The Ident Automation Strategic Plan: Critical Assumptions and Scenarios

The FBI has spent the last year working on a strategic plan for the Ident automation program. The strategic plan will provide the basis for the design and procurement of the FBI's automated fingerprint identification and criminal record system. A quality strategic plan will help ensure that the technical system meets well-defined needs in a realistic, timely, cost-effective way. Therefore careful congressional consideration of the FBI's planning process is needed. The FBI faces several challenges in developing a strategic plan and making key assumptions about

NFF/III implementation and criminal justice use,
baseline noncriminal justice use,
new fingerprint check applications,
response time,
file size, and
storage requirements.

Assumptions About NFF/III Implementation and Criminal Justice Use

The plan depends on assumptions about the implementation of NFF/III. If the NFF/III can be fully implemented, including enactment of an interstate compact or Federal legislation, then the daily volume of criminal fingerprints received by Ident could be reduced by as much as 50 percent or more from what it would otherwise be. This reduction would likely be the case even if there were an increase in the underlying level of criminal activity.

Ident received about 17,900 State and local criminal fingerprint cards per day in fiscal year 1990.[33] (All estimates of daily fingerprint card submissions assume 250 workdays per year-365 days less weekends and holidays.[34]) This number would increase to about 24,000 cards per day in 2000, assuming a basic underlying annual growth rate of 3 percent and no implementation of NFF/III (see table 2).[35] The volume would reach 29,200 cards per day in 2000, assuming 5-percent annual growth. (Use of the term "cards" includes fingerprint images as well, to the extent electronic submissions replace paper cards by 2000.) If the NFF/III is phased in over a 10-year period, then this expected growth rate would be more than offset by reductions in State/local criminal fingerprint card submissions. The maximum reduction would be about 65 percent of the base in any given year after full NFF/III implementation, since roughly that proportion of criminal offenders are repeat offenders whose records (and fingerprints) should already be on file. Thus State/local fingerprint card submissions could decline from 18,000 per day in fiscal year 1990 to about 8,400 per day in fiscal year 2000 with full NFF/III and 3-percent underlying annual growth, or to about 10,200 per day assuming 5-percent growth. If the NFF/III is half implemented in fiscal year 2000, perhaps a more realistic scenario, the reduction would be 30 to 35 percent of the baseline growth. Under this scenario, State/local submissions would decline marginally to about 16,800 cards per day in fiscal year 2000 with 3-percent underlying growth, or increase modestly to 20,400 cards per day with 5-percent growth.

Ident receives a small number of Federal criminal fingerprint cards—about 700 per day in fiscal year 1990. This number would increase to perhaps 940 per

Table 2—impact of NFF/III Implementation on FY2000 Daily Criminal Justice Fingerprint Card Submissions

	Cards per day		
	State/local	Federal	Total
FY90 base (no growth)	17,900	700	18,600
With 3% a.g.			
With no NFF/III	24,100	940	25,040
With half NFF/III	16,800	940	17,740
With full NFF/III	8,400	940	9,340
With 5% a.g.			
With no NFF/III	29,200	1,140	30,340
With half NFF/	20,400	1,140	21,450
With full NFF/III	10,200	1,140	11,340

a.g. = annual growth.

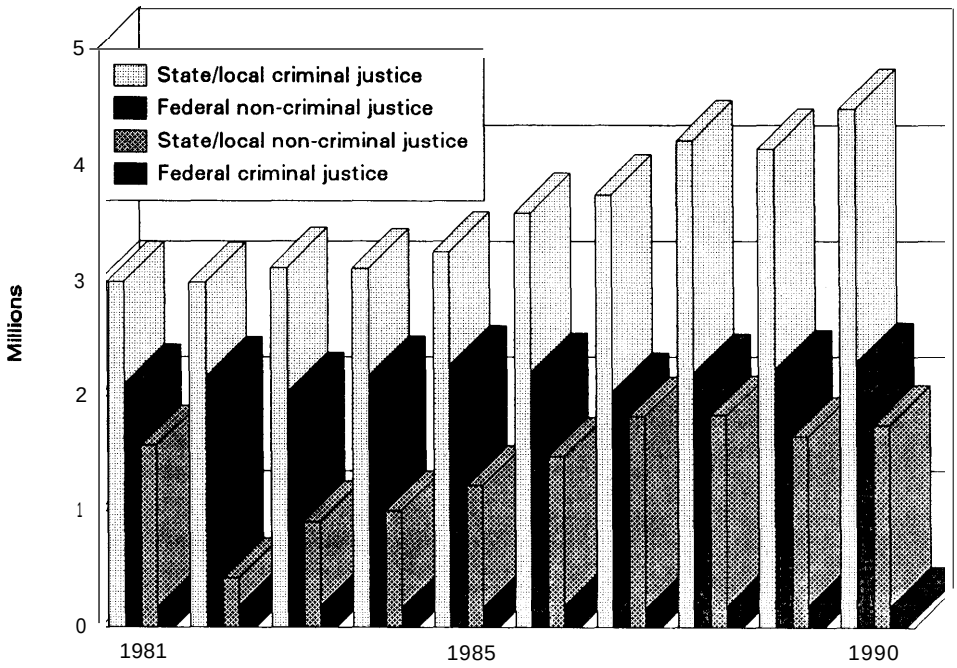
SOURCE: Office of Technology Assessment, 1991.

