30453

Supplement to
TECHNICAL REPORT NO. 11

CLIS
CRIMINALISTICS LABORATORY INFORMATION SYSTEM

VOLUME I
Identification of User Needs

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MAY 1975

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Final report on work performed under Law Enforcement Assistance Administration Grant No. 73-SS-99-3309, awarded to the California Crime Technological Research Foundation for Project SEARCH. In 1974, Project SEARCH was incorporated as SEARCH Group, Inc., and the project was continued to completion under its guidance.

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PREFACE

The model for a criminalistics laboratory information system described in this report was developed by Project SEARCH (now SEARCH Group, Inc.) as part of its ongoing program of facilitating the application of advanced technology to the administration of criminal justice. The project, funded by the Law Enforcement Assistance Administration, addressed itself to three topics:

- definition of the information needs of criminalistics laboratories throughout the nation
- conceptual design of an automated information storage and retrieval system
- creation of a plan for implementing the system

Future efforts will include the detailed design, implementation, and evaluation of a pilot system and, eventually, full system implementation.

SEARCH Group, Inc. (Project SEARCH) is a private, non-profit justice research organization owned and operated by the fifty states, the District of Columbia, Puerto Rico, and the Virgin Islands, which fosters research of greater magnitude than can normally be undertaken by individual states.

Thomas M. Muller served as CLIS Project Chairman and Fred Wynbrandt as Vice-Chairman. Subcommittee Chairmen were Edward Bigler, Richard Fox, and Frank Madrazo. Administrative staff services for the project were provided by the California Crime Technological Research Foundation; technical support was provided under contract by PRC Public Management Services, Inc.

Four volumes providing detailed information about specific aspects of the project are being published.

- Volume 1 — *Identification of User Needs*
- Volume 2 — *Systems Design For a Conceptual Model*
- Volume 3 — *System and Organizational Impact*
- Volume 4 — *Implementation Plan*

Copies of these volumes are available from SEARCH Group, Inc.

GLOSSARY

DATA PROCESSING TERMS

baud Number of bits transmitted per second. (It usually requires eight bits to transmit one character.)

byte That portion of a computer word capable of containing a single character. Used synonymously with "character" in this report.

CPU Central processing unit. A computer without its data storage and other peripherals.

CRT Cathode ray tube.

hardwired Accomplished by electronics rather than programming.

I/O Input and output.

modem Device which connects a terminal or computer to a telephone line.

peripheral Device with which a computer stores data or communicates with the outside world, such as a disk drive, card reader, or teletypewriter.

INSTITUTIONAL ABBREVIATIONS

ASTM American Society for Testing and Materials (Philadelphia, Pennsylvania).

FCIC Florida Crime Information Center (Tallahassee, Florida).

HOCRE Home Office Central Research Establishment (Aldermaston, United Kingdom).

WRAIR Walter Reed Army Institute for Research (Washington, D.C.)

GEOGRAPHIC ABBREVIATIONS

NE = NEW ENGLAND
- Connecticut
- Maine
- Massachusetts
- New Hampshire
- Rhode Island
- Vermont

MA = MIDDLE ATLANTIC
- New Jersey
- New York
- Pennsylvania

ENC = EAST NORTH CENTRAL
- Illinois
- Indiana
- Michigan
- Ohio
- Wisconsin

WNC = WEST NORTH CENTRAL
- Iowa
- Kansas
- Minnesota
- Missouri
- Nebraska
- North Dakota
- South Dakota

SA = SOUTH ATLANTIC
- Delaware
- District of Columbia
- Florida
- Georgia
- Maryland
- North Carolina
- South Carolina
- Virginia
- West Virginia

ESC = EAST SOUTH CENTRAL
- Alabama
- Kentucky
- Mississippi
- Tennessee

WSC = WEST SOUTH CENTRAL
- Arkansas
- Louisiana
- Oklahoma
- Texas

M = MOUNTAIN
- Arizona
- Colorado
- Idaho
- Montana
- Nevada
- New Mexico
- Utah
- Wyoming

P = PACIFIC
- Alaska
- California
- Hawaii
- Oregon
- Washington

PR = PUERTO RICO

CHAPTER 1. INTRODUCTION

The first task involved in the development of an information system for criminalistic laboratories was the identification of those laboratories in the United States that might be concerned with access to such an information system. Accordingly, a list of such laboratories was compiled from information obtained from mailing lists of federal agencies, the roster of the American Academy of Forensic Sciences and personal knowledge of the project consultants and members of the project committee. This list contained addresses of 28 federal laboratories, 83 state laboratories, 61 municipal laboratories, 44 county laboratories and 30 regional crime laboratories. In addition, three laboratories in Puerto Rico, one in the Virgin Islands and one at the University of Illinois were included.

As was anticipated, the laboratory sector involved in criminalistic activity is essentially supported publicly as part of the overall law-enforcement picture. There are probably a few private laboratories that do some criminalistic work, but their small volume of work would not warrant their inclusion in a survey of this type. This master list of those laboratories surveyed is available from SEARCH Group, Inc. (SGI)

Having identified the market area for the Crime Laboratory Information System, the next step was to identify the potential users in this population and the information sources they most desired to have developed. The most direct way of obtaining these two facts was deemed to be through a detailed survey form that would furnish information concerning the jurisdiction served by each laboratory, the population of the area, number of personnel, case load and numbers of examinations, instrumentation and reference files available and an expression of priority information needs. Several such trial survey forms were developed and revised and a final Information Form was produced, a copy of which is included in Appendix. A.

Data collected from site visits to selected laboratories were used to test the preliminary forms and identify necessary modifications. These visits were made by two-man teams of the CLIS project staff. The interviews were conducted by using the form included as Appendix B. Five laboratories were visited. They included laboratories in all the different budgetary support categories. This direct encounter with laboratory personnel provided extremely useful information which was put to use in modifying the original survey form. The final revision included suggestions made by members of the Project Committee at Dallas, Texas on February 12, 1974. A total of 12 additional site interviews were conducted.

The survey form that was finally developed was then prepared for mailing to a final list of laboratories. However, prior to the mailing, a letter written over the signature of Mr. Thomas Muller, Chairman of the CLIS Special Project Committee, was sent out. This was deemed advisable as an advance notice of the overall importance of the project, and to prepare the recipients of the mailing so that they would fully understand the importance of the survey form and the data requested. A copy of this letter is attached as Appendix C.

The mailing has resulted in a return of 176 completed survey forms representing a 69 percent return (not counting duplicates). These responses have been subjected to an analysis which forms the basis of this report.

CHAPTER 2. INFORMATION GATHERING

GOALS AND OBJECTIVES

The goals of the first portion of the Phase I effort are: (1) determine the informational needs of potential CLIS users and (2) analyze and define the informational needs in sufficient detail to permit selection of priority data files by the project committee.

The objectives pursued for the achievement of the above goals are:

- Identify the crime laboratory population in the United States (potential CLIS users).
- Collect relevant data from potential CLIS users to indicate both informational needs and priorities.

IDENTIFICATION OF POTENTIAL CLIS USERS

The Drug Enforcement Administration furnished a copy of its mailing list for Micrograms, consisting of some 1,500 address cards. The FBI provided a copy of its recent survey list consisting of approximately 180 crime laboratories. Other lists were obtained from LEAA, the American Academy of Forensic Sciences and the CLIS Special Project Committee Chairman. Data from each of these sources was consolidated into a draft master laboratory list which was presented to the Project Committee in mid-February. After reviewing the draft master list, the committee noted appropriate modifications, which were incorporated into a final listing, for the purpose of distributing mail survey forms. This list is available from SGI.

An announcement letter describing the purpose of the project, and its scope, was sent out over the Special Project Committee Chairman's signature to all laboratories on the master list.

MAIL SURVEY FORM

Employing the technical expertise of the PMS staff from both the criminal laboratory and data processing fields, a preliminary draft mail survey form was developed for forwarding to all of the criminal laboratories throughout the country. This form was developed and designed to obtain statistical and opinion data relative to the needs and requirements of CLIS.

To assist in formulating the survey form, reviews were made of a survey instrument recently (10/73) used by the FBI Laboratory to obtain data relative to the administrative, personnel and training structures of the criminal laboratory population, as well as to determine their technical capabilities and what instrumentation was being utilized. A review was also made of a survey developed by the John Jay College of Criminal Justice, the City University of New York, in connection with a LEAA grant entitled "Study of Needs and the Development of Curricula in the Field of Forensic Science — A Survey of Crime Laboratories." This survey was rather extensive and endeavored to accumulate data relative to technical capabilities and disciplines used by the many criminal laboratories. It also requested information relative to their scientific instrumentation.

The preliminary draft mail survey form was modified and format changed several times before the field test was undertaken. To determine the adequacy and clarity of the mail survey form, it was field tested by a single interview team at five different laboratories. These five laboratories were selected by the CLIS Special Project Committee. Scheduling was performed by the Project Committee Chairman with an effort to organize the interview travel in such a manner as to minimize travel to Washington, D.C.

The following five laboratories were visited by the single interview team:

1. FBI Laboratory, Washington, D.C. 1/28, 1/29/74
2. Pennsylvania State Police Laboratory, Harrisburg, Pennsylvania. 1/31/74
3. Pittsburgh and Allegheny County Crime Laboratory, Pittsburgh, Pennsylvania. 2/1/74
4. North Carolina State Bureau of Investiga-

tion Laboratory, Raleigh, North Carolina. 2/4/74

5. Charlotte Police Department Laboratory, Charlotte, North Carolina. 2/5/74.

As a result of the test surveys, the form was modified almost daily by making deletions, suggested additions and altering the format. For example, it was determined that none of the laboratories engaged in pathology. Also, a category designated as "Trace Analysis" was confusing since some of the laboratories understood this to mean analysis of small traces of paint, glass, etc., whereas the category was meant to mean trace element analysis within such specimens. It was also apparent that there was a lack of uniformity in the manner in which laboratory statistics were maintained. Some were maintained as "cases," some as "examination," and some as "specimens."

Subsequent to the five test laboratory surveys, a final draft mail survey form was prepared that incorporated the changes and modifications dictated by test interviews and surveys. This modified survey form was then presented to the CLIS Special Project Committee at the American Academy of Forensic Sciences (AAFS) meeting in Dallas, Texas on February 12, 1974.

