Document Title: **Evaluability Assessment of Mobile Automated Fingerprint Identification System (AFIS)**

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Evaluability Assessment of Mobile Automated Fingerprint Identification System (AFIS)

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NIJ Guidance

The National Institute of Justice (NIJ) recommends an evaluation of Mobile Automated Fingerprint Identification System (AFIS) technology in the site assessed below or other appropriate settings where this technology is being implemented. NIJ supports state-level deployment of this technology in South Carolina. In particular, NIJ is interested in evaluations with appropriate comparison groups in a police patrol setting. Extent of deployment appears to be a significant hurdle to accomplishing an evaluation of this technology. NIJ will consider providing the AFIS units necessary to conduct this evaluation. Applicants should indicate the number of units that are necessary to carry out the project and include a description of current or intended implementation policies and practices.

Applicants who propose to evaluate this technology are encouraged to consider outcome variables such as identification of wanted individuals and identification errors as well as challenges (including threats to validity common to pre-experimental designs) identified below.

Applicants may depart from this guidance by providing appropriate rationale.

1. Technology Summary: The San Joaquin County Sheriff's Department has implemented a prototype mobile AFIS system, in collaboration with local police departments, juvenile and adult probation and the district attorney's office. This technology, known as *Live ID*, can identify unknown persons and can also link fingerprints taken in the field to on-file mug shots. According to Cogent Systems, the technology vendor, this technology can remotely transmit digital fingerprint images to Bluetooth-enabled PDAs, laptops or cell phones. These images are then submitted to a remote server that can search local or statewide fingerprint records. Search results are then returned and displayed on the remote device's LCD display (www.cogentsystems.com). At present the department has mobile AFIS scanners in operation in the county jail. These are routinely utilized for identification and scanning

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purposes at booking intake, as well as prior to release of prisoners. In addition, approximately five units are installed in police patrol vehicles, three of which are assigned to shift sergeants. Patrol deputies may request that one of the sergeants or another unit outfitted with AFIS assist them in the field to identify unknown individuals.

Expansion plans in 2006 called for the addition of thirty-five mobile units. Additional units were also to be installed in fixed locations, such as in probation and district attorney offices. The implementation of this technology will be in partnership with other jurisdictions in the county as well. Plans called for installation of ten units in the City of Stockton and between two and five units in six other incorporated cities, including Lodi, Manteca, Tracy, Rippen, Escalon and Lathrop. However, to date these expansion plans have not been put into motion.

Scope of Evaluation: Due to the very limited extent of deployment, evaluation options are somewhat limited in San Joaquin County at present. However, should the current system be expanded as planned, or if another jurisdiction is identified that is about to implement AFIS in the future, several evaluation options exist. The first would be a random assignment pre-post comparison area design of AFIS implementation, efficiency and effectiveness and a second would be a post-only implementation and outcome study. With a sufficient number of use incidents a cost benefit study of identification efficiency might also be possible.

a. Summary of Evaluability Assessment Activity: The assessment of the feasibility of evaluating mobile AFIS technologies began with a literature review and a Web-based search to identify vendors of such identification technology. The researchers also contacted technology experts at the National Law Enforcement and Corrections Technology Centers (NLECTC), and held conference calls and personal interviews with NIJ Program Managers from the Office of Research and Evaluation and the Office of Science and Technology. Outreach was also made to the Center of Excellence in Biometrics and the International Biometrics Group.

The literature review, telephone interviews, and conference calls revealed that mobile biometric technologies are relatively new to the field of law enforcement and are used by only a handful of agencies. However, very little is known empirically about the effects of mobile AFIS identification technology.

The Urban Institute's initial screening identified two mature applications of mobile biometric identification technology. One was found in Hennepin County, which began implementing mobile AFIS in 2002 and currently has 100 operational units. The other was in San Joaquin County, California. San Joaquin has been planning to expand its limited AFIS application in the near future with an additional 55 new units.

On the basis of the screening information compiled, UI and NIJ mutually decided that San Joaquin County, CA would be the location for a further site visit screening.

Finding: A scientifically rigorous outcome evaluation of the San Joaquin County application would be difficult at present. Current use of the technology in the local jail is

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routine as all suspects are fingerprinted for identification purposes at intake as well as at release. However, field uses are quite limited due to the small number of available units, as well as limited necessity of deputies needing to identify unknown persons. While use frequency could not be verified empirically, local staff estimated that deputies requested assistance from AFIS equipped units perhaps once per shift.

