE-75-659	Forensic Science Grant Monitoring, Technical Instruction 75-020	16 Dec. 74
3330-JOE-75-660	Commerce Business Daily Announcement for Gunshot Residue (7915)	16 Dec. 74
3330-JOE-75-661	Action Item Log and Meeting Schedule	16 Dec. 74
3330-JOE-75-095	Energy Reports	17 Dec. 74
3330-JOE-75-097	Requests for Information	17 Dec. 74
3330-JOE-75-662	Grant Monitoring - Pulse Rate Monitor Ref: Technical Instruction 75-019	17 Dec. 74
3330-JOE-75-663	Transmittal of reports (police car info)	17 Dec. 74
3330-JOE-75-665	Evaluation of Methods for Disseminating Information about the Research of the Law Enforcement Development Group	18 Dec. 74
3330-JOE-75-099	Information Request Concerning FY 75 Army Tasks	20 Dec. 74
3330-JOE-75-666	Multiple Awards	20 Dec. 74
3330-JOE-75-667	November Monthly Progress Report	20 Dec. 74
3330-JOE-75-668	Information on Automotive Topics	20 Dec. 74
3330-JOE-75-670	Action Item Log and Meeting Schedule	23 Dec. 74
3330-JOE-75-671	Revised Technical Instruction Delivery Date	23 Dec. 74
3330-JOE-75-101	Body Armor Final Report	27 Dec. 74
3330-JOE-75-102	Final Report - Semi-Automatic Speaker Identification System	27 Dec. 74
3330-JOE-75-105	Kondis Letter	30 Dec. 74

Letter Number	Subject	Date
3330-JOE-75-669	Program Plan for Improved Police Car System - Task 7914	30 Dec. 74
3330-JOE-75-672	Program Plan for Police Patrol Car System - Task 7914	30 Dec. 74
3330-JOE-75-673	Eratta Sheet - Planning Guide	30 Dec. 74
3330-JOE-75-674	Action Item Log and Meeting Schedule	30 Dec. 74
3330-JOE-75-675	Further Comments on Technical Instruction 75-006	3 Jan. 75
3330-JOE-75-676	Special Technical Support, Technical Instruction 75-021	3 Jan. 75
3330-JOE-75-678	Action Item Log and Meeting Schedule	6 Jan. 75
3330-JOE-75-107	Evaluation of Gleason Concept Paper, Technical Instruction 75-017	9 Jan. 75
3330-JOE-75-109	Visit to New York City Police Department	10 Jan. 75
3330-JOE-75-652A	Subcontract Funding Status	10 Jan. 75
3330-JOE-75-658A	Reconciliation of FY 75 Budget	10 Jan. 75
3330-JOE-75-686	Task Plan Modifications	10 Jan. 75
3330-JOE-75-687	Action Item Log and Meeting Schedule	13 Jan. 75
3330-JOE-75-111	Paper for 1975 Carnahan Conference on Crime Countermeasures	16 Jan. 75
3330-JOE-75-113	Summary of Briefing Presented to the Conference on an Improved Police Car Development Program	20 Jan. 75
3330-JOE-75-691	Action Item Log and Meeting Schedule	20 Jan. 75

Letter Number	Subject	Date
3330-JOE-75-115	Citizen Alarm Inputs for Institute Advisory Committee	21 Jan. 75
3330-JOE-75-689	Review of Shoe Alternative, Technical Instruction 75-022	21 Jan. 75
3330-JOE-75-690	Technical Support to the FCC/LEAA Coordinating Committee, Technical Instruction 75-021	21 Jan. 75
3330-JOE-75-692	Foreign Inquiry Re: Body Armor	21 Jan. 75
3330-JOE-75-693	Subcontract No. 44368-V, GTE Sylvania, Inc.	21 Jan. 75
3330-JOE-75-694	Monthly Progress Report	21 Jan. 75
3330-JOE-75-112	Proposed Paper for Presentation to the 1975 Carnahan Conference	22 Jan. 75
3330-JOE-75-110	Evaluation of C. E. Furlong and Group to Perform Proposed Research, Technical Instruction 75-018	23 Jan. 75
3330-JOE-75-695	Transmittal of 10 copies of "Summary Briefing Presented to the Conference on an Improved Police Car Development Program - Jan. 13, 1975"	23 Jan. 75
3330-JOE-75-696	Gunshot Residue Detection and Analysis Program - Subcontract Procurement Package for Review and Approval	23 Jan. 75
3330-JOE-75-697A	Special Technical Support, Technical Instruction 75-021	24 Jan. 75
3330-JOE-75-114	Request for Data Package	27 Jan. 75
3330-JOE-75-698	Subcontract No. 57201-V, Analytical Research Lab., Inc. (ARLI)	27 Jan. 75
3330-JOE-75-699	Action Item Log and Meeting Schedule	27 Jan. 75