Each of the questions and all of the data charts in the revised mail survey were reviewed by members of this committee. At this time, several changes were recommended by the committee, among which was a change from the number of technically trained employees to a more specific listing calling for the number of firearms and toolmarks examiners, number of chemists or microanalysts, number of questioned document examiners and number of toxicologists. It was also decided that laboratory floor space and annual budget data were not germane and instead a case load indication for 1971, 1972, and 1973 appeared more significant. It was also suggested that Chart #1, relative to standard analytical reference data files, be expanded and that a column showing the type of file be added. Nomenclature in other questions and charts was revised.

As a result of the five test laboratory visits and interviews and the input by the CLIS Special Project Committee in Dallas, Texas, a final main survey form was prepared. This form is presented as Appendix A.

INTERVIEW GUIDE FORM

To assist in the interviews at the test laboratories and in order to gather supplemental, more comprehensive data relative to the informational needs, an interview guide form was developed and prepared. This guide was designed to obtain information as to what evidence files the laboratories would like to have available, what evidence files they now maintain, the storage media, currency, associated problems and the coding structure used.

Information was also sought relative to any computer applications that the laboratories were using, had knowledge of, had planned or would like to have available to them. In a laboratory where a computer application was being utilized, interviews were conducted with the users.

The interview guide also solicited information on what bibliographic and/or abstract services were required and used, the frequency and subject matter of the searches, the cost and present needs. Where available, organizational charts and maps showing the geographical area of responsibility would be obtained. Each instrument now in use would be viewed and current uses and/or unusual applications would be determined. The output, problems, calculations, references, time per examination, storage of output and future reference availability would be studied.

The guidelines used for the interview form were to describe and explain the CLIS project, its purpose and scope, to explain Project SEARCH, the LEAA funding and the Special Project Committee. In addition, the backgrounds and expertise of the PRC/PMS interview team were described. The general information desired was explained and the laboratory personnel to be interviewed were identified. Discussions were held relative to the mail survey form and suggestions were solicited. The interview forms were handwritten at each interview and verified by the interview team prior to leaving each laboratory.

INTERVIEW RESULTS

The director and the technical personnel interviewed at each of the five laboratories listed above were very enthusiastic about the CLIS project, and all expressed a genuine interest in and need for such a data system. They all reiterated that not only would such a system save valuable time, it would extend services and capabilities and make possible a severely needed exchange of information and communication among laboratories. All of the test laboratories provided personnel and data readily and volunteered suggestions and information. Each laboratory expressed a desire to see the final report, as they stated that this was one undertaking that was designed specifically to aid the crime laboratory. They were disappointed that they have participated in many other time-consuming surveys and have never in the past been appraised of any results.

Narcotics

As a result of on-site interviews at Harrisburg, Pittsburgh, Raleigh and Charlotte, it was apparent that the major number of cases and examinations handled by all of these laboratories was in the drug and narcotic category with a significant steady increase each year during the past five years. These examinations, without exception, involved the use of infrared and ultraviolet spectrophotometers, gas chromatographs and entailed thin layer chromatography techniques. The use of an ultraviolet spectraphotometer dropped considerably in one laboratory after the acquisition and installation of gas chromatography-mass spectragraph instrumentation. The use of IR, UV and GC all require in-house reference analytical data. All had some purchased reference analytical data files. One laboratory had complete, up-to-date Sadtler sets of IR and UV Spectra. The one test laboratory which has GC-MS instrumentation is analyzing its data by the use of an available computer. One of the other test laboratories has on order a GC-MS instrument with an associated dedicated computer.

In performing their drug and narcotic examinations, it appears that most of the laboratories, because of the present large volume, only endeavor to associate a questioned specimen with one on a list of prosecutable controlled drugs. If by analysis the substance does not fit into this category no further attempt is made to identify it. In-house references and standards meet their immediate needs in this rather limited category.

Because of the almost overwhelming amount of drug and narcotic case loads, test laboratories advised that other types of important criminalistic examinations were not being given the attention they should have, and many evidence and data collections are being neglected. Any time-saving devices, evidence and data collections would be extremely helpful, especially in these neglected areas.

Firearms and Ammunition

The second major type of examination, volume-wise, involved firearms and ammunition. All of the laboratories maintained in-house accumulated reference data, published texts, such as Matthews on Firearms Identification, and a rifling specification card index system previously prepared and distributed by H. P. White Laboratories. All advised that they had no access to current and extensive rifling specifications and ammunition data.

Serology

Among the test laboratories, serology, (more specifically blood sampling) was number three in volume of types of evidence requiring analysis and identification. All are actively engaged in or researching the identification of subgroups and enzymes present in the blood, in addition to the usual major blood grouping techniques. The newer techniques utilize electrophoresis methods and equipment, and all laboratories visited expressed a desire to see a running computer tabulation made in order to determine the uniqueness of an analyzed blood sample. The personnel in one laboratory are making their own in-house study by sampling a relatively small number of the local population. Present developments in blood grouping involving subgroups, protein groups and enzymes are such that laboratories are now thinking about the possibility of blood being as unique as fingerprint identification. Much data has yet to be accumulated on frequency distributions. None of the test laboratories was interested in or expressed a desire for complex computational capabilities.

Summary

The personnel of the FBI laboratory were extremely helpful by reviewing an early draft of the mail survey form and suggesting appropriate modifications. Several review sessions were held with FBI laboratory staff over a two-day period. Because of the remaining test schedule, it was not possible to incorporate the modifications in the draft survey form and apply it to the Bureau's activities for statistical gathering purposes. This data was provided by the FBI at a later date.

The apparent informational needs which the four nonfederal test laboratories most desired were for analytical support, rifling specifications, sources of standard samples, compilation of statistics of blood, glass and paint to determine their uniqueness and bibliographic and abstract information, but not necessarily in the order listed.

The interviews at the five test sites resulted in some minor revisions of the interview guide form. The CLIS Special Project Committee at the AAFS meeting in Dallas, Texas on February 12, 1974 also reviewed the interview guide form and had no suggested changes or input.

The original presentation to the CLIS Special Project Committee in Dallas, Texas on November 20, 1973 stated that the laboratory personnel of five major and seven smaller criminalistic laboratories throughout the United States would be contacted by the PMS interview team relative to the needs and requirements of CLIS. The PMS work plan and schedule report presented to the CLIS Special Project Committee at the AAFS meeting in Dallas, Texas on February 12, 1974 included addresses of 15 laboratories to be visited. It was suggested by the CLIS Special Project Committee at this February 12, 1974 meeting that a medical examiner-type of laboratory also be included in the site visitation list. Specifically, it was suggested that an interview team visit the Cuyahoga County Coroner's Laboratory at Cleveland, Ohio and that this laboratory be substituted on the visitation list for the Laboratory Division of the Police Department at Baltimore, Maryland. Because of operational and planned laboratory ADP systems, an additonal visit was scheduled to the Central Laboratory of the Florida Department of Law Enforcement.

The PMS interview team received an invitation from the executive director of the California Criminalistics Management Association to present a talk on the CLIS project at their meeting being held at the Orange County, California airport on March 29, 1974. This invitation was accepted and the laboratory visitation schedule was revised to visit Los Angeles County Sheriff's Department of Criminalogical Laboratory on March 27, 1974 and to include an additional visit to the Criminalistics Laboratory of the Los Angeles Police Department on March 28, 1974. In all, 17 laboratories were visited, their facilities and procedures inspected and pertinent personnel interviewed.

Need for Data

As was the case in the visits to the five test laboratories, all of the additional twelve laboratories visited expressed a real and enthusiastic interest in the CLIS project. The need for an informational data system was quite apparent in all of the laboratories, although the immediate needs which were expressed varied from laboratory to laboratory and from one expert to another in the same laboratory. For example, the firearms examiners, almost without exception, thought that the first priority of such a system be relative to rifling specifications; whereas the blood analysts thought that the accumulation of statistics relative to ascertaining the uniqueness of blood groupings should be number one on the list of informational needs.

All of the additional laboratories visited also were burdened with examinations dealing with drug and narcotics with yearly steady increases in this category. Methods of analyses for the identification and quantifying of drugs and narcotics were similar to those of the five test laboratories as previously described. Gas Chromatography-Mass Spectrographic methods for drug and narcotics examinations were in use in seven of the laboratories, and several of these installations were computer-assisted in comparing results with previously run standards or for use in searching purchased limited drug libraries. Those laboratories not having GC-MS capabilities either had such a system on order or had future plans to acquire one.

The volume firearms examinations constituted the second major type of examination made by the laboratories. Current and extensive rifling specifications and ammunition data were unanimously needed as well as a means for information exchange and communications between the firearms examiners among criminalistics laboratories.

Serology, for the most part, was number three in the volume of types of examinations made. Although there is not a great deal of analytical support data required in these examinations, statistic gathering for uniqueness had a number one priority for those technical people involved in the newer subgroups and enzyme identification techniques.

A few of the laboratories were handling large volume of blood-alcohol determinations and were doing so because of requirements of state statutes relative to drunk driving. This is normally a routine type of examination requiring no informational support system. The volume in some cases required automatic sampling devices with a dedicated computer for automatic instrument control and output recording.

In two of the additional laboratories visited, several GC instruments in simultaneous continuous operation had dedicated minicomputers for instrument and sample control and for recording the outputs.

It was determined from the visits to all of the laboratories that other types of important criminalistic examinations were necessarily being neglected because of the drug and narcotic burdens, and evidence and data collections were not being given their fair attention. Burglaries which involve such items of evidence as paint, glass, soils, safe insulations, etc. were suffering because of the lack of laboratory time, personnel, reference data and analytical support information. Yet burglaries, one of the most prevalent of crimes involve more of the innocent public than do drugs and narcotic cases and account for tremendous monetary and property losses per year.

Not all of the laboratories visited had documented examination capabilities, and where such facilities were available, the information needs appeared to be limited. Most would like to have some standards, such as typewriter specimens, available for direct comparisons.

The visits to 17 laboratories were necessary and productive. The primary data collection vehicle has been a mail survey form, and it has proved to be more than adequate in fulfilling its intended purpose. Personal visits, however, provide the full flavor of problems, opinions, needs and priorities. The site visits were scheduled, therefore, to cull additional information not captured through the mail survey (personal reponse and reactions) and to probe more deeply, in a question and answer environment, the needs and priorities of laboratories relative to the CLIS concept.