2. Brief Literature Review

What do we already know about projects like these? Would this evaluation add to what we know?

State and local law enforcement agencies have a critical need for accurate identification of individuals. When officers encounter persons unknown to them they may need to ascertain whether they have outstanding warrants, have suspended or revoked driving privileges, are gang members, have been reported missing or may be dangerous based upon past behaviors or a criminal record. Until relatively recently, the only means available in the field to meet these needs was to rely on identification carried by possible suspects or persons police encounter. Historically the police have had to rely upon photo identification cards, such as driver's licenses or state-issued IDs for identification of unknown persons. Unfortunately, the police often encounter individuals without identification cards or sometimes with falsified ones. In addition to police, a variety of other law enforcement entities such as jails, courts, prosecutor's office, and prisons need to have a way to accurately identify offenders, suspects, and persons they encounter.

In order to solve such problems biometric technologies have recently been developed for law enforcement use. These are designed to provide rapid and accurate identification of individuals encountered by the police in the field based upon unique physiological characteristics instead of physical documents. These technologies include facial, fingerprint, iris, retinal and voice recognition, among others. One of the most emergent of these law enforcement solutions to date, at least according to the literature, has been automated fingerprint identification systems (AFIS).

AFIS units can be mobile or stationary and are generally linked to local or regional law enforcement fingerprints databases. For example, Tacoma Washington Police recently acquired an AFIS system that connects to regional databases containing more than 37 million records (Business Wire 2005). Tacoma AFIS is connected to the Washington State Patrol (the primary database of Washington State) and the Western Identification Network (an integrated AFIS shared by six states). Tacoma's connection to the Washington State database will provide them with access to the FBI database (IAFS). Tacoma's system has helped law enforcement officials develop leads for over 25 unsolved cases (Business Wire 2005)

Prior to AFIS law enforcement agencies utilized a manual system of matching fingerprints. However, that process was extremely time consuming, not as reliable, and utilized more resources. Biometrics such as AFIS are beneficial because they can confirm mistaken identify, process multiple subjects at once, identify jail and prison populations

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in real time, track individuals throughout correctional facilities, control access to restricted areas, provide identification for various activities, and identify individuals authorized to access various databases (Scarborough 2005). Recently there have been a number of laws passed by the Federal government that have helped fuel biometric technology popularity and increase use (Rhodes 2003).

Agencies currently using AFIS have reported much success. For example, law enforcement in Ontario, California and Hennepin County, Minnesota, are employing mobile automated fingerprint technology for in-field identification purposes. In Ontario a handheld fingerprint scanner was used in the field over 3,000 times during the first six months of 2003, resulting in the successful identification of 816 individuals and the detention of 164 of them. In Hennepin County, deputies used the system "679 times, identifying 110 individuals and detaining 37" (NLECTC 2004). Feedback from law enforcement officials in both jurisdictions about the value of this technology indicates that it is an effective means of confirming the identity of suspects encountered in the field. They also cited ease of use, portability, and increased inter- and cross-agency information sharing as additional benefits of this technology (NLECTC 2004; www.businesswire.com 2002). In general the advantages to fingerprint biometric technology include: availability of multiple sources (ten finger), ease of use and portability (i.e., mobile units), affordable access to large amount of background data or watch lists, proven effective in large scale systems, employs fingerprints which are unique to each individual and ridge arraignment remains permanent throughout one's lifetime (NSTC 2006).

There are also challenges or disadvantages to implementing and using AFIS including: negative public perception such as privacy concerns or liability implications, health concerns with touching a machine that has been touched by others, retrieving some latent images requires skill; and an individual's age and occupation affect some sensors ability to capture a complete and accurate image. In addition, some agencies do not have access to AFIS systems and therefore cannot link up with other systems in place. In addition, as agencies continue to link up to one another's AFIS systems the opportunity for suspected criminals to escape identification has lessened (NSTC 2006).