Letter Number	Subject	Date
3330-JOE-75-116	Special Technical Support, Technical Instruction 75-021	28 Jan. 75
3330-JOE-75-117	Conference Papers	28 Jan. 75
3330-JOE-75-700	Technical Instructions 75-023, 75-024 and 75-025	28 Jan. 75
3330-JOE-75-703	Burglar Alarm Sensors	29 Jan. 75
3330-JOE-75-704	Input for Institute Advisory Committee	31 Jan. 75
3330-JOE-75-707	Action Item Log and Meeting Schedule	3 Feb. 75
3330-JOE-75-118	Request for Release of Technical Information Relating to the Semi-Automatic Speaker Identification System	6 Feb. 75
3330-JOE-75-121	Characterization of Explosives Vapors	6 Feb. 75
3330-JOE-75-119	Proposed Paper, "Development of Analytical Methods for the Semi-Automatic Speaker Identification System", for publication in the proceedings fo the 1975 Carnahan Conference	7 Feb. 75
3330-JOE-75-120	Proposed Technical Paper on Speaker Identification for Publication in the Journal of the Acoustical Society of America	7 Feb. 75
3330-JOE-75-708	Permission to Grant Interview With Our Technical People on the Citizen Alarm Work Per a Request from David Kay, Electronics Design Magazine	7 Feb. 75
3330-JOE-75-712	Action Item Log and Meeting Schedule	10 Feb. 75
3330-JOE-75-709	Transmittal of 3 Transparencies on Protective Garments	11 Feb. 75

CONTINUED

2 OF 3

Letter Number	Subject	Date
3330-JOE-75-122	Transmittal of Survey and Assessment and Identification of Alternative Concepts Report Under the Gunshot Residue Detection and Analysis Program	12 Feb. 75
3330-JOE-75-710	RFP Package- Weaving of Kevlar-29 for Lightweight Body Armor	13 Feb. 75
3330-JOE-75-711	Candidate Issues for the FCC/LEAA Coordinating Committee	13 Feb. 75
3330-JOE-75-717	Action Item Log and Meeting Schedule	18 Feb. 75
3330-JOE-75-716	Review of Shoe Alternative, Technical Instruction 75-022	19 Feb. 75
3330-JOE-75-720	Additional Copies of Final Report for Semi-Automatic Speaker Identification System	21 Feb. 75
3330-JOE-75-721	Transmittal of "Research and Development Sources Sought" CBD Announcement Concurrently with Its Submittal for Publication	21 Feb. 75
3330-JOE-75-727	Monthly Progress Report	24 Feb. 75
3330-JOE-75-728	Action Item Log and Meeting Schedule	24 Feb. 75
3330-JOE-75-126	Additional Data Requests	25 Feb. 75
3330-JOE-75-124	Evaluation of Martin Marietta Proposal, Technical Instruction 75-004	27 Feb. 75
3330-JOE-75-724	Technical Papers	27 Feb. 75
3330-JOE-75-723	FY 73 Deliverables	28 Feb. 75
3330-JOE-75-730	Action Item Log and Meeting Schedule	3 Mar. 75
3330-JOE-75-123	Citizen Alarm Operational Analysis Support	4 Mar. 75
3330-JOE-75-131	Feasibility Demonstration of the Citizen Alarm System	7 Mar. 75
3330-JOE-75-731	Action Item Log and Meeting Schedule	10 Mar. 75

Letter Number	Subject	Date
3330-JOE-75-719	Candidate Issues Submitted 2/13/75 modified and Submitted as Enclosure	11 Mar. 75
3330-JOE-75-135	Citizen Alarm System Data Request	12 Mar. 75
3330-JOE-75-732	Report on the Analysis of Advanced Forensic Science Capabilities - enclosed ten copies represent our contractual requirement	17 Mar. 75
3330-JOE-75-733	FY 73 Deliverables	17 Mar. 75
3330-JOE-75-734	Evaluation of DIAX Explosives Detector, Technical Instruction 75-026	17 Mar. 75
3330-JOE-75-735	Action Item Log and Meeting Schedule	17 Mar. 75
3330-JOE-75-133	Review and Evaluation of Final Report, "New Fingerprint Recording Method", Technical Instruction 75-023	18 Mar. 75
3330-JOE-75-138	Commerce Business Daily Announcements	19 Mar. 75
3330-JOE-75-139	Foreign Requests on Equipment Systems Improvement Program Projects	19 Mar. 75
3330-JOE-75-140	Comments on Draft Report of NILECJ, Grant No. 74-NI-99-0004-G	19 Mar. 75
3330-JOE-75-142	Photographs of the Brassboard Semi-Automatic Speaker Identification System	20 Mar. 75
3330-JOE-75-145	Your Request for Data	20 Mar. 75
3330-JOE-75-148	Transmittal of Burglary Alarm System Report for John Marshall	21 Mar. 75
3330-JOE-75-736	Evaluation of Tidel Cash Controller System	24 Mar. 75
3330-JOE-75-737	Evaluation of the Possible Relationship Between Daylight Saving Time and Crime, Technical Instruction 77-028; Psychological Stress on Policemen, Technical Instruction 75-029	24 Mar. 75
3330-JOE-75-738	Subcontract No. 55414 (Tyler Research)	24 Mar. 75
3330-JOE-75-739	Action Item Log and Meeting Schedule	24 Mar. 75