The stratified random sample of laboratories interviewed included almost seven percent of the total number of laboratories now included on the master list. Personal interviews have supported the data received through the mail. As is sometimes the case, laboratory personnel did not indicate that their opinions and experiences were anything different than what was stated on the survey form. A major objective of the site visits was to uncover unanticipated trends and developments which would contradict survey data and which might not be apparent through additional analysis of survey data. This did not happen, and the size of the sample is large enough to assume it will not happen.

CHAPTER 3. DEFINITION AND DISCUSSION OF LABORATORY INFORMATIONAL NEEDS

SOURCES OF STANDARD SAMPLES

In order to conduct comparison examinations for the purpose of identifying specific types of substances, an analyst must often have physical samples generally similar to the questioned substance. For example, an analyst may remove several specimens from a piece of evidence which are obviously man-made fibers. His problem may now be to identify specifically the type of fiber and its manufactuer. Generally, the broad "family" will be known; i.e., drugs, inks, fibers, hair, wood, paint, safe insulation, etc. But it is often imperative that the substance be identified with much finer specificity to the exclusion of any other substance if possible.

Laboratories were asked to identify their standard evidence collection in Chart 2 of the survey form. Approximately 75 percent of the responding laboratories had one or more standard evidence collections.

The size of these files varies considerably, as do the usage rates. For example, the FBI laboratory has the largest automobile paint file consisting of over 9,400 samples. The file is used approximately 30 times per month. The paint files in the other responding labs contain an average of 75 samples. The average use of these files is approximately nine times per month each. Drug and narcotic dosage form files vary in size from 20 to 5,000 and in usage from one to 600 times per month.

Recognizing the difference in size, type and volume of work among laboratories, a principal reason for such inconsistencies in the existence, size and usage of standard evidence files is the difficulty in locating and obtaining standard samples. Not all labs need large numbers of comprehensive sample files. Their problem then becomes more acute. These labs are not seeking samples for the purpose of building a file, but for the purpose of completing nonroutine examinations. Obtaining standard samples often becomes a time-consuming, even fruitless, effort.

The most important benefit provided by CLIS in this area again would be the saving of valuable time. Sources of standard samples could be compiled and categorized in a data base to be accessed by users. Sources could include other laboratories, trade associations, manufacturers, and academic institutions. The file could initially be organized to satisfy the most frequent needs of the users with more "exotic" samples being added as time and resources permit.

COMPILATION OF STATISTICS TO DETERMINE SPECIMEN UNIQUENESS

Most of the laboratories visited and those from whom the mail survey was received, indicated that one of the top priority items to be supported by a computerized information system was a compilation of statistics to determine the uniqueness of specimens, such as blood, glass, and paint.

In order to present the lay reader an idea as to the specific meaning of this designation, the following examples are detailed:

Blood Analysis

Previously, a typically routine dried blood stain analysis in forensic use allowed for the identification of A, B, O and AB blood groups and Rh factors. The present developments in blood grouping techniques and apparatus (electrophoresis equipment) involve the identification of subgroups including M, MN, and N red-cell enzymes such as those classified as PGM, EAP, with three homozygous forms and three heterozygous forms and at least four other red-cell enzymes. There are also identifiable protein groups such as hemoglobin and haptoglobin. With little present information available, in order to determine the uniqueness of a blood stain analyzed by the above grouping systems it is necessary to determine the frequency distribution both locally and nationwide. It appears probable, that if one considers the most common basic blood groups, type O (47 percent of the population), the more extensive analyses may alter this frequency to a discrimination of one in 100. If one considers the rarest basic blood, AB, which represents about three percent of the population, the extended analyses may alter this frequency to a discrimination of one in a billion. Blood grouping, if statistics are available, may become extremely unique and increase the effectiveness of expert court testimony. However compilation of statistics submitted by the many analytical laboratories is a necessary factor.

Glass Analysis

The same statistical compilation of the determinable properties of small fragments of glass also is necessary to determine its uniqueness. Almost all of the forensic laboratories analyze and compare glass samples on the basis of their indices of refraction, dispersion and density. One of the laboratories visited has a current research program compiling analytical data relative to the physical properties of its glass samples with the aid of an available computer. In addition to normally analyzed physical properties, statistical data should also be accumulated relative to basic element composition as well as accidental trace elements. Window glass should be different from plate glass and headlight lenses and bottle glass. It is necessary however for the various analytical criminalistic laboratories to submit data on the continuing basis for the significant compilation of data for sample uniqueness evaluations.

Paint Analysis

Paints are somewhat similar to glass and much analytical data must be compiled to determine a sample's individuality. Paints are analyzed by several different methods. The organic vehicle and vehicle modifiers in a paint are probably more important than the pigments, extenders and coloring agents. One of the laboratories visited has an ongoing research program wherein they are endeavoring to ascertain the uniqueness of a small paint sample by determining the ratio of the common ingredient Titanium to the other elements present. This program is being carried out by use of a local available computer which calculates the ratios and compares the results with previously analyzed samples.

The principal problem in this area is the current lack of any comprehensive data base which would identify a specimen's uniqueness. It is a problem not easily overcome and one which may take several years to remedy. Several laboratories have started to address this problem and others will follow. If all laboratories were given the capability of submitting their findings in a standard format to a central repository, the remedy would be achieved sooner than if data compilation were to continue on a fragmented basis. CLIS could play an important role by possibly collecting and compiling the needed data.

ANALYTICAL/IDENTIFICATION SUPPORT

In the survey form, the category listed in Chart 3 under General Laboratory Information Needs as "Analytical/Identification Support," means processing the outputs of a specific type of scientific instrument to aid in identifying an unknown, indicate the chemical class or functional groups of an unknown or limit identification possibilities to a few most similar compounds which could be either subsequently identified or eliminated by other physical or chemical properties or other analytical procedures.

Infrared Spectrophotometer

For example, a typically effective standard procedure used to identify an unknown organic compound such as a drug, plastic, paint vehicle, poison or explosive is to examine the specimen by the use of an infrared spectrophotometer. The infrared spectrophotometer is an electronic-optical instrument capable of providing a large amount of data relative to the actual types of chemical bonding in the molecules of the compound under examination. A questioned sample can be prepared in several different fashions for presentation to the instrument. It can be presented as a liquid between sealed sodium chloride (or other noninfrared absorbing crystals) plates; it can be presented, in the case of a plastic, as a thin "as is" specimen, it can be presented as a "mull" in mineral oil between sodium chloride plates or it can be presented for instrument inspection as a finely divided inclusion in a disc of potassium bromide which is prepared under pressure and vacuum. The instrument floods the prepared sample with a polychromatic beam of infrared radiations. Certain chemical bonding will absorb specific wavelengths of infrared radiation. The optical system of the infrared instrument diverges the emerging infrared radiations according to wavelengths and the resulting infrared

spectrum is scanned by a detector which results in the quantification of each very narrow band of infrared radiation passing through the sample. The analytical output from such an analysis is displayed in the form of a strip chart, plotting infrared wavelengths or wave number versus the amounts of each absorbed by the sample. Some shifting or attenuation of peaks may result if a sample is prepared in potassium bromide as opposed to being a mull.

An unknown so analyzed is normally identified by: relying on the analyst's experience and/or recognition; by comparisons with selections from a file of standards such as those marketed by Sadtler; or by a search through reference books, periodicals, libraries or in-house collections. An unknown suspected drug is compared to known drug standards. A plastic is compared to known standards of monomers and polymers. Other substances are compared with the appropriate standard references.

A completely unknown sample could be, and sometimes is, compared with literally thousands of known infrared spectra. Often such a search is negative because the standard spectra are not readily available, possibly nonexistent, or because a manual search is so time-consuming and laborious it is not completed. A computerized search through a data bank would, in most cases, make a more extensive library available and would limit the identification possibilities to a few substances and in some instances could indicate inherent significant functional groups leading indirectly to subsequent identification.

X-ray Diffraction

X-ray diffraction examinations are conducted to identify an unknown crystalline compound. In such a method of analysis, a prepared sample is bombarded by a monchramatic beam of X-rays and the sample, because of its crystal geometry, will diffract the X-ray beam at different angles. The intensity and angle of the diffracted X-ray beam are normally recorded on a strip chart or photographic film. Identification is based on the angles and intensities of the diffracted beam and is again dependent on comparisons with libraries containing voluminous known standards. Such a comparison search is very time-consuming and could involve thousands of compounds. The ASTM, for example, publishes the X-ray diffraction data for approximately 25,000 compounds. The complexity of such a search is compounded when there are two or more compounds in the sample under consideration. X-ray diffraction is therefore an analytical procedure where computerized identification and analytical support is applicable.

Gas Chromatograph – Mass Spectrometer

As reported earlier, many laboratories are presently using or anticipate using an analytical procedure utilizing a gas chromatograph — mass spectrometer technique. Such a system has a gas chromatograph instrument interfaced with a mass spectrograph. The gas chromatograph is used to separate a drug or narcotic, for example, from its matrix or interfering components. Retention times within this instrument are important and recorded. The separated component is then introduced into the mass spectrograph which analyzes the compound according to its mass weight and the mass weights of its multitude of characteristic fragments. The output of such a system is tremendous and is best interpreted by at least a dedicated minicomputer. Most laboratories visited have some type of dedicated or locally available computer in service to make comparisons and searches with in-house or purchased libraries of limited standards. Comprehensive analytical support would certainly be most helpful in this method in the near future.

From the data submitted in the questionnaire it was only possible to distinguish two general types of computer applications used in the responding laboratories; i.e. management information systems (MIS), and instrumentation support.

Only a few laboratories have an operating MIS. Our interview experience shows that the level of sophistication of these systems will vary greatly from one laboratory to another. The most sophisticated include:

- Evidence control
- Case tracking
- Activity
    - By section
    - By examiner
    - By contributor
- Types of cases
- Report generation.

This area was not evaluated in any detail as it lies outside the defined scope of the CLIS Phase I effort.

Some laboratories indicated that they had implemented systems which directly involve some type of analytical support for instrumentation. These laboratories identified the gas chromatograph-mass spectrograph (GC-MS) as the instrument involved and others stated specifically that their systems were supporting infrared spectrophotometer (IR) applications. Other applications cannot be identified by type of instrument, but can be reasonably assumed, based upon field experience, that the principal instruments involved will be the GC-MS, IR, ultraviolet spectrophotometer (UV) and X-ray diffractometer.

