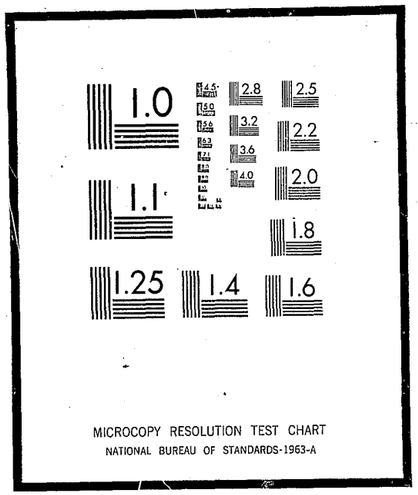

WASHINGTON OPERATIONS

RESEARCH ON LATENT FINGERPRINTS ON HUMAN SKIN

October 1973

Equipment Systems Improvement Program Report
prepared for

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U.S. DEPARTMENT OF JUSTICE
LAW ENFORCEMENT ASSISTANCE ADMINISTRATION
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THE EQUIPMENT SYSTEMS IMPROVEMENT PROGRAM

Following a Congressional mandate* to develop new and improved techniques and equipment to strengthen law enforcement and criminal justice, the National Institute of Law Enforcement and Criminal Justice under the Law Enforcement Assistance Administration of the Department of Justice established the Equipment Systems Improvement Program. The objectives of the Program are to determine the priority needs of the criminal justice community to help in its fight against crime, and to mobilize industry to satisfy these needs. A close working relationship is maintained with operating agencies of the criminal justice community by assigning systems analysts to work directly within the operational departments of police, courts and corrections to conduct studies related to their operational objectives.

This document is a research report from this analytical effort. It is a product of studies performed by systems analysts of the MITRE Corporation, a not-for-profit Federal Contract Research Center retained by the National Institute to assist in the definition of equipment priorities. It is one of a continuing series of reports to support the program decisions of the Institute relative to equipment development, equipment standardization and application guidelines. Comments and recommendations for revision are invited. Suggestions should be addressed to the Director, Advanced Technology Division, National Institute of Law Enforcement and Criminal Justice, Law Enforcement Assistance Administration, U. S. Department of Justice, Washington, D. C. 20530.

Gerald M. Caplan, Director
National Institute of Law
Enforcement and Criminal Justice

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* Section 402(b) of the Omnibus Crime Control and Safe Streets Act of 1968, as amended.

THE MITRE CORPORATION
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(703) 790-6000

31 October 1973

SUBJECT: RESEARCH ON LATENT FINGERPRINTS ON HUMAN SKIN

REFERENCE: TGL-65, LEAA Directive A-73-040

BACKGROUND

MITRE has made a brief review of research and development of a method for revealing latent fingerprints on human skin. Two inspectors in the San Francisco Police Department and the San Francisco coroner have advanced a technique reported several years ago for identifying fingerprints left by an assailant. Under laboratory conditions they have not only simplified an X-ray technique for photographing such prints, but they have also demonstrated that the print can sometimes be lifted onto tape after proper treatment. The Department requests support in finding "a reliable and simplified procedure that is economically feasible for any law enforcement agency and is applicable in the field at the scene of a violent crime."

FINDINGS

In the process of evaluating the request we discussed with several authorities the importance and methods of finding and identifying prints on human skin. In addition to receiving more details from Inspectors Kenneth Moses and Walter Ihle (the San Francisco investigators), a representative of the Federal Bureau of Investigation discussed some of their experience with such prints; members of MITRE's Forensic Laboratory Analysis Group identified technical and biological problems;

and representatives of the National Bureau of Standards and the Aerospace Corporation Development Group discussed their experience and the applicability of their current research. In brief, our findings and recommendation based on this cursory review are:

- o A practical routine technique for revealing latent prints on human skin does not yet exist but would be extremely valuable for identification of suspects, especially if it would be applied to living persons.