Letter Number	Subject	Date
3330-JOE-75-741	Transmittal: 2 copies of Doug Theis' article on microprocessors	25 Mar. 75
3330-JOE-75-742	Transmittal: 2 copies of reprint of DATA-MATION article on microprocessors	25 Mar. 75
3330-JOE-75-743	Monthly Progress Report	25 Mar. 75
3330-JOE-75-127	Voiceprint Examiner Services for Test and Evaluation of the SASIS	27 Mar. 75
3330-JOE-75-134	Transmittal of nine copies of the document "Semi-Automatic Speaker Identification (SASIS) Analytical Studies"	27 Mar. 75
3330-JOE-75-146	Body Armor Field Evaluation Test Plan Delay	28 Mar. 75
3330-JOE-75-147	Body Armor Final Reports, Vols. I, II, and III	28 Mar. 75
3330-JOE-75-149	Police Car Improvements Program	28 Mar. 75
3330-JOE-75-151	Interview with Assaulted Newark Officer	28 Mar. 75
3330-JOE-75-137	Minutes of Technical Sessions of the March Program Review of the ESIP	31 Mar. 75
3330-JOE-75-143	Delivery of Report Titled: "Applications of Semi-Automatic Speaker Identification Techniques"	31 Mar. 75
3330-JOE-75-744	Kevlar Procurement Actions	31 Mar. 75
3330-JOE-75-746	Annual Operating Plan - FY 76	31 Mar. 75
3330-JOE-75-747	Citizen Alarm Product Sales	31 Mar. 75
3330-JOE-75-749	Action Item Log and Meeting Schedule	31 Mar. 75
3330-JOE-75-745	Police Car Program Plan	1 Apr. 75
3330-JOE-75-150	Cargo Security Program Vehicle Alarm System	4 Apr. 75

Letter Number	Subject	Date
3330-JOE-75-153	Additional Body Armor Symposium Data Packages	7 Apr. 75
3330-JOE-75-753	Action Item Log and Meeting Schedule	7 Apr. 75
3330-JOE-75-156	New Jersey State Planning Agency Correspondence	8 Apr. 75
3330-JOE-75-158	Material for House Committee on Science and Technology, Technical Instruction 75-027	8 Apr. 75
3330-JOE-75-160	Transmittal of report on Conclusive Detection of Gunshot Residue by the Use of Particle Analysis issued under the Gunshot Residue Detection and Analysis Program	8 Apr. 75
3330-JOE-75-143A	Commerce Business Daily Announcement for a Citizen Alarm Field Evaluation	9 Apr. 75
3330-JOE-75-161	Seattle Film on Hollow Point .38 Caliber Bullet Damage	9 Apr. 75
3330-JOE-75-163	Distribution of U.S. Army Reports to Body Armor Field Evaluation Participating Cities	9 Apr. 75
3330-JOE-75-752	Technical Instructions 75-032, 75-033, and 75-034	9 Apr. 75
3330-JOE-75-751	Discontinuation of direct monitoring Forensic Science Grants	14 Apr. 75
3330-JOE-75-755	Action Item Log and Meeting Schedule	14 Apr. 75
3330-JOE-75-165	Assess Proposed HUD/LEAA Field Evaluation of Door and Window Security Standards, Technical Instruction 75-032	15 Apr. 75

Letter Number	Subject	Date
3330-JOE-75-164	Second Chance Information	18 Apr. 75
3330-JOE-75-167	Additional Copies of Lightweight Body Armor Training Film	18 Apr. 75
3330-JOE-75-754	Technical Instructions 75-033 and 75-034	18 Apr. 75
3330-JOE-75-758	Submittal of Draft Program Plans	18 Apr. 75
3330-JOE-75-756	Technical Instructions 75-030 and 75-031	21 Apr. 75
3330-JOE-75-759	Technical Instruction 75-035	21 Apr. 75
3330-JOE-75-760	Action Item Log and Meeting Schedule	21 Apr. 75
3330-JOE-75-761	Monthly Progress Report	25 Apr. 75
3330-JOE-75-174	Additional Application of Two-Photon Technique	28 Apr. 75
3330-JOE-75-763	Action Item Log and Meeting Schedule	28 Apr. 75
3330-JOE-75-765	Evaluation Guidebook to Computer-Aided Transcription	29 Apr. 75
3330-JOE-75-172	ATR-75(7908)-1, "Survey and Technical Assessment - Cargo Security System"	30 Apr. 75
3330-JOE-75-104	Evaluation of Concepts Proposed by the U.S. Army MERDC, Technical Instruction 75-016	2 May 75
3330-JOE-75-177	Foreign Request for Information	2 May 75
3330-JOE-75-178	Procurement of Commercial Garments	2 May 75
3330-JOE-75-767	Cargo Security Venture, Technical Instruction 75-037; AICCC Comments on Burglary Alarm System, Technical Instruction 75-038	5 May 75

Letter Number	Subject	Date
3330-JOE-75-769	Evaluation of the Possible Relation Between Daylight Saving Time and Crime, Technical Instruction 75-028	5 May 75
3330-JOE-75-772	Action Item Log and Meeting Schedule	5 May 75
3330-JOE-75-770	Investigation of Effectiveness of Automobile Anti-Theft Devices, Technical Instruction 75-036	7 May 75
3330-JOE-75-771	Prime Contract No. J-LEAA-025-73, No. 55415 to Protective Materials Co.	7 May 75
3330-JOE-75-773	Evaluation Guidebook to Computer-Aided Transcription, Technical Instruction 75-039	7 May 75
3330-JOE-75-169	Citizen Alarm Hardware Procurement	8 May 75
3330-JOE-75-774	Statement of Work Approval, Police Car Design Study	9 May 75
3330-JOE-75-778	Statement of Work for Police Car Design Study	9 May 75
3330-JOE-75-779	FY 76 Task Plans for Contract J-LEAA-025-73 forwarded for approval	9 May 75
3330-JOE-75-781	Prime Contract No. J-LEAA-025-73, No. 55402 to J.P. Stevens Co., Inc.	9 May 75
3330-JOE-75-782	Prime Contract No. J-LEAA-025-73, Subcontract No. 53122-V, Change Notice No. 2, J.W. Wiggins Company	9 May 75
3330-JOE-75-775	Technical assistance to the Counties of Hawaii and Honolulu	12 May 75
3330-JOE-75-788	Action Item Log and Meeting Schedule	12 May 75
3330-JOE-75-184	Explosives Vapors Detector Development	13 May 75
3330-JOE-75-185	Foreign Request re: LEAA Programs	13 May 75
3330-JOE-75-187	Body Armor Field Evaluation Scope	13 May 75