Problems

There are several major problems associated with this important informational need. The length of time sometimes necessary to identify unknown substances has already been mentioned. A contributing factor is the availability of standard reference data. Almost 40 percent of the responding laboratories have no commercially available standard reference data. The cost of reference data is prohibitive to many laboratories. Also, commercially available reference data is often compiled from analyses conducted under conditions which cannot be duplicated in functional crime laboratories. This can lead to low "hit" percentages and a general lack of user confidence. The most potentially serious problem, however, is the fragmented and duplicative work that is being conducted by laboratories around the country in the instrumentation support area. Perhaps relatively few are involved now, but the fact that this need was expressed as the number one priority for CLIS indicates that more will be implementing similar systems in the near future. In spite of the exposure available through regional and national organizations, and conference and workshops, it appears that most development and implementation activities are conducted independently of one another. Without some central controlling influence, we can look to even more fragmentation and duplication. Another major problem stems from the fact that not all labs can afford to undertake such ambitious programs. Almost 50 percent of the responding laboratories have less than ten total employees. Budgets of most laboratories that size cannot support or justify instrumentation support systems.

CLIS, as conceptualized at this point, would seem to offer potential benefits which would successfully meet the challenges posed by the problems just mentioned. CLIS could obviously eliminate much of the need for fragmented and duplicative efforts. Files need only to be generated once and could probably be more comprehensive and accurate than most generated by or for "private" (one lab) systems or regional systems. An important feature of CLIS could be the acceptance of user-generated reference data. While there may be a tendency not to completely trust commercially available data, our field interviews indicate this would not be the case for reference data resulting from "real world" conditions. CLIS could save considerable search time by providing realistic "hit" possibilities to the tolerance desired by users and suggesting analytical techniques for final identification. This capability would also be available to smaller laboratories which could not hope to develop similar resources on their own.

BIBLIOGRAPHIC INFORMATION

Literature Abstract Information

These two application areas are similar in the services that they are to provide and therefore it is recommended that they be implemented concurrently. Bibliographic Information would be an index to papers and articles ordered alphabetically by title and author(s). Literature Abstract Information would consist of a brief abstract describing the general topic of the article or paper. Abstracts would be indexed by key words and/or category designations.

There currently exists several sources for abstracting information that would be useful to forensic laboratory operations; however, these sources are largely disparate and few of them consider general forensic science as their prime field. Some of the currently available reference and abstracting services are:

- National Institute of Health MEDLARS
- AAFS What's New
- The DEA Microgram
- National Criminal Justice Reference Service
- Chemical Abstracts
- Nuclear Abstracts
- FBI Abstracts of Forensic Science
- Indicus Medicus.

Some of these sources provide only referral services, and while helpful, require the examiner seeking additional information to spend a substantial amount of time in actually obtaining the article.

The field of forensic science covers a large number of disciplines from organic chemistry to ballistic trajectory determination. A laboratory examiner or criminalist needs not only to be knowledgeable and current in his own speciality but must also be aware of other disciplines that relate to his work. He must be cognizant of new analytical techniques, suggested standard methodologies, landmark court cases that may affect the presentation of expert testimony, and the opinions and conclusions of recognized experts in the forensic field. The current method of obtaining this information consists of reviewing the many periodicals and journals in each of the forensic fields of discipline. These subscriptions are costly, and there are few laboratories that subscribe to all of the pertinent periodicals and references.

Using CLIS, all articles books, research project reports and pertinent forensic information would be indexed in the system along with a short abstract defining the general content of the reference. The abstract would also specify the source of the information and how to obtain copies and/or additional information. It is recommended that each abstract be indexed by author, a category classification and a series of key word identifiers. Examples of category classification would be High Voltage Electrophoresis, powder residues or drug metabolism. Each general category would be numbered and subdivided as required. Key word indexing would come from the abstract and some key word examples would be footprints, hair, blood alcohol, spectra or drug names.

These cross-indexed techniques would allow for complete coverage of forensic applications and would allow the user to search the file of abstracts and obtain only those abstracts that were applicable to the key words and categories that were entered.

Implementation of these two application areas on CLIS would provide a central source for abstracts of forensic information and would be of immense assistance to those laboratories that do not have large reference libraries or access to other abstracting services. Procedures would have to be developed and criteria established for abstracting the information and entering it into the system. It may be practical to subscribe to some currently available abstracting services on a regular basis with specific instructions to review and abstract all literature pertinent to the many disciplines of forensic science.

RIFLING SPECIFICATIONS

The definition of Rifling Specifications as an application area for the CLIS project is currently limited to the ability to determine the possible make and model of a firearm from the physical characteristics of a fired bullet specimen. These characteristics would be caliber, number of lands and direction of twist, groove diameter, land width, groove width and possibly pitch of twist. These dimensions could be expressed in either the English or Metric system. Classification of accidental markings or striations is not within the scope of this application area at this time.

The means by which a firearms examiner attempts to identify a weapon from a sample bullet is a time-consuming search of his own files, NRA publications, Matthew's reference book on firearms identification, or direct requests for rifling characteristics and specifications from weapons manufacturers. The examiner's in-house data is generally made up of information from articles in trade magazines, data from his own examinations of previous cases or perhaps information from a colleague in another laboratory. Information on rifling specifications is also available from the FBI laboratory. The file could not be considered complete and would probably contain information only on weapons that are common to the types of cases that the laboratory has examined in the past. Unfortunately, there is no single source for this characteristic data on weapons at this time.

In the course of his duties, the firearms examiner must perform a number of examinations which could include, but not be limited to the following:

- Determine whether a bullet was fired from a specific weapon
- Determine whether a cartridge case was fired in a specific weapon
- Determine the relative distance of firing by

analyzing powder patterns on the victim's clothing
- Determine whether a hole in clothing was made by a bullet
- Operability of Weapons
- Trigger pull tests
- Identification of weapons by fired specimens.

It is the last of these functions that we are currently directing our attentions to. Due to the large number of different models and manufacturers of weapons throughout the world, the typical firearms examiner may not be aware of all of the weapons that may have possibly fired the bullet he is examining. There is no central index for this data and he thus relies upon his own in-house evidence files, manual card indices or selected reference manuals. This reference material is not standardized in format nor complete, making his search tasks extremely difficult.

It is anticipated that the CLIS Rifling Specification file would contain the following information for each make and model of weapon entered:

- Caliber
- Number of Lands and Grooves
- Direction of Twist
- Pitch of Twist (very difficult to measure on a fired specimen)
- Land Width
- Groove Width
- Description of Weapon
- Source of Information and Date Entered
- General Remarks.

It is expected that the number of weapon entries in this file would be less than 8,000. The anticipated operation of CLIS would require the examiner to enter all of the dimensions of his sample bullet that he is able to measure along with a tolerance factor. CLIS would respond with a list of all those weapons in its file that could have fired the sample bullet. The examiner can control the number of responses by adjusting the tolerance factor and make deletions based upon his knowledge of the circumstances and his experience. Assuming that the CLIS file was reasonably complete, the examiner would have a list of all of the possible weapons along with a description of each. This information could play a critical role in the investigation of a crime.

Thus CLIS would provide a central repository for rifling specifications of weapons currently available and would accommodate expansion to include newly manufactured weapons. This rifling information would come from many sources including laboratories with accurate evidence files, manufacturer's specifications and currently available reference files. This centralization of data would provide a common source for data of this type and would facilitate the submission and gathering of this data from the manufacturers.

SOURCES OF SPECIALIZED KNOWLEDGE

The on-site interviews disclosed informal procedures in most laboratories to identify and contact specific individuals who have developed a specialized expertise in one of the forensic sciences areas. As the need arises, these "experts" are contacted to provide advice and assistance. The contacts are usually only made in cases of extreme emergency when nonroutine procedures are required and either the use of techniques or their results need corroboration. This type of information exchange between criminalistics personnel is extremely valuable and examiners do not hesitate to admit the need for and to seek help when faced with unusual problems in areas which are perhaps not a part of their normal disciplines.

The problem then becomes one of first identifying and then locating the appropriate people to provide infrequent, indirect, but nonetheless, important resources capabilities to laboratories. Individual laboratories are currently developing these contacts independently of each other which again, reveals an informational activity which is in a sense fragmented and duplicative. Obviously, the needs vary between laboratories and each laboratory would require the ability of being able to select sources of expertise based on individual need and their assessment of the qualifications of various individuals to provide the desired assistance. The next problem is making sure that an individual would not object to being on a list of resources which may result in occasional inconveniences. The final problem is one of maintaining a current list. The objectives of an index of sources of specialized knowledge is to provide increased capabilities to laboratories by making available the combined experiences of many recognized technicians who have "been there." At the same time, if such an index is not current and accurate at all times, it may cost more time than it is designed to save and even prove to be embarrassing to users at times. Additions and purges must be made regularly and changes in addresses and telephone numbers must be updated routinely.

With much care, CLIS could perform these and other necessary functions relative to the listing of sources of specialized knowledge with a maximum of effectiveness and efficiency. The primary source of data will be crime laboratories themselves. The file itself could be accessed in a number of ways on a keyword basis:

- By name
- By type of knowledge — either general or with several levels of specificity
- By geographic location
- By technique or procedure desired
- By currency (when was specific expertise developed)
- By a combination of the above items.

A principal benefit will be the provision of important information with negligible expenditure of personnel resources by users.

SOURCES OF SPECIALIZED REAGENTS

Generally speaking, a reagent is an additive applied to a laboratory specimen to achieve a desired reaction. The reaction desired may be to cause precipitation, change or intensify a color, form a solution or to make something visible. Once achieved, this reaction enables an examiner to either perform an analysis or suggest to him the next step in the analytical process.

For example, an invisible latent fingerprint on a laboratory specimen can be made visible by applying the appropriate reagent. The same is true for making old, dry blood stains visible.

Some reagents are quite common and relatively easy to obtain. Specialized reagents, however, may be extremely difficult and costly to acquire. Some are available only through foreign sources. By identifying the possible sources for specialized reagents and compiling them in a central data base, CLIS could save users valuable time in locating such substances. Even if personnel were available to perform this function without taking away from bench time, the circumstances surrounding a particular case may require immediate action by the laboratory. The fact that personnel are available to perform exhaustive searches becomes academic. Providing a user with a list of sources for the reagent he is seeking solves a major portion of his problem. Most delivery problems can be overcome once the reagent is located.

COMPUTATION DATA AND CAPABILITY

This application area would provide each user the computational capabilities of a powerful general purpose computer system. This function would consist of capabilities to manipulate algebraic expressions involving numbers, variables and expressions, integrate or tabulate analytical data, solve equations, balance chemical formulae, plot curves and in general serve as a sophisticated calculator for laboratory personnel.