While there are many biometrics applications in use today by law enforcement and criminal justice agencies, very little evaluation has been done on the new implementations (Krishnan 2004), most likely because AFIS is a relatively new technology. An earlier study on the accuracy, applications, costs, legal issues, and privacy issues associated with potential uses of biometrics found that there is great potential for both public and private organizations (Coleman 2000). However, there have been a number of media reports and specific success stories offered as evidence of success, such as:

> Ten years ago when the Frederick County, Md. Sheriff's Office Corrections Bureau installed an AFIS at its adult detention center to make better verify the identities of criminals at booking. In 1998 AFIS identified 40 people who gave

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county law enforcement false names in 2003 that number jumped to 75 (Leckie 2006)

Santa Clara County Sheriff's (CA) detectives used AFIS to arrest a man for three unsolved homicides committed in the 1970s. He was on probation for domestic violence and police were able to match his prints to a 1975 and a 1977 double murder. (San Francisco Chronicle 2000)

Notably, two recent evaluations of biometric technology demonstrate positive findings. One is an evaluation of a demonstration program, the Biometric Inmate Tracking System (BITS) – a joint effort of the National Institute of Justice (NIJ), the United States Navy, and the United States Department of Defense. BITS was designed to improve inmate movement and tracking within prison and jails. Over a three-year period all of the biometric methods were tested (iris, facial, retinal, finger and hand geometry, voice, and fingerprint) and found that finger and hand geometry were the most accurate methods and voice recognition was the least effective (Miles and Cohen, 2006).

Thus, while it has been suggested that "the most important and significant impact of science on policing has been AFIS" and that fingerprint technology is the most persuasive and conclusive type of evidence available (Burkhalter 1998) little empirical evidence is available in support of such statements. This research seeks to provide some evidence of both implementation and deployment outcomes.

What audience would benefit from this evaluation?

The primary beneficiaries would be local corrections and law enforcement policymakers, administrators, and investigators. An evaluation would also contribute significantly to empirical knowledge about the use of technology to aid in decision-making and to improve efficiency and effectiveness outcomes. Federal funding agencies would also find the results of an evaluation useful for policy and program development.

3. Level of Site Cooperation

San Joaquin County Sheriff's Department voiced both a willingness to cooperate and an interest in an evaluation. There has been no formal evaluation to date and none is currently planned.

4. Background History

Implementation of this technology began several years ago in San Joaquin County. It includes the routine identification use at jail intake and release and a limited patrol application, primarily in shift sergeants' vehicles. Local probation and other police departments also participate in the AFIS system and identification matches are made utilizing a countywide database of previously fingerprinted individuals from all participating agencies.

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5. Program Design

Target Population

The target population is suspects or other individuals encountered by jail intake and release deputies, as well as by law enforcement officers in the field, who cannot be identified or who present false names or identification.

Project Goals and Objectives

The goals of the use of this technology are to improve the efficiency and effectiveness of identification of persons in the local jail, as well as in the field. The objectives for the jail setting are to: 1) Identify unknown persons during the booking intake process; 2) Prevent mistaken identity of inmates during transport outside of the jail; and 3) Positively identify individuals during the release process to prevent mistaken releases. On routine field patrol the objectives are to: 1) increase the apprehension of wanted persons; 2) decrease the amount of time required to identify unknown persons; and 3) reduce the number of mistaken identifications, thereby clearing innocent persons thought to be wanted.

6. Program Logic Model

Exhibit 1 presents the basic AFIS technology logic model. Under this basic model this technology is designed to be utilized in encounters with unknown persons. When used in the local jail or in the field three logical outcomes can take place: positive identification of the unknown person; no identification is possible with the technology; or possibly, a mistaken identification. Positive identifications for the purpose of this study are thus defined as successful uses. On the other hand no identification or mistaken identifications are non-successes. Theoretically, at least, organizational efficiencies result from successful identification (time reductions, for example) and organizational effectiveness is increase through reduced mistaken identifications and apprehensions of wanted persons. Other outcomes could also be measured in jail settings, such as reduced booking times, identification of individuals with mental health needs or histories of violent behavior while incarcerated and other potential behavioral issues.

However, careful consideration of this logic model shows intermediate outcomes of the employment of this technology as well. The hypothesized positive efficiency and effectiveness outcomes are contingent on valid and reliable identification decisions by an individual deputy or officer in the local jail or in the field. It is assumed that technology utilization results in positive identification decisions, but this assumption has not been empirically tested.

Is the logic supportable by empirical evidence?

The only empirical evidence at present includes anecdotal “success stories” and limited descriptive findings of the numbers of individuals identified at jail intake or release, as well as individuals apprehended or released for warrants following the use of this

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technology in the field. Other outcomes have not yet been documented, nor have current findings been compared to other identification technology approaches.

Are there apparent contradictions or conflicts between certain activities and the outcome expected?