334.48 million cards divided by 250 workdays per year.

34Ident currently operates with a full day shift and one-half evening shift Monday through Friday (except holidays), and with a skeleton staff nights, weekends, and holidays to handle emergency requests and system maintenance. Ident assumes that the same basic staffing pattern will be used with a fully automated system.

35 State/local criminal fingerprint card submissions increased about 2 percent/year for FY8 1-85, but 4 percent/year for FY86-90.

Figure 5--Total Volume of Fingerprint Cards Submitted to Ident by Type, 1981-90



SOURCE: Federal Bureau of Identification, 1991.

day at an assumed annual growth rate of 3 percent, and to 1,140 per day at 5-percent annual growth (which is far greater than the historical rate[36]—see figure 5). The total combined (Federal plus State/local) daily criminal fingerprint card volume thus could range from a low of about 9,000 with full NFF/III to a high of about 25,000 with no NFF/III and 3-percent underlying growth (see table 2). With 5-percent growth, the total combined criminal fingerprint volume could range from about 11,000 to 30,000 cards per day, again depending on the extent of NFF/III implementation.[37]

The FBI's crime statistics indicate that total criminal arrests grew by about 3 percent per year from 1980 through 1989, and that serious crime arrests grew by about 2 percent annually.[38] Thus an assumed 3-percent baseline growth rate for the next decade should cover likely increases in criminal fingerprint card submissions generated by criminal activity. A 5-percent baseline growth rate would allow for some further increase in the underlying crime rate or in fingerprint submissions for other reasons (e.g., new types of fingerprint checks, old fingerprints not submitted previously).

Since criminal fingerprints account for about half of the total number of fingerprints received by Ident (figure 6), full NFF/III implementation should translate into at least a 25-percent reduction in daily fingerprint activity, other things being equal. Also, full NFF/III implementation should result in a large reduction—as much as 90 to 95 percent—in the size of the computerized criminal history file maintained by Ident.[39] Whether and when this reduction will be realized is unclear, since it assumes that States will take full responsibility for all of their own records, including those currently maintained by Ident.

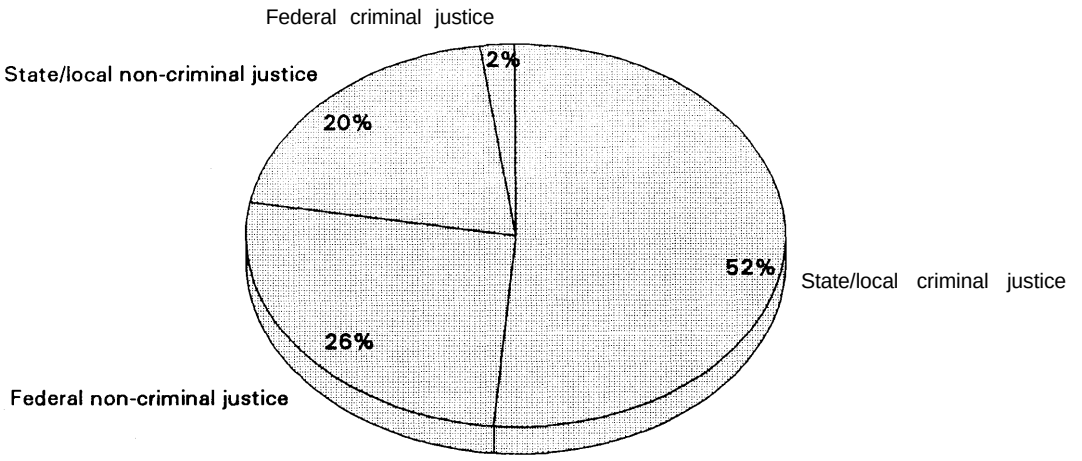
36The number of Federal criminal fingerprint card submissions grew only slightly over the last decade, fluctuating between 661 and 742 cards per day.