The current availability and price of solid state calculators, both fixed function and programmable, has helped to ease the computational load of the laboratory analyst. However, these calculators are very limited in storage capacity and cannot handle large volumes of data such as that needed for evaluatory statistical information. The CLIS system can furnish this capability as a tool for the examiner. It is expected that these processing functions would be implemented in a scientific higher level language such as FORTRAN and/or BASIC. This would permit each user to develop his own analytical programs as well as have access to common system supported programs.

EXPLOSIVE TAGGING

The Department of Treasury, Bureau of Alcohol, Tobacco and Firearms is currently developing a program that would enable laboratory examiners to detect and identify explosives used in crime. The "tagging" program would allow law enforcement officers to identify explosives before and after their use, as well as to detect their presence in cargo, luggage and other potentially dangerous situations. The Bureau has begun the process of evaluating the feasibility of several candidate systems for the detection and identification process. There are several methods that may be applicable, such as gas impregnation, bead seeding and chemical additives. The eventual system which will be used has not been selected at this time and the following discussion regarding the chemical additive process is intended only as an example.

The chemical additive "tagging" is accomplished at the time of manufacture of the explosive by the addition of certain quantities of chemicals in coded relative proportions so as to produce a distinct chemical composition that can be identified with the specific manufacturer, plant, batch and date of manufacture. These chemicals are such that they retain their composition and relative proportions after an explosion, thus a laboratory examiner will be able to identify by analytical techniques the composition and relative proportions of the "tagging" chemicals in an explosive or explosive residue. It is anticipated that the distinct coding of each different batch of explosive would be maintained on CLIS such that an examiner would only have to indicate to the system the identity and relative proportions of the "tagging" chemicals and the system would respond with all of the available information on that particular batch of explosive.

Regardless of the type of "tagging" system which is selected, it will be necessary to make the identification information available in a central repository, accessible for updating as each new batch is "tagged" and available to the laboratory examiner for his criminal investigation purposes. CLIS will be capable of adequately supporting this application in a manner that will assist the criminal investigative process for all law enforcement agencies.

CHAPTER 4. PROFILE OF RESPONDING LABS

Many facets of laboratory operations must be considered when analyzing the requirements of criminalistic laboratories throughout the nation. Laboratory size varies from one-man labs analyzing several hundred samples a year to the FBI Laboratory with over 400 employees processing one-half million cases in 1973. Laboratory organization and administration are equally disparate: some accept only drug and narcotics analysis; some are concerned only with general identification cases (fingerprints and photography); and others are fully capable of analyzing all crime scene evidence. Administrative control of a crime laboratory may rest with the county sheriff, the local police department, the medical examiner's office, the prosecutor's office, a statewide crime laboratory organization or a federal agency. All of the variations of these attributes make it difficult to devleop a description of the "average" laboratory. These facts must be taken into consideration in the profiling discussions that follow.

Our analysis of the needs of these laboratories is primarily based upon the 168 responses that were received.

The information that these responses contained was supplemented by staff interviews with a representative sampling of these laboratories and by the collective experience of the members of the project staff.

Responses indicate that the average total laboratory size is 16 persons; of these, approximately 9.5 are technically trained. This averages out to be approximately 6.5 chemists, 1 firearms/toolmark examiner, 1 document examiner, and 1 toxicologist per laboratory. Note that these are gross averages and do not include the FBI Laboratory. The majority of these labs are classified as main laboratories and are administered at a state or county level.

The case loading for all laboratories responding to this question was tabulated and averaged; the figures indicate an increase from year to year. The average case load for 1972 was 18.8 percent higher than that of 1971; the average case load for 1973 was 22.1 percent higher than that of 1972. Based upon these figures, it is to be expected that the 1974 case load will be 25.4 percent greater than that of 1973. Based upon an overview of the responses to questions 10 and 11 (activity by analytical service provided), the most active category of analytical work is Drugs and Narcotics. This corroborates the information obtained from the laboratories that were interviewed and also the estimates of the project staff.

Almost all of the responding laboratories had capabilities in gas chromatography, infrared spectrophotometry and ultraviolet spectrophometry. Over 85 percent of the laboratories have an infrared spectrophotometer, and 84 percent have at least one ultraviolet spectrophotometer. This commonality of instrumentation suggests that analytical/identification support by CLIS would initially center upon the use of one of these instruments.

Few laboratories make use of standard reference files with routine frequency. In fact, it appears that most of the laboratories rely upon their own in-house standard reference and evidence files. This suggests that close attention must be given to the source of standard reference files that will be used in CLIS.

The general conclusion is that the responding laboratories and the data provided are representative of the laboratory population surveyed.

CHAPTER 5. PRIORITIES

The response to the general laboratory information need is depicted in the tabulation of the responses to question 8, which is presented in Chapter 2. These are simply yes or no answers. Question 9 requests that a priority be assigned to those functional areas that are considered more important than others relative to the activities of individual laboratories. The following tabulations list the priorities assigned by the responding laboratories to each specific functional area. Note that this is merely a compilation of raw data; no weighting techniques were used to attempt to accommodate differences in case load, instrumentation, personnel, etc.

Analytical Identification Support

Priority	Number of Labs Selecting this priority	Percentage
1	65	49.2
2	26	19.7
3	11	8.3
4	10	7.6
5	5	3.8
6	6	4.5
7	4	3.0
8	1	0.7
9	1	0.7
10	3	2.3
Total	132	99.8

Average Priority for this function = 2.47

Sources Of Specialized Knowledge

Priority	Number of Labs Selecting this priority	Percentage
1	3	2.8
2	9	8.3
3	11	10.2
4	14	13.0
5	15	13.9
6	17	15.7
7	9	8.3
8	9	8.3
9	9	8.3
10	12	11.1
Total	108	99.9

Average Priority for this function = 5.77

Sources Of Standard Samples

Priority	Number of Labs Selecting this priority	Percentage
1	17	12.8
2	30	22.6
3	27	20.3
4	20	15.0
5	11	8.3
6	11	8.3
7	7	5.3
8	5	3.8
9	2	1.5
10	3	2.3
Total	133	100.2

Average Priority for this function = 3.73

Bibliographic Information

Priority	Number of Labs Selecting this priority	Percentage
1	4	3.7
2	7	5.9
3	15	12.6
4	21	17.7
5	27	22.7
6	11	9.2
7	16	13.5
8	8	6.7
9	5	4.2
10	5	4.2
Total	119	100.4

Average Priority for this function = 5.20

Literature Abstract Information

Priority	Number of Labs Selecting this priority	Percentage
1	12	10.1
2	13	10.9
3	19	16.0
4	18	15.1
5	17	14.3
6	11	9.2
7	12	10.1
8	12	10.1
9	3	2.5
10	2	1.7
Total	119	100.0

Average Priority for this function = 4.58

Computation Data And Capability

Priority	Number of Labs Selecting this priority	Percentage
1	6	6.7
2	6	6.7
3	4	4.5
4	8	9.0
5	9	10.1
6	11	12.4
7	10	11.2
8	8	9.0
9	16	18.0
10	11	12.4
Total	89	100.0

Average Priority for this function = 6.30

Sources Of Specialized Reagents

Priority	Number of Labs Selecting this priority	Percentage
1	2	1.8
2	3	2.7
3	7	6.3
4	13	11.7
5	16	14.4
6	15	13.5
7	19	17.1
8	18	16.2
9	12	10.8
10	6	5.4
Total	111	99.9

Average Priority for this function = 6.27

Explosive Tagging

Priority	Number of Labs Selecting this priority	Percentage
1	2	2.6
2	3	4.0
3	4	5.3
4	5	6.6
5	6	7.9
6	11	14.5
7	7	9.2
8	11	14.5
9	18	23.7
10	9	11.8
Total	76	100.1

Average Priority for this function = 6.91

Rifling Specifications

Priority	Number of Labs Selecting this priority	Percentage
1	3	3.0
2	18	18.2
3	19	19.2
4	12	12.1
5	11	11.1
6	9	9.1
7	8	8.1
8	8	8.1
9	6	6.1
10	5	5.1
Total	99	100.1

Average Priority for this function = 4.82

Compilation Of Statistics

Priority	Number of Labs Selecting this priority	Percentage
1	32	26.9
2	24	20.2
3	20	16.9
4	11	9.2
5	10	8.4
6	10	8.4
7	5	4.2
8	5	4.2
9	1	0.8
10	1	0.8
Total	119	100.0

Average Priority for this function = 3.26

Therefore, the priorities selected by the responding laboratories are:

	Function	Average Priority Ranking	Overall Priority
A.	Analytical/Identification Support	2.45	1
J.	Compilation of Statistics	3.26	2
C.	Sources of Standard Samples	3.73	3
E.	Literature Abstract Information	4.58	4
I.	Rifling Specifications	4.82	5
D.	Bibliographic Information	5.20	6
B.	Sources of Specialized Knowledge	5.79	7
G.	Sources of Specialized Reagents	6.27	8
F.	Computation Data and Capability	6.30	9
H.	Explosive Tagging	6.91	10

CLIS SEQUENCE OF IMPLEMENTATION

It is not expected that implementation of all of the CLIS application areas will occur simultaneously. There are a number of factors that must be taken into account in order to produce a realistic, structured approach to good overall systems design. This design will be developed in the succeeding volumes. The following criteria will serve as a basis for this development.

Laboratory Priority List. This list defines the needs of the users and must be used as a base in order to guarantee that CLIS will be responsive to the requirements of the users.

Visibility. CLIS must have high visibility in as short a period of time as practical. Visibility means that the system must provide some useful information in an operational mode to several laboratories. This will ensure that the project's services will not be delayed by an extended implementation period; that the CLIS committee is indeed a viable entity reacting to the needs of the users in a prompt manner; that Project Search and LEAA have a high level of interest in solving the many problems of criminalistic laboratories; and that system credibility and user confidence will be fostered, resulting in maximum and continued user support in the future.

Availability of Current Data Bases. Consideration must be given to use of any currently available data base and those data bases that will have to be developed and put on line. Data for some of the application areas can be easily obtained from several sources and encoded in machine readable form. Other data will have to be culled from many references and in some cases can only be produced by sample analyses using appropriate instrumentation techniques.

Anticipated Use. It would be highly advantageous to implement an application that would be heavily used as soon as it was operational. Conversely, it would make little sense to implement an application that is used rarely or only used by one or two laboratories.