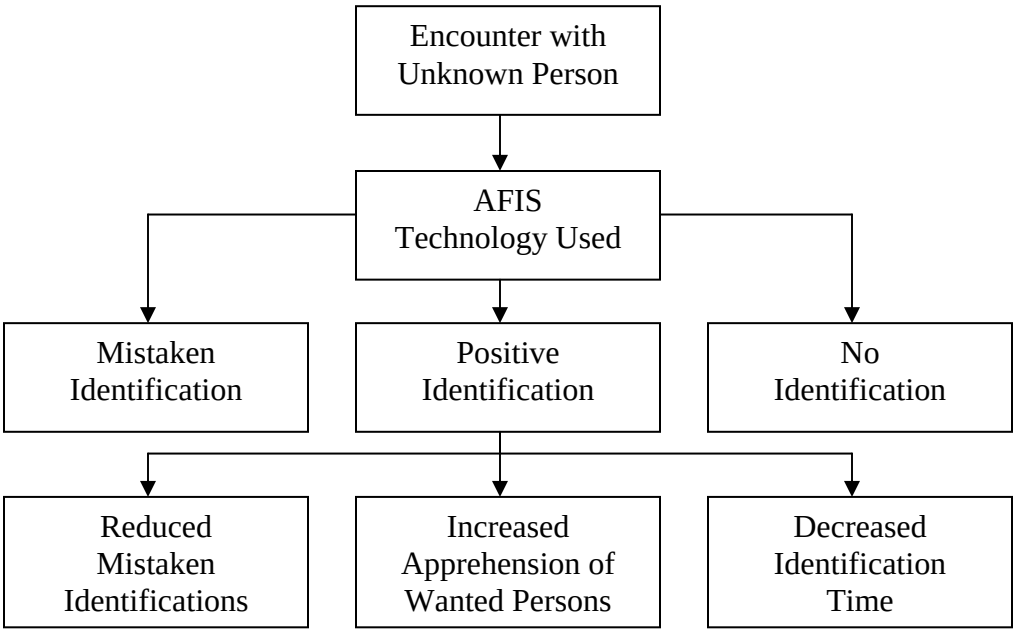
The use of this technology as a tool for law enforcement to improve the efficiency and effectiveness of the identification of unknown persons appears logical. However, these outcomes are dependent on the technology's matching accuracy as well as individual officer or deputy decision making when comparing unknown or suspicious individuals to existing identification data. The accuracy of such decision-making has not been systematically explored. In addition, a possible unanticipated outcome was noted during the site visit. It was hypothesized that an over reliance on AFIS might lead to the diminishing of officer or deputy investigative skills, particularly interview and interrogation techniques, that have been successfully utilized in the past to identify unknown persons without the benefit of such automated identification technology. Similarly, this hypothesis has not been tested.

7. Implementation Issues

Is the project being implemented as planned?

Plans developed last year called for the field expansion of AFIS by over tenfold. While it appeared that such plans still exist, implementation had not begun as of the date of the site visit.

Exhibit 1 – AFIS Logic Model



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Describe staffing.

Currently there are approximately 2-3 mobile units deployed in the jail and another 5 in patrol units, 3 of which are in shift sergeant's vehicles. Jail staffing includes intake and release deputies. Patrol staffing is primarily by the shift sergeants. It was also reported that several local police agencies, as well as probation and juvenile corrections, utilize the same technology and their identification scans are incorporated into the countywide reference data base maintained by the Sheriff's Department.

Describe the stability of the project over time

The implementation of this technology is mature in the local jail, but only in preliminary roll out stages in patrol vehicles. Current plans are to expand the use of this technology to more patrol units and to integrate photo displays into PDAs for jail transportation deputies.

What aspects of the project could be evaluated for outcome?

There are several outcome designs worth considering for an evaluation of AFIS in jail and police patrol environments. In a jail setting, use of AFIS would likely be near universal during intake and release. This would mean that randomization would not be feasible. A pre- post- efficiency and effectiveness outcome design could be utilized for a site that has not yet implemented AFIS but is about to. Otherwise, a post-only design would be necessary.

An alternative and more rigorous outcome evaluation design appears feasible in a police patrol setting. This would be a pre-post comparison group design, for a site that is currently planning to implement AFIS, or one such as San Joaquin, which is expanding deployment. Two options exist for comparison areas. One design would restrict implementation to randomly selected areas of the jurisdiction (precincts or districts, for example). Those areas would become the experimental areas and the other areas would be controls. Another alternative for this design would be implementing the technology throughout a department, which would be the experimental department, and using a similar department without mobile biometric technology as a control. Under both options, pre-post and longitudinal time series outcomes could be compared. It should be noted, however, that ensuring the integrity of such quasi-experimental designs would likely be a challenge for researchers given the practical influences that could arise and threaten the maintenance of true comparison areas.