37The FBI questions whether full NFF/III implementation will be realized in the foreseeable future, and has concluded that 50-percent implementation is the best that can reasonably be expected by 2000.

38 See U.S. Department of Justice, FBI, *Crime in the United States: Uniform Crime Reports 1989* (Washington, DC: U.S. Government Printing Office, August 1990), p. 176.

39Even with full NFF/III implementation, the FBI is likely to retain responsibility for some older, less active or inactive records that are not maintained by the States.

Figure 6-Distribution of Fingerprint Cards Submitted to Ident by Type, 1990



SOURCE: Federal Bureau of Identification, 1991.

Assumptions About Baseline Noncriminal Justice Use

The plan also depends on assumptions about growth in current noncriminal justice uses of the Ident system. Noncriminal justice fingerprint checks account for about half of all Ident fingerprint card activity. Full implementation of NFF/III might result in a small reduction in noncriminal fingerprint submissions to Ident, since a State's own fingerprint files would occasionally have the relevant fingerprint, eliminating the need to forward a print to the FBI. However, this reduction is likely to be more than offset by underlying growth in noncriminal justice fingerprint checks.

The total number of requests for noncriminal justice fingerprint checks received by Ident from State and Federal agencies has varied widely, but has shown little net change over the last 10 years—the number was about 3.7 million in 1981 and 4.1 million in 1990 (see figure 5). Ident believes, however, that growth has been artificially restrained due to policy changes and increases in FBI fees charged for noncriminal justice fingerprint checks.[40]

The number of requests for Federal noncriminal justice fingerprint checks received by Ident grew only slightly during the 1980s, from 2.1 million (about 8,400 per day) in fiscal year 1980 to 2.3 million (about 9,200 per day) in fiscal years 1989 and 1990. Most of these are for employment and security purposes. Federal agency officials expect no significant baseline growth during the 1990s, since the Federal civilian workforce is unlikely to grow, and the Federal defense workforce may actually shrink.

The Defense Investigative Service (DIS) conducts background investigations for Department of Defense security clearances (on military, civilian, and industrial defense personnel). DIS conducts about 800,000 to 900,000 national agency checks per year, of which 400,000 include a name check and 500,000 include both a name and a fingerprint check. Little or no growth in such checks is likely during the 1990s since any increases in investigative requirements should be offset by reductions in total personnel. The Office of Personnel Management (OPM) conducts background investigations on Federal civilian employees (including some civilians employed by the Department of Defense). OPM requests about 250,000 to 300,000 criminal record checks per year, including name and fingerprint checks. The volume of checks roughly corresponds to the personnel turnover rate.[41] OPM anticipates no significant change in baseline turnover rates or fingerprint check volumes during the 1990s (new

40 In January 1990, the FBI established a user fee of $14 per fingerprint check for Federal employment applications, matching the fee previously established for fingerprint checks on State/local employment and licensing applications. In March 1990, the FBI raised the State/local employment and licensing fingerprint check fee to $20. In October 1990, the FBI raised the State/local fee to $23 per fingerprint check, and the Federal fee to $17 per check. The FBI believes that the noncriminal justice demand for fingerprint checks will rebound; however, the price elasticity of demand is unknown.

41 Estimated to be 12 percent of 2.2 to 2.4 million employees.

agency-specific fingerprint check requirements are considered separately).