Required System Sophistication. Some applications will require a substantial amount of computing power and/or file storage before they can become operational. It may be more advisable to delay the implementation of these applications until a basic CLIS has been established and has proved useful to the member laboratories. System resources can be increased in stages to fit the requirements of the application areas as they are implemented.

Time Required for Implementation. Certain applications will take longer to implement than others, based upon data base availability, complexity and level of system sophistication required. All of these factors must be taken into account when considering the high initial visibility that the system should have.

CHAPTER 6. ANALYSIS OF RESPONSES

Of the 248 requests for information that were sent to all of the laboratories on the master list, 176 were returned. Six of these responses were duplicates. All of our analyses of the responses are based upon the 168 laboratories that did respond with at least some meaningful data.

PERCENTAGE OF QUESTIONS ANSWERED

The following list indicates the percentage of questions answered by the 168 responding laboratories.

Question	Number of Responses	Percentage Responding to this Question
1. a. Name	168	100
b. Year established	165	98
c. Director	168	100
d. Control	163	97
e. Type	164	98
f. Jurisdiction	165	98
g. Pop. served	151	90
h. Total employees	152	90
i. Technically trained	163	97
j. Case load	136	82
2. Expansion:		
a. Personnel	134	80
b. Services	126	75
c. Instruments	136	81
3. a. Use Computer	164	98
b. Access to Computer	102	61
c. MFG and model	59	35
d. Purpose	38	23
4. Automated Lab Systems	111	66
5. Biblio/Abstract Services	110	65
6. Reference Files	110	65
7. Evidence Files	135	80
8. Information Needs	152	90
9. Priorities	148	88
10. Analytical Services	152	90
11a. 1. Type of Statistics	47	28
2. Type of Statistics	25	15
3. Type of Statistics	32	19
4. Type of Statistics	15	9
b. Relative Activity	33	20
12. Instrumentation	155	92
13. MFG and Model	156	93
14. Frequency of Use	132	79
15. Priorities	113	67

TABULATION PROCEDURES

Certain responses were selected to be tabulated based upon their relative pertinence to the present task and their completeness. For instance, jurisdictional population was not tabulated because of the overlapping jurisdictions of federal, state and regional laboratories which would necessitate a complex interpretation of results. Other responses were not tabulated because of a sufficient lack of data or inconsistent data. In some cases, questions were misinterpreted; thus, the resulting answers were irrelevant and had to be discarded. In some of the tabulations, notably those concerned with personnel, data from the FBI Laboratory was not included in the figures. This was done to prevent the impact of this one large laboratory from producing unrealistic conclusions.

An informal spread sheet was developed as an aid to tabulating the responses. This sheet proved to be valuable in the course of reducing the data and provided a good overview of the completeness and trends of the responses.

TABULATION

Percentages may not necessarily total 100 due to rounding.

QUESTION 1d. CONTROLLING JURISDICTION

Responses to this question — 163

Type of Laboratory	Number	Percentage
Federal	14	8.6
State	70	42.9
County	41	25.2
Municipal	35	21.5
County/Municipal Combination	3	1.8

QUESTION 1e. MAIN OR SATELLITE LABORATORY

Responses to this Question — 164

Type of Laboratory	Number	Percentage
Main	130	79.3
Satellite	34	20.7

QUESTION 1h. NUMBER OF FULL-TIME EMPLOYEES

Responses to this Question — 152

Responses to this question are depicted by size of the laboratory (by employees).

No. of Employees Range	Number of Laboratories in this Range	Percentage (No. of lab) (158)
0 - 4	48	30.4
5 - 9	33	20.9
10 - 14	20	12.7
15 - 19	14	8.9
20 - 24	11	7.0
25 - 29	5	3.2
30 - 34	7	4.4
35 - 39	2	1.3
40 - 44	5	3.2
45 - 49	4	2.5
50 - 59	1	0.6
70 - 74	2	1.3
75 - 79	1	0.6
80 - 84	3	1.9
85 or more	2	1.3

Note: Although the number of responses to this question was 152, the total number of laboratories in this breakdown is 158. These six additional responses were obtained by totalling the number of employees from the following question.

QUESTION 1i. NUMBER OF TECHNICALLY TRAINED EMPLOYEES

Responses to this question — 161

In breaking this information out by type, only the responses of 159 laboratories were used because some laboratories answered the question but not in the specific categories. These tabulations do *not* include the FBI laboratory.

Firearms and Toolmarks Examiners

No. per Laboratory	Number of Laboratories in this Range	Percentage (No. of lab) (159)
0	79	49.7
1 - 2	52	32.7
3 - 5	19	11.9
6 - 8	3	1.9
9 or more	6	3.8

Average per Laboratory = 1.3

Chemists or Microanalysts

Number per Laboratory	Number of Laboratories in this Range	Percentage (No. of lab) (155)
0	18	11.6
1 - 2	45	29.0
3 - 5	42	27.1
6 - 8	18	11.6
9 - 11	7	4.5
12 - 14	5	3.2
15 - 17	7	4.5
18 - 20	5	3.2
21 or more	8	5.2

Average per Laboratory = 6.6

Questioned Document Examiners

Number per Laboratory	Number of Laboratories in this Range	Percentage (No. of lab) (155)
0	98	63.2
1 - 2	43	27.7
3 - 5	9	5.8
6 - 8	2	1.3
9 or more	3	1.9

Average per Laboratory = 0.7

Toxicologists

Number per Laboratory	Number of Laboratories in this Range	Percentage (No. of lab) (155)
0	105	67.7
1 - 2	31	20.0
3 - 5	11	7.1
6 - 8	4	2.6
9 or more	4	2.6

Average per Laboratory = 1.3

Total Technical Personnel Reported by Category

	Number	Percentage
Firearms and Toolmarks	215	14.1
Chemists or Microanalysts	1030	67.5
Questioned Documents	121	7.9
Toxicologists	160	10.5
	1526	100.0

QUESTION 4. AUTOMATED LABORATORY INFORMATION SYSTEMS

The following is a listing of the various automated laboratory information systems and automated data bases (files) reported via the questionnaire:

Type	Source
Drug levels in human deaths	Toxicology Section — AAFS
Instrumentational info system	Bureau of Ident., Joliet, Ill.
Identity of Alcoholic Beverages	ATF, Cinn., Ohio
Drug ID	General Electric
Drug ID	Finnegan
Sadtler IR	Sadtler Company
DCJS IR	New York State
Medline	National Library of Medicine
Mass Spec Data	Finnegan
IR Drugs	FDA Labs
Procheck	FBI
NAA & Mass Spec data reduction	FBI
Mass Spec data reduction	Hewlett-Packard
"Stride"	DEA
MASS SPEC Pharmaceuticals	NIH
Toxicological Data	Walter Reed Army Inst. for Research
GC & LC Abstracts	Preston Abstracting Service
IR	ASTM
Chemical Information System	DCRT/CIS Mass Spec System NIH
Current Awareness Literature Search Service	USDA
Information Service	HOCRE, Aldermaston, G.B.
IR Spectra	Metascience, Inc.
NCJRS	LEAA
NADDIS	DEA
Toxline	National Library of Medicine
Mass Spec	EPA
Mass Spec	MIT
Index Chemicals	Institute for Scientific Information
Registry of Human Toxicology	AFIP
Mass Spec	Battelle Institute
Science Research	Smithsonian Science Information Exchange

QUESTION 5. BIBLIOGRAPHIC/ ABSTRACTING SERVICES

The following is a listing of the types and sources of abstracting services currently used by the responding laboratories:

Sources Of Bibliographic And Abstract Information

American Academy of Forensic Sciences "What's New" Abstracts
Quarterly Journal of Studies on Alcohol Abstracts
Medlars
Medline Services — for Toxicology, Bibliography
Microgram, DEA
AOAC
Chemical Abstracts (ACS)
Police Science Technical Abstracts Section of the J. of Police Science and Administration Abstracts
Document Retrieval Index
U.S. Department of Justice
FBI Academy Library Publications "Abstracts of Forensic Science"
Journal of Forensic Science
Abstracts published by various instrument companies
Journal of Criminology
Journal of Chromatography
American Lab. Information Service
BIOSIS
TIAFT (The International Association of Forensic Toxicologists)
Current Contents
Toxon
Nuclear Abstracts
Firearms Information and Research Service
SDC, (Scientific Documentation Center, Dunfermline, U.K.)
Abstracts on Police Science (Kluwer, the Netherlands)
Standardization News (ASTM)
Clinical Lab. Digest
The Criminologist
Science News
Metallographic Review
Analytical Abstracts
The Forensic Society Journal
Analytical Chem.
Journal of Pharmacology
Chromatographic Science
Drug Abuse Current Awareness System from National Clearinghouse for Drug Abuse Information
Ringdoc; Drug Dependence
International Microform-Legal Medicine
G. C. Abstracts
N.I.L.E. & C.J. Firearms Information Service
National Criminal Justice Reference Service (LEAA) abstracts from journal of the Forensic Science Society

QUESTION 6. STANDARD REFERENCE FILES

The use of the following commercially available instrumentation support files is based upon questionnaire responses.

File	Number of Responding Labs
Sadtler IR Standard	15
Sadtler IR Drugs	27
Sadtler IR Pharmaceuticals	40
Sadtler IR Monomer/Polymer	5
Sadtler UV Standard	11
Sadtler UV Drugs	22
Sadtler UV Pharmaceuticals	25
ASTM IR Spectra	1
ASTM Powder Diffraction	11
ASTM GC	4
CORNU Mass Spec	2

In addition to these commercially available files, a large number of laboratories had in-house instrumentation support files for support of the following methodologies:

- Infrared
- Ultraviolet
- Visible
- Thin-layer Chromatography
- Mass Spectroscopy
- X-ray Diffraction
- Nuclear Magnetic Resonance
- Gas Chromatography
- Unspecified

The largest single category of use of these files was "unspecified," thus preventing an in-depth analysis of file use.

The second largest category was drugs, and use of this file far overshadowed other files such as paints, toxicology, fibers, explosives, and plastics. Usage data was reported very sporadically and did not seem to have any correspondence to size or type of file.

Potential Sources of Data

Based upon responses to the questionnaire, the following sources of standard reference files have been identified.