Letter Number	Subject	Date
3330-JOE-75-776	Technical Instruction 75-025	13 May 75
3330-JOE-75-780	Cargo Security System	13 May 75
3330-JOE-75-783	Police Car Program - Data System Integration Procurement Plan	13 May 75
3330-JOE-75-188	Additional Body Armor Data Packages	15 May 75
3330-JOE-75-788	Public Information Briefs, Technical Instruction 75-040	15 May 75
3330-JOE-75-181	Transmittal of Design Requirements Report, Cargo Security System Program	16 May 75
3330-JOE-75-182	Transmittal of Feasibility Analysis Report Reckoning & Hyperbolic Grid Location - Cargo Security System	16 May 75
3330-JOE-75-183	Transmittal of Final Report for the Feasibility Investigation of Laser Optoacoustic for the Detection of Explosives	19 May 75
3330-JOE-75-191	Report ATR-75(7908)-1, "Survey and Technical Assessment - Cargo Security System"	19 May 75
3330-JOE-75-789	Action Item Log and Meeting Schedule	19 May 75
3330-JOE-75-192	Citizen Alarm Technology Transfer	22 May 75
3330-JOE-75-194	Document, "Data Package for the Industry/User Symposium on Lightweight Body Armor", dated Sept. 1974, V-87890	22 May 75
3330-JOE-75-195	Body Armor Field Evaluation Subcontract	22 May 75
3330-JOE-75-190	Evaluation of Department of Transportation Letter Proposal, Technical Instruction 75-037	23 May 75
3330-JOE-75-171	Development Program Inputs for FY 75 Annual Report	25 May 75
3330-JOE-75-197	Improved Citizen AlarmFinal Design Review	27 May 75
3330-JOE-75-791	LEAA/IACP letter draft	28 May 75
3330-JOE-75-792	Re: Dr. Simon Rottenberg/assigning appropriate area for 2nd topic	28 May 75

Letter Number	Subject	Date
3330-JOE-75-179	Trauma Testing of Commercial Garments	2 June 75
3330-JOE-75-199	Delivery of Pilot Test Plan for the Semi-Automatic Speaker Identification System	2 June 75
3330-JOE-75-795	Action Item Log and Meeting Schedule	2 June 75
3330-JOE-75-798	Monthly Progress Report	2 June 75
3330-JOE-75-168	Evaluation of Diax Laser Optoacoustic Spectroscopy System, Technical Instruction 75-026	4 June 75
3330-JOE-75-766	Accounting of FY 74 Deliverables	4 June 75
3330-JOE-75-201	Request for Data Package	4 June 75
3330-JOE-75-202	Citizen Alarm Hardware Procurement	6 June 75
3330-JOE-75-203	Body Armor Field Evaluation Medical Planning	9 June 75
3330-JOE-75-803	Action Item Log and Meeting Schedule	9 June 75
3330-JOE-75-791A	LEAA/IACP letter draft	10 June 75
3330-JOE-75-799	Status of Outstanding Technical Instructions	11 June 75
3330-JOE-75-204	Report Transmittal	13 June 75
3330-JOE-75-196	Citizen Alarm Field Evaluation Test Conductor	16 June 75
3330-JOE-75-198	Aerospace Report No. ATR-75(7908)-2, "Cargo Security System, Feasibility Analysis Report - Hybrid Grid Location	16 June 75
3330-JOE-75-200	Review of Naval Air Development Center Concept Paper, Technical Instruction 75-031	16 June 75
3330-JOE-75-205	Commerce Business Daily Announcement for a Semi-Automatic Speaker Identification System	16 June 75
3330-JOE-75-804	Action Item Log and Meeting Schedule	16 June 75
3330-JOE-75-206	Document, "Data Package for the Industry User Symposium on Lightweight Body Armor", dated Sept. 1974	17 June 75

Letter Number	Subject	Date
3330-JOE-75-805	Prime Contract No. J-LEAA-025-73, Subcontract No. 55415, Change Notice No. 1 - Protective Materials Co.	19 June 75
3330-JOE-75-806	Prime Contract No. J-LEAA-025-73, Subcontract No. 55402, Change Notice No. 1 - J.P. Stevens and Co., Inc.	19 June 75
3330-JOE-75-807	Police Department Selection for the Police Car Program	19 June 75
3330-JOE-75-208	Disclosures by Rockwell International under Subcontract P.O. 40109-V	20 June 75
3330-JOE-75-809	Action Item Log and Meeting Schedule	23 June 75
3330-JOE-75-210	Citizen Alarm General Test Plan Report	24 June 75
3330-JOE-75-808	Police Patrol Car System Improvements - Program Plan	24 June 75
3330-JOE-75-211	Transmittal of Body Armor Field Evaluation - Test and Evaluation Plan	25 June 75
3330-JOE-75-811	Monthly Progress Report	30 June 75
3330-JOE-75-812	Weekly Action Item Log and Meeting Schedule	30 June 75
3330-JOE-75-802	Possible Relation Between Daylight Saving Time and Crime, Technical Instruction 75-028	30 June 75