The Immigration and Naturalization Service (INS) conducts criminal record checks, including fingerprint checks, on about 1 million persons per year who are seeking to become permanent U.S. residents (legal aliens) or naturalized citizens, or who are seeking asylum (primarily refugees). The baseline total has increased slightly during the 1980s, with the exception of a temporary larger increase (or bulge) due to an amnesty program. INS expects the 1990s to be similar, but with some increase in the base growth rate (due to higher immigration), possibly augmented by another temporary increase in 3 to 8 years when some of those granted amnesty seek naturalization. INS also runs about 220,000 fingerprint checks per year on persons who are apprehended at port-of-entry inspection stations or by the U.S. Border Patrol (Ident counts these as Federal noncriminal justice, although they obviously have a law enforcement dimension).

DIS, OPM, and INS collectively account for about 90 percent of all Federal noncriminal justice fingerprint checks. The composite baseline estimates project no significant growth during the 1990s. Federal noncriminal justice fingerprint card submissions would grow from 9,200 per day in fiscal year 1990 to 10,200 per day in fiscal year 2000, assuming a l-percent growth rate (see table 3), or 11,200 per day in fiscal year 2000 with a 2-percent growth rate (sources of growth above the base are discussed later). The assumed 1- to 2-percent annual baseline growth rate for the next decade should be adequate, since historical growth has averaged 1 percent over the last decade, and no net increase in Federal personnel or contractors is likely (again, new fingerprint check requirements are considered separately). The INS base might increase by as much as 4 to 5 percent per year by fiscal year 2000. But since DIS and OPM (accounting for about 60 percent of the Federal base) are likely to show very little if any baseline growth, a 2-percent overall growth rate should be able to accommodate INS needs. A 3-percent growth rate would provide an additional margin for any unanticipated new fingerprint check requirements.

Table 3-Projected Daily Noncriminal Justice Fingerprint Card Submissions, FY 2000 Base Level

	Cards per day
Federal:	
FY90 base (no growth)	9,200
With 1% a.g.	10,200
With 2% a.g.	11,200
With 3% a.g.	12,360
State/local:	
FY90 base (no growth—use FY88 peak year)	7,200
With 2% a.g.	8,800
With 3% a.g.	9,700
With 5% a.g.	11,700
Total:	
FY90 base	16,400
Federal at 1% a.g., State/local at 2% a.g.	19,000
Federal at 2% a.g., State/local at 3% a.g.	20,900
Federal at 2% a.g., State/local at 5% a.g.	22,900
Federal at 3% a.g., State/local at 5% a.g.	24,060

a.g. = annual growth.

SOURCE: Office of Technology Assessment, 1991.

State/local noncriminal fingerprint card submissions also increased slightly during the 1980s, from 1.6 million (about 6,400 per day) in fiscal year 1980 to 1.7 million (6,800 per day) in fiscal year 1990. Ident believes that demand was suppressed due to significant fee increases. The peak year was fiscal year 1988, when State/local submissions reached 1.8 million (7,200 cards per day). Setting data for fiscal years 1989 and 1990 aside, the annual growth rate between fiscal years 1980 and 1988 was about 2 percent. Using the peak year fiscal year 1988 figure as the starting point for fiscal year 1990, State/local submissions would reach 8,800 per day in 2000 with 2-percent annual growth, 9,700 with 3-percent growth, or 11,700 with 5-percent growth. This gives a noncriminal justice base range of about 19,000 to 24,000 cards per day in fiscal year 2000 (see table 3).

The combined base (criminal and noncriminal), assuming full NFF/III implementation, is about 29,000 to 34,000 fingerprint cards per day (see table 4). This means that the fiscal year 1990 level of 34,000 cards per day could be adopted as the fiscal year 2000 base level, although this figure would not allow much if any margin for new fingerprint check applications. Without NFF/III, the projected fiscal year 2000 volume would be 45,000 to 53,000 cards per day. With NFF/III at 50-percent implementation, the fiscal year 2000 volume would be 38,000 to 44,000 cards per day.

Table 4-Projected Total Fingerprint Card Submissions Per Day, FY2000 Base Level

	No NFF/III		Half NFF/III		Full NFF/III	
	3% a.g.	5% a.g.	3% a.g.	5% a.g.	3% a.g.	5% a.g.
Criminal justice:						
State/local	24,100	29,200	16,800	20,400	8,400	10,200
Federal	940	1,140	940	1,140	940	1,140
Noncriminal justice:						
State/local	9,700	11,700	9,700	11,700	9,700	11,700
Federal	10,200[a]	11,200[b]	10,200[a]	11,200[b]	10,200[a]	11,200[b]
Totals	44,940	53,240	37,640	44,440	29,240	34,240

a.g. = annual growth.
[a] =With 1% a.g.
b= With 2% a.g.