What would the outcome measures be?

Efficiency and effectiveness outcome measures would include mistaken identifications, apprehension of wanted persons, and time required to identify unknown persons. Intermediate outcome measures include accuracy and consistency of officer identification

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decision-making using AFIS. The reliability and accuracy of AFIS matching could also be ascertained by documenting false positives and false negatives.

How could an appropriate comparison group be created?

Naturally occurring comparison events do not appear to occur in the jail setting in San Joaquin County and probably could not be created in other jail settings. But, in the patrol environment an efficiency and effectiveness study, internal comparison groups could be created in a startup agency by restricting use of AFIS technology to selected geographic areas within the agency's jurisdiction and using other areas within the jurisdiction as comparison groups. Alternatively, another similar law enforcement agency could be recruited for comparison purposes.

Are the sample sizes statistically significant?

The availability of outcome data in San Joaquin suggests that sampling would not be required. This would be particularly true in patrol environments, as the frequency of incident use is likely to be relatively small, perhaps too small to detect effect sizes.

Is random assignment possible?

Not for a post-only efficiency and effectiveness outcome design within a jail setting. However, for patrol comparison areas could be randomly generated. Randomization of the use by individual officers or deputies does not appear to be feasible.

Recommended Approach

It is recommended that NIJ support a pre-post comparison group design in either San Joaquin or another jurisdiction just beginning implementation of AFIS. This design is the most rigorous approach possible and the one least likely to result in findings subject to alternative explanations.

Alternative Approach

An alternative approach would be to implement a post-only case study where field applications are mature, or in jail settings, where use cannot be controlled and where comparison areas or applications cannot be utilized.

What strengths and weaknesses do the designs have?

Both of the efficiency and effectiveness designs suffer from the typical threats to validity associated with pre-experimental approaches. Their primary strength is the generation of knowledge on which to base future research efforts in an area where very little is known from a social science perspective.

How long in duration would the evaluation be?

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It is estimated that a post-only study of implementation and outcomes could be accomplished within eighteen months. A pre-post comparison group study of efficiency and effectiveness in a jurisdiction just beginning the implementation of AFIS technology would likely take an additional 6 months or more. This would be primarily due to the extra time required to identify and recruit a comparison area or agency and to collect and analyze new data.

What would be the estimated cost?

A pre-post comparison group study of a new AFIS application is estimated to require $325,000–350,000 because of new data collection requirements or startup recruitment costs associated with use of a comparison agency. The least costly would be the post-only case study of San Joaquin or another AFIS agency. Some new data would need to be collected, but current data systems appear more than adequate. Estimated costs for this approach would be in the $175,000-200,000 range.

What aspects of the project make an evaluation more difficult?

For the pre-post comparison group design, site recruitment, data access, and gaining buy-in for an evaluation, particularly from a comparison agency, if one is used, could present obstacles. Maintenance of non-use in comparison areas in a single jurisdiction would also be a challenge. A post-only case study would be the least challenging, but would still require agency and researcher data collection demands.

8. Measurement Model

The efficiency and effectiveness outcomes and intermediate decision making outcome measures are summarized in the logic model (exhibit 1). These include accuracy and consistency of officer or deputy identification decisions that result in the apprehension of wanted suspects, release of suspects not wanted, and decreased identification time.

9. Data

Comment on the quality and availability of project-generated data to support these measures.

The San Joaquin County Sheriff's Department reportedly maintains comprehensive AFIS use databases that can be used for evaluation purposes. These include electronically stored tables of AFIS uses and outcomes. The department maintains these data in collaboration with its AFIS vendor, although it is accessible from the department's own computer systems.

Can services delivered be identified?

Delivery of services is not an element of this technology application.

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Can target population be tracked over time?

The current population of technology use events can be tracked over time.

Would an evaluation have to generate new or additional data?

Regardless of the design employed, new additional data would have to be collected. New data collection would be most burdensome for the pre- post- design and least demanding for a post-only efficiency/effectiveness design.

10. Summary Remarks

Recommendations for evaluation

It is recommended that a pre- post- outcome design in patrol settings or post-only design within a jail setting be considered by NIJ. This is particularly important given how little is known about the efficiencies and effectiveness of AFIS. Such a study could eventually be implemented in San Joaquin once expansion plans are initiated again. Alternatively, a new agency just beginning AFIS implementation and use could be identified for future evaluation efforts.

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