APPENDIX B

SUMMARY OF MAJOR DOCUMENTATION PREPARED IN FISCAL YEAR 1975

Planning 7901

Candidate Programs List (3330-JOE-75-586) (Planning)	Oct. 74
Revised Planning Guide (3330-JOE-75-571) (Planning)	Oct. 74
Program Plans for Continuing and Candidate Programs (3330-JOE-75-571) (Planning)	Jan. 75
FY-76 Annual Operating Plan (330-JOE-75-746) (Planning)	Mar. 75
FY-76 Task Plans (3330-JOE-75-779) (Planning)	May 75

Special Technical Support - 7902

Preliminary Evaluation Report on Multiconfiguration Anti-Skid Braking System Program (Special Technical Support)	July 74
Discussion Paper on Selected Automotive Topics (3330-JOE-75-668) (Special Technical Support)	Dec. 74
Current Status of Burglary Alarm Systems (3330-JOE-75-754) (Special Technical Support)	April 75
Current Status of Citizen Alarm Systems (3330-JOE-75-754) (Special Technical Support)	April 75
Evaluation of the Possible Relationship Between Daylight Saving Time and Crime (3330-JOE-75-802)	June 75

General Program Management - 7903

Briefing Package - Semi-Annual Project Review (General Program Management)	Nov. 74
Annual Progress Report - FY-74 (General Program Management)	Sept. 74
Briefing Package - Quarterly Project Review (General Program Management)	March 75

Burglary Alarm System - 7904

Subcontract Data Package - External Alarm Transmission Media Study (3330-JOE-75-534)	Aug. 75
Procurement Data Package - Integrated Burglar Alarm System Development	Aug. 75
Subcontract Data Package - Burglary Alarm Development, Integration, and Test Program (3330-JOE-75-693)	Jan. 75
Final Report - "External Alarm Transmission Media Study," Stanford Research Institute	June 75
Procurement Data Package - Electric Field Sensor Development (3330-JOE-75-656)	Dec. 74
Final Report "Survey and System Concepts for a Low Cost Burglary Alarm System for Residences and Small Businesses," Aerospace Report No. ATR-74(7904)-1 (3330-JOE-75-019)	Sept. 74

Citizen Alarm System - 7905

Procurement Data Package - Operational Analysis of Improved Citizen Alarm System (3330-JOE-75-123)	Mar. 75
Subcontract Data Package - Operational Analysis of Improved Citizen Alarm System (3330-JOE-75-782)	May 75
Subcontract Data Package - Improved Citizen Alarm System (3330-JOE-75-509)	July 74
Procurement Package - Citizen Alarm Demonstration System (3330-JOE-75-532)	Aug. 74
Phase I Report - "Analysis of System Requirements and Component Design Specifications," Compu-Guard Security Systems, Inc.	Dec. 74
Discussion Paper - "Citizen Alarm System Development Background"	Jan. 75
Final Report - "Feasibility Demonstration of the Citizen Alarm System," Volume I. Compu-Guard Security Systems, Inc.	Feb. 75

Final Report - "Feasibility Demonstration of the Citizen Alarm System," Volume II, Appendices. Compu-Guard Security Systems, Inc.	Feb. 75
Protective Armor Development - 7906	
Procurement Package - Kevlar Fabric for Field Evaluation Garments	July 74
Data Package - Industry/User Symposium on Lightweight Body Armor	Sept. 74
Final Report - "Protective Armor Development Program: Volume I - Executive Summary; Volume II - Technical Discussion; Volume III - Appendices," Aerospace Aerospace Report No. ATR-75(7906)-1	Dec. 74
Technology Transfer Plan for Lightweight Body Armor (3330-JOE-75-546)	Sept. 74
Speaker Identification - 7907	
"Preliminary Investigation of Applications of the Computer-Aided Speaker Identification System," Aerospace Report No. ATR-74(7907)-1	Aug. 74
Procurement Data Package - Laboratory and Pilot Field Test for the Semi-Automatic Speaker Identification System	Aug. 74
Subcontract Data Package - Laboratory and Pilot Field Test for the Semi-Automatic Speaker Identification System	Nov. 74
"Semi-Automatic Speaker Identification System Final Report," Rockwell International Report No. 74-1185/501 (Hardware Development Report)	Dec. 74
"Analytical Studies Final Report," Rockwell International Report No. C74-1184/501	Dec. 74
"Applications of Semi-Automatic Speaker Identification Techniques," Aerospace Report No. ATR-75(7907)-1	Mar. 75

Pilot Test Plan - Semi-Automatic Speaker Identification Systems	May 75
Cargo Security System - 7908	
"Survey and Technical Assessment - Cargo Security System," Aerospace Report No. ATR-75(7908)-1	July 74
Procurement Package - Design, Development, Fabrication, and Test of a Brassboard Cargo Security System	Aug. 74
"Cargo Security System Feasibility Analysis Report - Hybrid Dead Reckoning and Hyperbolic Grid Location," Aerospace Report No. ATR-75(7908)-2	April 75
"Cargo Security System - Design Requirements," Hoffman Information Identification, Inc.	April 75
"Operational Design of a Cargo Security System," Aerospace Report No. ATR-75(7908)-3	June 75
Blood and Bloodstain Analysis - 7910	
Subcontract Data Package - Bloodstain Analysis System	Sept. 74
"Persistence of Selected Genetic Markers in Dried Blood," Aerospace Report No. ATR-75(7910)-1	April 75
Control of Illegal Use of Explosives - 7911	
Subcontract Data Package - Explosives Vapor Characterization	Jan. 75
Final Report - "Feasibility and Test of Coded Taggant Materials for the Identification of Explosives," Lawrence Livermore Laboratory	April 75
Final Report - "An Investigation of the Feasibility of Use of Laser Optoacoustic Detection for the Detection of Explosives," Case Western University	April 75