Infrared Spectroscopy. American Society for Testing and Materials. The ASTM maintains encoded abstracts of all the published IR spectra which can be found. It is available by subscription in hard copy or machine-readable form. It includes the files of Sadtler, the European Documentation of Molecular Spectroscopy (DMS), The American Petroleum Institute (API), Coblentz, Aldrich, etc. Actually, it does not contain the original spectra, but it refers to them and may be verified if needed. A problem is that the compilation process runs a couple of years behind. However, at 102,000 spectra (due to be increased to 140,000 in 1974), it is the largest data base available and is used in all computerized IR search systems.

Eastman Kodak Company has a data base (available only through their Infrared Spectral Retrieval Service) which contains 90,000 ASTM compounds plus 10,000 Eastman Organic Chemicals.

The New York State Division of Criminal Justice Services has a data base consisting of the ASTM file plus forensic files contributed by the New York State Police and the New York City Medical Examiner's Office.

Sadtler Research Laboratories, Inc. sells a large IR data base and a number of specialized subfiles. The quality of the Sadtler spectra has been unfavorably compared with others, such as those in the Coblentz file. However, the questionnaire responses show that, next to in-house files, Sadtler files enjoy the widest usage among criminalistics laboratories, perhaps because they are more actively marketed. The complete Sadtler IR file contains about 34,000 entries. Subfiles used by various crime laboratories include the following (with number of entries): Pharmaceuticals (1,200), Commonly Abused Drugs (600), Monomers and Polymers (5,100), Fats, Waxes and Derivatives (500), Plasticizers (600), Pyrolyzates of Polymers (600), Lubricants (500), and Agricultural Chemicals (500).

The United Kingdom Home Office Central Research Establishment has forensic sciences and alkaloids IR files totalling about 2,300 spectra available on microfilm. These are not included in the ASTM data base.

Other standard sources of IR spectra in use among the laboratories surveyed include Aldrich, Sunshine, E.C.G. Clarke, the Association of Official Analytical Chemists (AOAC), Hummel/Scholl, and the API.

Ultraviolet Spectroscopy. Sadtler Research Laboratories, Inc. markets a UV file of 36,000 entries. There are two subfiles in common use among crime laboratories: Pharmaceuticals (2,000 spectra) and Commonly Abused Drugs (300 spectra).

The United Kingdom Home Office Central Research Establishment provides a microfilm file of UV spectra for about 700 alkaloids.

Other standard UV sources mentioned by laboratories responding to our questionnaire include E.C.G. Clarke, Sunshine and the AOAC.

Gas Chromatography. The ASTM produces a Gas Chromatographic Data Compilation with retention indices and other information for a large number of compounds. It is available as hard copy or on magnetic tape.

Emission Spectroscopy. Sadtler is starting a collection of excitation and emmission fluorescence reference spectra of pure organic compounds. It contains 500 entries to date.

Mass Spectroscopy. The Mass Spectral Search System (MSSS) which is available through GE Timesharing but which is a public domain system developed and operated by various US and UK agencies (i.e., National Heart and Lung Institute; National Institutes of Health [NIH]; Mass Spectroscopy Data Center [MSDC], Aldermaston, England; and Environmental Protection Agency), has a data base containing the following collections: ASTM E14 Uncertified Spectra; Dow Chemical Company Spectra; American Petroleum Institute

Standard Spectra; TRC Spectra; MSDC Spectra Collection Cornell University Spectra; and NIH Spectra. When the John Wiley Registry Data Base is added in 1974, the total number of spectra in the file will be about 37,000.

Manufacturers of computerized MS and GC/MS systems may provide data bases to go with their instruments.

Other sources of MS files are the American Society of Mass Spectroscopists, Finkle and Taylor, and the Massachusetts Institute of Technology.

Miscellaneous Files. X-Ray Fluorescence. ASTM publishes *X-Ray Emission and Absorption Wavelength and Two-Theta Tables* and *X-Ray Emission Wavelengths and KEV Tables for Non-diffractive Analysis*. Raman spectra — Sadtler's continuing collection of Raman Reference Spectra of pure compounds (2,000 entries). Nuclear Magnetic Resonance Spectra — Sadtler's collection of 20,000 NMR spectra and their collection of 2,000 Carbon-13 NMR spectra.

QUESTION 8. INFORMATION NEEDS

This compilation was made independent of the priority level assigned. If neither box was checked and a priority was not given, the response was not counted. If neither box was checked and a priority was given, then it was assumed that the box was to be checked "yes."

General Laboratory Information Needs

	Resp.	Yes	No	% Yes
A. Analytical/Identification Support	139	135	4	97.1
B. Sources of Specialized Expertise	132	110	22	83.3
C. Sources of Standard Samples	143	139	4	97.2
D. Bibliographic Information	135	126	9	93.3
E. Literature Abstract Information	138	126	12	91.3
F. Computation Data and Capability	125	92	33	73.6
G. Sources of Specialized Reagents	129	112	17	86.8
H. Explosive Tagging	113	79	34	69.9
I. Rifling Specifications	125	104	21	83.2
J. Compilation of Statistics	136	124	12	91.2
K. Sources for Special Training		1		
Information on Drug Metabolism		1		
Blood and Tissue Levels for Toxicity		1		
Update on New Products		1		
Regional Latent Print Records		1		
Drug Product I.D. Code		1		
Automobile Parts Numbers		1		
Typewriter I.D.		2		
Cartridge Head Stamp		3		
.22 Cal. firing pin impressions		1		
GC data for Auto Paint		1		
Registry of Human Toxicology		1		
Typewriter Typeface Styles		1		
Single Fingerprint file		1		
Records		1		
Standard Statistical Report		1		

QUESTION 12. INSTRUMENTATION

The following is a tabulation of the total number of instruments for all responding laboratories by instrument type. Those instruments which may be used in more than one category (e.g., UV and Visible Spectrophotometer) are counted only once.

Positive Responses to this question – 155

Instrument	Total Number of Instruments	Average per Laboratory
1. Infrared Spectrophotometer	181	1.2
2. Ultraviolet Spectrophotometer	170	1.1
3. Visible Spectrophotometer	67	0.4
4. Near Infrared Spectrophotometer	8	0.1
5. Gas Chromatograph	317	2.0
6. Liquid Chromatograph	10	0.1
7. Gas Chromatograph - Mass Spectrograph	30	0.2
8. Mass Spectrograph (Inorganic)	3	—
9. Emission Spectrograph	70	0.5
10. Raman Spectrograph	2	—
11. X-Ray Diffractometer	34	0.2
12. X-Ray Fluorescence	12	0.1
13. U-V Fluorescence	70	0.5
14. Atomic Absorption Spectrometer	39	0.3
15. Flame Photometer	8	0.1
16. Electron Probe (ESCA)	3	—
17. Nuclear Magnetic Resonance	7	0.1
18. Differential Thermal Analysis	16	0.1
19. Neutron Activation Analysis	10	0.1
20. Scanning Electron Microscope	7	0.1
21. Electrophoresis	94	0.6
22. Energy Dispersive X-Ray	2	—
23. Polarimeter	6	—

GEOGRAPHIC DISTRIBUTION OF INSTRUMENTATION

	Total	PR	NE	MA	ENC	WNC	SA	ESC	WSC	M	P
1. X-Ray Diffractometers	28			5	5	2	9	2	4		1
2. Neutron Activation Analyzers	9			1	2	1	4				1
3. Gas Chromatograph/Mass Spectrographs	29			4	7	3	6		4	2	3
4. Differential Thermal Analyzers	17			1	3	4	6		1	1	1
5. Nuclear Magnetic Resonance	7			1		1	2	2			3
6. Scanning Electron Microscopes	6			1	1		2				2
7. Emission Spectrographs	67	1	1	12	11	6	9	2	11	3	11
8. X-Ray Fluorescence	10			1		2	3		2	1	1
9. Ultraviolet Fluorescence	66	1		12	10	6	12	3	6	7	9
10. Atomic Absorption Spectrometers	32	1		3	4	4	7	2	4	3	5
11. Mass Spectrographs (inorganic)	3			1		1	1				
12. Electron Probes (ESCA)	3			1	1						1
13. Electrophoresis	87	1	1	12	14	7	16	3	7	5	21
14. Infrared Spectrophotometers	184	3	1	28	35	15	26	4	20	19	33
15. Gas Chromatographs	308	5	1	42	50	23	47	19	25	26	70
16. Ultraviolet, Visible, & Near-Infrared Spectrophotometers	224	5	2	35	22	14	36	16	27	17	50
17. Polarimeters	6			1	1	1	1		1		1
18. Flame Photometers	10	1		1	1	1			1	2	3
19. Liquid Chromatographs	10			1	1	1	1		2	1	3
20. Raman Spectrographs	2									2	
21. Energy-Dispersive X-Ray	2										2

Total number of labs reporting instrumentation — 144

APPENDIX A
MAIL SURVEY FORM

PROJECT SEARCH

Form 1

CRIMINALISTICS LABORATORY INFORMATION SYSTEM (CLIS) INFORMATION FORM

1. a. Name of laboratory ____________ b. Year established ______

   c. Name and title of laboratory director ____________

   d. Controlling jurisdiction: Federal ______ State ______ County ______ City ______

   e. Main ______ Satellite ______

   f. Geographical jurisdiction served ____________

   g. , ɔulation of area served __ __ __ h. Number of full-time employees ______

   i. Number of technically trained employees who perform analyses and give testimony. Please list each employee only once.

      Firearms and toolmark examiners ______ Questioned document examiners ______

      Chemists or microanalysts ______ Toxicologists ______

   j. Total case load 1971 ____ 1972 ____ 1973 ____

2. What are your current plans for expanding your laboratory?

   a. Personnel:

      Firearms and toolmark examiners ______ Questioned document examiners ______

      Chemists or microanalysts ______ Toxicologists ______

   b. Services ____________

   c. Acquisition of new equipment and/or instruments (specify)

      On order: ____________

      Planned: ____________

3. a. Do you use a computer? Yes ____ No ____

   b. Do you have access to a computer that you are not presently using? Yes ____ No ____

   c. If "a" or "b" is "Yes," specify manufacturer and model number: ____________

   d. If you use a computer, please state for what purpose(s): ____________

4. Do you have knowledge of any automated laboratory information systems or computerized laboratory reference, bibliographic, evidence files?

Type	Source
______	______
______	______
______	______
______	______

5. Please list the bibliographic/abstracting services that you currently use in your laboratory: ____________

The purpose of Chart 3 is to identify (1) the general information needs of your laboratory which you feel could be supported by a computerized information system and (2) how important those needs are to your laboratory.