- o As Mr. Scott implies, the proposed X-ray technique has liabilities which seriously limit its application.

- o Alternative methods exist which would overcome the liabilities of the X-ray technique, but they may be ineffective for other reasons.

- o ESIP should support a quick review of the state of the art, including a review of the San Francisco work, to determine the fundamental difficulties encountered in attempting identification through fingerprints left on human skin and clothing by an assailant, and to delineate promising steps toward solutions.

Each point is discussed in more detail below.

The technique currently being studied in San Francisco has three operational drawbacks:

1. The X-ray technique is not adaptable to general use on living persons because it requires an incision and film insertion under each print.

2. The location of a print on the body must be known or surmised; the technique would not be used to locate a print.

3. The required X-ray equipment is too cumbersome for field use.

Although the last may be overcome by future equipment, the others are inherent in the method and indicate that any further research should encompass more than X-ray techniques.

The utility of revealing prints on human skin cannot be quantified quickly and rigorously because the required data are not readily available. For example, one measure of operational utility would be the

fraction of homicide cases in which charges were not placed or convictions could not be attained because of a lack of positive identification. Instead, only such collective figures as the overall clearance rate and conviction rate are readily available. Though such aggregate figures do not show where lack of identification is the problem, they do indicate where the greatest potential applications may lie. For example, the 1972 clearance rates for murder, aggravated assault, and forcible rape were 82%, 66%, and 57%, respectively. Of those charged, acquittals or dismissed cases numbered 36%, 41% and 49%, respectively.(1) Therefore, there would appear to be a greater potential "market" for print identification in forcible rape and aggravated assault cases than in homicide, but it would require the capability to find and identify prints on living persons as well as on cadavers.

The total number of possible applications cannot be the sole measure of potential utility; some weight must be given, also, to the small number of crimes where there is no other lead. The publicity which often surrounds such crimes sometimes causes as disproportionately large resource allocation which makes a solution both more important and more visible. Though none could quantify his assessment, the persons consulted about this proposed research gave uniformly high estimates of the potential utility of a technique to reveal fingerprints on human skin or, alternatively, on clothing. However, the problem (Problem Identification Report 112) was scored only moderately important by MITRE's Problem Assessment Group using their standard criteria.

X-ray techniques have been used to a limited extent to identify prints on hairless areas of living persons,(2) but even if that approach were further developed and if X-ray equipment became more practical for field use, the problems of locating a print would remain. A material is needed which is sufficiently non-toxic for whole body use on living persons, which has the requisite physical properties for fingerprint work, and which produces visible images directly or under stimulation (e.g., by fluorescence). Though such a concept would overcome the limitations of the X-ray technique, it is possible that the print itself does not survive long on living skin.(2) On the basis of only a cursory review, we cannot be certain what the controlling problems are in revealing prints on either skin or clothing.

The request of the San Francisco Police Department illuminated an important problem and their proposed areas of research are sound when interpreted to include more than X-ray methods. However, our discussions uncovered other facets, such as those mentioned above, as well as leads which indicate that more independent work already exists which could be very informative if it were mutually correlated and summarized.

The Development Group has an approved FY 1974 project on latent fingerprint research. We recommend that ESIP initiate a quick review of the state of the art of fingerprint detection and identification technology specifically related to latent prints on human skin and clothing as the first stage of that project. The review should incorporate at least the work of the FBI and the New York and Chicago Police Departments, as well as that of the San Francisco Police Department. The objective should be to identify the specific problems which explain why the search for such prints is not yet a routine procedure. The active product should be a detailed outline of suggested research which offers the best promise of solutions, with recommended priorities for ESIP funding.

REFERENCES

1. C.M. Kelley, "Uniform Crime Reports for the United States - 1972", FBI.

2. A.L. Cunn, "Use of X-ray and Other Techniques to Visualize and Reproduce Fingerprints from Living Human Skin", Law Enforcement Sciences and Technology, Volume III (1970), p. 509.

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