Police Patrol Car System Improvements - 7914

Preliminary Program Plan (3330-JOE-75-669) (Police Patrol Car)	Dec. 74
Briefing Package - "Police Car Improvement Program," Presentation to Police Advisory Group	Jan. 75
Final Program Plan (3330-JOE-75-149) (Police Patrol Car)	March 75
Statement of Work - Alternate Police Patrol Car Body Designs (3330-JOE-75-774)	May 75
Statement of Work - Police Car Integrated Data System (3330-JOE-75-783)	May 75

Detection and Analysis of Gunshot Residue - 7915

"Gunshot Residue Detection - Survey and Assessment and Identification of Alternate Concepts," Aerospace Report No. ATR-75(7915)-1	Sept. 74
"Conclusive Detection of Gunshot Residue By the Use of Particle Analysis," Aerospace Report No. ATR-75(7915)-2	Dec. 74
Subcontract Procurement Package - Gunshot Residue Detection and Analysis Program (3330-JOE-75-696)	Jan. 75

Analysis - 7918

Initial List of Candidate Areas for Survey and Assessment (3330-JOE-75-569) (Analysis)	Oct. 74
"Analysis of Advanced Forensic Science Capabilities," Aerospace Report No. ATR-75(7918-01)-1 (Analysis)	Feb. 75
List of Candidate Areas for Technology Utilization (Analysis)	Nov. 74

Improved Citizen Alarm Field Evaluation - 7920

Procurement Package - Citizens Alarm Field Evaluation Test Planning Support (3330-JOE-75-009)	July 74
Subcontract Data Package - Citizens Alarm Field Test and Evaluation Plan (3330-JOE-75-564)	Sept. 74
"Preliminary Draft - General Field Evaluation Test Plan for the Citizen Alarm System," Aerospace Report No. ATR-75(7902)-1	May 75
Procurement Package - Citizen Alarm Field Evaluation Hardware (3330-JOE-75-169)	May 75
Procurement Package - Test Conductor for the Citizen Alarm System Field Evaluation (3330-JOE-75-196)	June 75

Body Armor Field Evaluation - 7921

Preliminary Test Plan - Body Armor Field Evaluation (3330-JOE-75-066)	Oct. 74
"Body Armor Field Evaluation Test Plan," Aerospace Report No. ATR-75(7921)-1	June 75
Procurement Package - Kevlar Material for Body Armor Field Evaluation (3330-JOE-75-013)	July 74
Subcontract Data Package - Kevlar Material for Body Armor Field Evaluation (3330-JOE-75-073)	Nov. 74
Subcontract Data Package - Kevlar Material for Body Armor Field Evaluation (3330-JOE-75-781)	May 75
Procurement Package - Protective Undergarment for Body Armor Field Evaluation (3330-JOE-75-047)	Sept. 74
Subcontract Data Package - Undergarment Procurement for Body Armor Field Evaluation (3330-JOE-75-771)	May 75
Procurement Package - Market Survey of New Law Enforcement Equipment (3330-JOE-75-536) (Body Armor Field Evaluation)	Aug. 74

Subcontract Data Package - Market Survey of New Law Enforcement Equipment (3330-JOE-75-738) (Body Armor Field Evaluation)	March 75
Procurement Package - Protective Garments for Body Armor Field Evaluation (3330-JOE-75-187)	May 75

APPENDIX C

BRIEFINGS AND MEETINGS

BRIEFINGS AND MEETINGS

This appendix is divided into two parts. In both parts the items tabulated are organized according to program and task. Part I provides a listing of the major briefing presentations made during FY 75 in support of status reviews or program summaries.

Part II presents a listing of the various meetings and conferences attended by members of the Development Group during FY 75. These are not the hundreds of meetings and visits with industrial concerns, law enforcement agencies, or Institute personnel required in the normal course of technically directing the development programs. Rather, these are conferences and seminars where information was obtained or coordination was provided in support of the overall development program.

PART I - BRIEFINGS

Program Planning and Management

Subject	Presented to	Date
Strategic Planning	Institute Deputy Director	1 July 74
Law Enforcement Programs	Admiral Peterson, Bureau of Alcohol, Tobacco, and Firearms	17 Sept 74
FY 74 Annual Review	Institute Director	19 Sept 74
Law Enforcement Programs	FBI; Dept. of Justice	7 Oct 74
FY 75 Program Plans	Institute Director	18 Oct 74
Analysis and Planning (Semi-annual Review)	Assistant Director, Research & Programs (NILECJ)	15 Nov 74
Police Car Improvements	LEAA Administrator	21 Nov 74 2 Jan 75 7 Feb 75

Subject	Presented to	Date
LEAA Programs	G. C. Sheppard, White House Staff	29 Nov 74
Police Car Improvement Conference	Chiefs of Police	13 Jan 75
Communications-related LEDG Projects	FCC	Jan 75
FY 76 Program Plans	Assistant Director, Research and Programs (NILECJ)	6 Mar 75
Analysis of Advanced Forensic Capabilities	J. Sullivan (NILECJ)	May 75