8. Please indicate in column B, Chart 3, the general information needs of your laboratory which you feel the CLIS should support.

9. For the general laboratory needs checked "Yes" in column B, Chart 3, please select the ten information needs which are most important to your laboratory and rank them in column C, Chart 3, using a scale of 1-10: 1 = most important need, 10 = least important of the 10 priority needs you have selected. Please do not assign multiple priority rankings; i.e., there should be only one information need, ranked "1," one information need ranked "2," etc.

Chart 3

A	B		C	D
General Laboratory Information Needs	Yes	No	Priority	Comments
A.* Analytical/Identification Support (including TLC)				
B. Sources of Specialized Expertise				
C. Sources of Standard Samples				
D. Bibliographic Information				
E. Literature Abstract Information				
F. Computation Data and Capability				
G. Sources of Specialized Reagents				
H. Explosive Tagging				
I. Rifling Specifications				
J. Compilation of Statistics to Determine Specimen Uniqueness (Example: blood, glass)				
K. Other (Specify)				

**Processing* instrumental output to limit identification possibilities for unknown substances.

12. Please indicate the instrumentation currently used in your laboratory in column B, Chart 5.

13. If column B, Chart 5, is checked "Yes," please insert the manufacturer's name and model number in column C, Chart 5.

14. For the instruments checked "Yes" in column B, Chart 5, please indicate the 10 most frequently used for each of the past 3 years in columns D, E, and F, Chart 5. Use a scale of 1-10: 1 = most frequently used instrument, 10 = least frequently used instrument of the 10 selected.

15. For the instruments checked "Yes" in column B, Chart 5, please indicate the five priority instruments which you feel the CLIS should support. (Use a scale of 1-5: 1 = top priority, 5 = least priority of the top five.

Chart 5

	A	B		C	Relative Frequency of Use			Priority
	Instrument	Yes	No	Manufacturer-Model Number	D	E	F	G
					1971	1972	1973	
1.	Infrared Spectrophotometer							
2.	Ultraviolet Spectrophotometer							
3.	Visible Spectrophotometer							
4.	Near Infrared Spectrophotometer							
5.	Gas Chromatograph							
6.	Liquid Chromatograph							
7.	Gas Chromatograph–Mass Spectrograph							
8.	Mass Spectrograph (Inorganic)							
9.	Emission Spectrograph							
10.	Raman Spectrograph							
11.	X-Ray Diffractometer							
12.	X-Ray Fluorescence							
13.	U-V Fluorescence							
14.	Atomic Absorption Spectrometer							
15.	Flame Photometer							
16.	Electron Probe (ESCA)							
17.	Nuclear Magnetic Resonance							
18.	Differential Thermal Analysis							
19.	Neutron Activation Analysis							
	Radiation Detection Equipment							
20.	Scanning Electron Microscope							
21.	Electrophoresis							
22.	Others (Specify)							

APPENDIX B
INTERVIEW GUIDE FORM

PROJECT SEARCH

Form 2

CRIMINALISTICS LABORATORY INFORMATION SYSTEM

INTERVIEW GUIDE

Laboratory Name: ______________________ Date: __________

Interviewee(s): ______________________

____

____

____

Interviewer: ______________________

GENERAL LABORATORY INFORMATION FORM

A. Check List Items

1. Meet with laboratory director.
   a. Describe project - purpose, scope
   b. Explain Project SEARCH, LEAA funding
   c. Explain CLIS Special Project Committee
   d. Describe general information to be collected
   e. Identify laboratory personnel to be interviewed (talk to examiners in each section)
   f. Describe backgrounds and expertise of PRC/PMS interview team
2. Discuss Form 1 (mail information form) if completed. Complete as necessary.
3. Complete Form 2, General Laboratory Information Form.
4. Complete one (1) Form 3 for each evidence file utilized by the laboratory.
5. Complete Form 4, Bibliographic/Abstracting Services.
6. Complete Form 5, ADP Capabilities
7. Complete one (1) Form 6 for each type of instrumentation that might be supported by automation.

B. General Questions

1. What types of evidence files would you like to have available in your laboratory?

Type of File	Use of File

2. Do you know of any laboratories or organizations that have these files?

____

3. Have any companies approached your laboratory with respect to installing automated laboratory information systems? If so, what are the names and addresses of these firms?

Name of Firm & Representative	Address & Telephone No.

4. Do you have any knowledge of automated information systems or computerized laboratory reference, bibliographic, evidence data bases or modules?

Type	Source	Quality

5. What is your laboratory's geographic area of responsibility? (Obtain map if possible)

6. What is the organizational structure in which your laboratory is located? (Obtain organization chart if possible)

7. What is the management reporting chain external to the laboratory? Describe if it differs from the chain implied in the organizational structure.

8. How is the budget established for the laboratory? Who has final budget approval?

9. How would you describe the interaction that your laboratory has with other laboratories? On what levels does it occur, frequency, and subject matter?

Form 3

PROJECT SEARCH

CRIMINALISTICS LABORATORY INFORMATION SYSTEM

INTERVIEW GUIDE

Laboratory Name: ______________________ Date: ______________

Interviewee(s): ______________________

____

____

Interviewer: ______________________

EVIDENCE FILE INFORMATION FORM

1. File Name of Subject Matter: ______________________
2. Storage Media: ______________________
3. Currency of file (frequency of all types of maintenance, additions, changes, and purge)

____

____

4. Problems encountered with file: ______________________

____

____

5. Items/elements of information and coding structure:

Item/Element	Coding Structure

Form 4

PROJECT SEARCH

CRIMINALISTICS LABORATORY INFORMATION SYSTEM

INTERVIEW GUIDE

Laboratory Name: ______________________ Date: ______________

Interviewee(s): ______________________

____

____

Interviewer: ______________________

BIBLIOGRAPHIC/ABSTRACT INFORMATION FORM

1. What are your literature search/storage requirements?

____

____

____

____

2. How frequently do you conduct such searches?

____

____

3. What are your most frequently searched subject areas? ______________

____

____

4. What bibliographic/abstracting documents or services do you now use? What do they cost? (Obtain names, publishers, and addresses, and xerox copies of pages)

____

____

____

5. Are any of the above services supplied on microfilm? (Note name, manufacturer, film size, and equipment used)

____

____

6. How frequently do you use the microfilm service? ______________________________

____

PROJECT SEARCH

Form 5

CRIMINALISTICS LABORATORY INFORMATION SYSTEM

INTERVIEW GUIDE

Laboratory Name: ______________________________ Date: ______________

Interviewee(s): ______________________________

____

____

Interviewer: ______________________________

AUTOMATION/DATA PROCESSING INFORMATION FORM

1. What automated capabilities are utilized?

Name of System/Application	Source or Supplier of System	Cost

2. How is each system utilized? What laboratory functions or instrumentation are supported? (Use extra sheets if needed)

System/Application: ______________________________

____

____

System/Application: ______________________________

____

____

3. Do these systems help or hinder laboratory work? In what way(s)? ____

____

____

4. What computer equipment/hardware is required of each system/application?

System/Application: ______________

Equipment in laboratory ____________ External: ____________

____________ ____________

Form 5 (cont'd.)

System/Application: ____________

Equipment in laboratory: ____________ External: ____________

____________ ____________

____________ ____________

5. What data bases are required to support each system/application?

System/Application: ____________

Data base (1) ____________

Size ____________ Source ____________ Content/Format ______

Data base (2) ____________

Size ____________ Source ____________ Content/Format ______

PROJECT SEARCH

Form 6

CRIMINALISTICS LABORATORY INFORMATION SYSTEM

INTERVIEW GUIDE

Laboratory Name: ____________ Date: ____________

Interviewee(s): ____________

____

____

Interviewer: ____________

INSTRUMENTATION INFORMATION FORM

1. Type of Instrument: ____________
2. Model Number: ____________
3. Manufacturer: ____________
4. Please list the types of specimens most frequently examined using this instrument. (Input)
   a. ____________
   b. ____________
   c. ____________
   d. ____________
5. Determine how instrument output, digital, strip chart, or other is utilized by expert.
   a. What is analytical process from this point on? ____________

   ____

   b. What manuals, calculations, tables, or reference files are employed?

   ____

   ____

   c. Identify format, source, size, currency, cost (xerox papers if possible) ____________

   ____

   ____

   d. Amount of time spent in performing this search per examination.

   ____

Form 6 (cont'd.)

e. What problems does expert have in this process? ________________

____

____

f. What subsequent procedure is used if sample is still unidentified by the process used? ________________________________

____

____

g. What procedure is used to maintain chart, digital, or other output future reference? ________________________________

____

____

APPENDIX C
INTRODUCTORY LETTER

CTRF
CALIFORNIA CRIME TECHNOLOGICAL RESEARCH FOUNDATION
4343 Williamsbourgh Drive, Suite 100, Sacramento, California 95823, Telephone 916/322-3220
DOUGLAS E. ROUDABUSH, Executive Director

Dear

Project SEARCH is currently involved in a study which may have a revolutionary impact upon the criminalistics laboratory field for many years to come. The product of this project will be the conceptual design for a computer-based information system which will address the priority operational needs of all forensic crime laboratories throughout the country.

As you may know, Project SEARCH is a consortium of criminal justice experts from 50 states funded by the Law Enforcement Assistance Administration (LEAA) of the U.S. Department of Justice and administered by the California Crime Technological Research Foundation (CCTRF) under grants from LEAA.

The governing board of Project SEARCH, through its Executive Committee, has delegated authority for the administration and coordination of this effort to a special Criminalistics Laboratory Information System (CLIS) Project Committee. A list of committee mmebers is enclosed.

I am writing to you, and some 200 other criminalistics laboratories we have been able to identify throughout the country, in behalf of the CLIS Project Committee for several reasons. First, because of the potential importance of this project, we want to announce its commencement to the field. Second, if this project is to be of benefit to all laboratories, we must work with you as directly as possible to obtain essential data, both objective and subjective, upon which the design concept will be based.

Consequently, within a month or so we will be asking you specifically to aid us in compiling the data which will ultimately determine the relative success of this project. All laboratories will be asked to send us some data through the mail. We will ask others if we can make personal visits to obtain their thoughts on what such a system should do for their laboratory.

We recognize the potential for some disruption and inconvenience in either case, but sincerely hope you will be able to contribute to the success we anticipate but certainly will not achieve without your assistance.

Sincerely,

Thomas M. Muller, Chairman
CLIS Special Project Committee

TMM/clr

END