Development Programs

	Subject	Presented to	Date
Cost Effective Burglary Alarm System	Project Review	Institute Staff	5 Nov 74
	Project Summary	T. Willick, Univ. of So. Calif.	26 Nov 74
	Project Summary	FCC	30 Jan 74
	Project Review	Institute Staff	3 Mar 75
	Project Review	Institute Staff	13 May 75
	Sensor Demonstration	Institute Staff	13 May 75
Citizen Alarm System	Project Review	Institute Staff	19 July 74
	Hardware Demonstration	State Prison of Southern Michigan	15-16 Aug 74
	Project Review	Institute Staff	7, 8 Nov 74
	Receiver Technology	Naval Air Development Center	3 Dec 74
	System Requirements	TMX, Inc.	4 Dec 74
	Technical Interchange	FCC	30 Jan 75
	Project Review	Institute Staff	5 Mar 75
	Hardware Demonstration	G. Washington High School	17 Mar 75

	Subject	Presented to	Date
Protective Armor Development	Project Review	NBS, Institute Staff	23-24 July 74
	Project Summary	Industry/User Symposium	22-25 Sept 74
	Project Review	Institute Staff	11 Oct 74
	Project Review	Institute Staff	5 Nov 74
Speaker Identification System	Project Status Review	Institute Staff	5 Nov 74
	System Demonstration	Bureau A, T, & F	7 Nov 74
	Project Status Review	Institute Staff	4 Mar 75
	Hardware Demonstration	Los Angeles P.D.	13 Mar 75
	Hardware Demonstration	Los Angeles County, D.A.'s Office	10 April 75
	Hardware Demonstration	Bureau of Alcohol, Tobacco and Firearms	14-18 April 75
	Program Overview	Carnahan Conference	7 May 75
	Program Overview	Calif. Association of Criminalists	15 May 75
	Program Overview	Association of Audio & Electronic Criminalists	20 May 75
Cargo Security System	Annual Program Review	Institute Director	19 Sept 74
	Project Status Review	Institute Staff	5 Nov 74
	Project Status Review	Institute Staff	4 Mar 75
	Location Options	Government Project Monitor	8 May 75
	Program Overview	Carnahan Conference	9 May 75

	Subject	Presented to	Date
Blood and Bloodstain Analysis	Project Overview	Colorado Bureau of Identification	24 July 74
	Project Status Review	Institute Staff	5 Nov 74
	Project Overview	California Criminalists Management Association	14 Jan 75
	Program Overview	J. Sullivan, NILECJ	19 Feb 75
	Project Status Review	Institute Staff	3 Mar 75
Control of Illegal Use of Explosives	Project Overview	Culver City, Calif. Police Department	23 July 74
	Project Review	LEAA Staff	26 July 74
	Project Status Review	Institute Staff	5 Nov 74
	Project Status Review	Institute Staff	3 Mar 75
Police Vehicle Improvements Study	Program Overview	LEAA Administrator; Chiefs of Police	13 Jan 75
	Program Review	LEAA Administrator	7 Feb 75
	Program Status Review	Institute Staff	4 Mar 75
	Program Status Review	LEAA Administrator	18 Jun 75
Detection of Gunshot Residue	Molecular Luminescence	Institute Deputy Director	1 July 74
	Project Overview	Colorado State Bureau of Investigation	24 July 74
	Project Status Review	Institute Staff	7 Nov 74
	Particle Analysis Method	California Criminalists Management Assoc.	17 Jan 75
	Particle Analysis Method	American Academy of Forensic Sciences	19 Feb 75
	Project Status Review	Institute Staff	5 Mar 75

	Subject	Presented to	Date
Detection of Gunshot Residue (cont'd)	Project Summary	Forensic Research Group, Northeastern University	25 April 75
	Project Status Review	Institute Staff	27 April 75
Improved Citizen Alarm System Field Evaluation	Project Status Review	Institute Staff	8 Nov 74
	Project Overview	FCC	30 Jan 75
	Project Status Review	Institute Staff	5 Mar 75
	Project Overview	Elizabeth, N. J. P. D., Housing Authority	27 Mar 75
Body Armor Field Evaluation	Project Overview	Atlanta, Ga.	8 July 74
		Birmingham, Ala.	9 July 74
		Miami, Fla.	10 July 74
		Tampa, Fla.	11 July 74
		St. Louis, Mo.	15 July 74
		Albuquerque, N. M.	16 July 74
		Tucson, Ariz.	17 July 74
		Oakland, Calif.	18 July 74
		Richmond, Va.	25 July 74
		Newark, N. J.	26 July 74
		Detroit, Mich.	29 July 74
		St. Paul, Minn.	30 July 74
		Seattle, Wash.	31 July 74
		Portland, Ore.	1 Aug 74
		New Orleans, La.	8 Aug 74
	Project Status Review	Institute Staff	5 Nov 74
	Project Summary	Seattle, Wash.	Dec 74
		Portland, Ore.	"
		Atlanta, Ga.	"
		Tampa, Fla.	"
		Miami, Fla.	"
	Project Summary	Tucson, Ariz.	Jan 75
		Albuquerque, N. M.	"
		New Orleans, La.	"
		Newark, N. J.	"
		Philadelphia, Pa.	"

	Subject	Presented to	Date
Body Armor Field Evaluation (cont'd)	Project Summary	St. Louis, Mo.	Feb 75
		Detroit, Mich.	"
		St. Paul, Minn.	"
		Richmond, Va.	"
		Birmingham, Ala.	"
	Project Status Review	Institute Staff	3 Mar 75
	Fabric Denier Selection	Institute Staff	27 Mar 75
	Project Status Review	Institute Staff	19 May 75

PART II - MEETINGS

Program Planning and Management

17, 18 Sept 74	Twentieth Annual Seminar and Exhibits, American Society for Industrial Security
23 Sept 74	81st Annual Conference, International Association of Chiefs of Police, Washington, D. C.

DEVELOPMENT PROGRAMS

Cost Effective Burglary Alarm System

31 Jan 75	Alarm Industry Committee for Combatting Crime Washinton, D. C.
3-5 Feb 75	International Security Alarm Conference, Los Angeles, California

Citizen Alarm System

31 Jan 75	Alarm Industry Committee for Combatting Crime

Protective Armor Development

6 June 74	New York Police Department - Capt. J. Curran Subject: Status of Wearability Tests
7 June 74	J. P. Stevens and Company - Mr. J. Saffadi Burlington Industrial Fabrics Co. - Mr. J. A. Zoufalu Subject: Material wearing requirements for Kevlor
18 June 74	Laurence Livermore Laboratories - C. Honadel Subject: Review of interim test results and additional testing requiremtns
16 July 74	Inglewood Police Department - Sgt. Joseph Subject: Finalize requirements for wearability test program

Protective Armor Development (continued)

15 Aug 74	Los Angeles Police Department - Investigator Pete Bernard Subject: Review status of commercial type body armore evaluation
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22 Aug 74	Nautical Laboratories - Mr. E. Barron Subject: Fabrication requirements for protective undershirt construction
22 Aug 74	Naval Undersea Center Subject: Discuss more clips of Kevlor shark bite protection
4 Sept 74	Los Angeles Police Academy - Sgt. Rosenblum Subject: Body Armor demonstration and evaluation
16 Sept 74	Laurence Livermore Laboratories - C. Honadel Subject: Review test results and draft of report
22-25 Sept 74	Body Armor Industry/User Symposium held in Washington, D. C.

Speaker Identification System

30 July 74	Technical discussion on computerized voice identification with personnel from TRW Systems Research Group - El Segundo
22 Jan 75	Meeting with Dr. Bruno Beek at the Rome Air Development Center to discuss current programs in voice identification - Rome, New York
23 Jan 75	Meet with personnel of the New York City Police Department Criminalistic Laboratory to discuss needs and uses for voice identification equipment - New York, New York
4 April 75	Meeting at Los Angeles Police Department Crime Laboratory to discuss Pilot Field Testing - Los Angeles, California

Cargo Security System

4-5 Sept 74	National Cargo Security Conference, Chicago, Illinois
16-17 Sept 74	Annual Meeting, Association of Transportation Security Officers, Arlington, Virginia
18 June 75	Technical Interchange with DOT/UMTA, El Segundo, California

Blood and Bloodstain Analysis

22-24 Oct 74	Semi-Annual Meeting, California Association of Criminalists, Berkeley, California
19-21 Feb 75	American Academy of Forensic Sciences, Chicago, Illinois
15-17 May 75	Semi-Annual Meeting, California Association of Criminalists, Los Angeles, California
10 June 75	Meeting with LA County Coroner's Office to discuss quality of commercial antisera

Control of Illegal Use of Explosives

16-18 July 74	Technical Subcommittee to the Advisory Committee on Explosives Tagging, Boston, Massachusetts
28-29 May 75	Advisory Committee on Explosives Tagging, Washington, D. C.

Police Vehicle Improvement Study

24 Jan 75	Vehicle Demonstration, Chelsea, Michigan
27 Jan 75	Coordination Meeting, National Bureau of Standards, Gaithersburg, Maryland
3 Feb 75	Technical Review of Chrysler Corporation Representatives, Detroit, Michigan

Police Vehicle Improvement Study (continued)

20 May 75	Visit to North American Rockwell, Anaheim, California to discuss anti-skid brake system

Interviews with Police Departments

18 Jan 75	Los Angeles Police Department (ECCCS Project) - to discuss police car and base station interfaces
25 Mar 75	Los Angeles Police Department, Los Angeles, California
26 Mar 75	Los Angeles County Sheriff Department, Los Angeles, California
28 Mar 75	St. Louis Police Department, St. Louis, Missouri
1-2 April 75	New York City Police Department, New York, New York
2 April 75	Washington, D. C. Police Department
7-8 April 75	Las Vegas Police Department, Las Vegas, Nevada
30 April 75	Indianapolis Police Department, Indianapolis, Indiana
15 May 75	New Orleans Police Department, New Orleans, Louisiana
16 May 75	Dallas Police Department, Dallas, Texas

Detection of Gunshot Residue

24-26 Oct 74	Semi-Annual Meeting, California Association of Criminalists, Berkeley, California
17 June 75	California Criminalists' Management Association, El Segundo, California

Detection of Gunshot Residue (continued)

18-21 Feb 75	27th Annual Meeting, American Academy of Forensic Sciences, Chicago, Illinois
10-11 Apr 75	Scanning Electron Microscope Conference, St. Louis, Missouri
15-17 May 75	California Association of Criminalists, Los Angeles, California

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