SOURCE: Office of Technology Assessment 1991.

Assumptions About New Fingerprint Check Applications

Federal Agency Fingerprint Check Proposals

New applications could push the daily fingerprint volume above the baseline growth projections. Some possible criminal and noncriminal (also known as civil) applications include INS naturalizations (civil); U.S. Border Patrol and INS apprehensions (criminal); checks on U.S. Census Bureau census takers, Federal Aviation Administration airport employees, and U.S. Postal Service employees; U.S. Secret Service investigations (criminal); and International Police Organization (Interpol) investigations (criminal). Other possibilities (discussed later) are fingerprint checks of firearms purchasers, license applicants, child care providers, teachers, and financial and securities industry officials.

INS projects a possible increase in naturalizations starting in about 3 years and continuing for a 5-year period. This increase will depend on how many aliens granted amnesty apply for U.S. citizenship when eligible. INS estimates that up to 400,000 additional applicants could apply per year, resulting in about 1,600 more fingerprint checks per day (for roughly fiscal years 1995 to 1999).

The U.S. Border Patrol would like to expand fingerprint checks on aliens apprehended at illegal border crossing points. The Patrol intends eventually to check everyone apprehended—about 1 to 1.2 million persons per year (or about 4,800 checks per day)—but does not intend to use Ident for the primary fingerprint checks. The Patrol needs an initial response within minutes, and plans to use live seamed single fingerprints compared against a fingerprint file of illegal aliens who are serious repeat offenders.

The file size will be much smaller than State or Federal criminal fingerprint files, in order to ensure rapid response using low-cost live scan equipment. The Patrol is targeting repeat serious offenders (e.g., those smuggling drugs, guns, and persons), not aliens who are merely trying to get into the United States for jobs. The Patrol does not have the resources, prosecutors, or jails to follow up on more than a small percentage of illegal entries—thus the need to focus on the most serious offenders. When the initial fingerprint check shows a hit, the Border Patrol plans to run secondary checks against State and Federal criminal fingerprint files. The same approach is being considered for the INS Inspection Service, which makes about 2.4 million apprehensions per year (in addition to Border Patrol apprehensions).

The Border Patrol and INS inspections combined could generate over 3.4 million fingerprint checks by 2000. But these will be checked against INS, not FBI, fingerprint files. The number of followup checks against State and possibly Ident files might double. This would mean an increase from about 220,000 full checks in fiscal year 1990 (100,000 Border Patrol, 120,000 INS inspections) to perhaps 440,000 in fiscal year 2000-a net increase of 220,000. The net impact on Ident might be in the range of 900 additional fingerprint checks per day.

The U.S. Census Bureau normally has little need for fingerprint checks—perhaps 1,000 per year on Census

employees (these are counted in the OPM totals). But in decennial census years, the Census Bureau must screen up to 2 million applicants for temporary census taker jobs. The Census Bureau could use name checks as the primary criminal records screening tool, with fingerprint checks reserved for those with some indication of a criminal record or for otherwise questionable applicants. Based on its 1990 experience, the Census Bureau expects that about 15 percent of all applicants will have some kind of criminal record (based on a name hit) and one-fifth of these (3 percent of the total) will have a disqualifying record. Fingerprint checks may be needed on between 3 percent and 15 percent of applicants, spread over the 18 months to 2 years preceding the 2000 census. This would translate into 30,000 to 150,000 additional fingerprint checks per year (assuming 2 million applicants), or about 115 to 575 checks per day, for those 2 years.

Using name checks for applicant screening raises civil liberties questions, however, if applicants are not given the opportunity to challenge adverse findings. Name checks might, in addition, miss criminals using phony identification. Should the Census Bureau decide to request fingerprint checks on all census taker applicants (and if it can afford them), an additional 1 million fingerprint checks per year (about 4,000 per day) for 2 years would be needed.

The Federal Aviation Administration (FAA) has been directed to develop a plan for conducting criminal history record checks on all employees and applicants with unsupervised, unrestricted access to airport operations (AOA access).[42] The FAA is evaluating its options. An estimated 650,000 persons have airport identification badges,[43] but many (e.g., parking lot, restaurant, and gift shop employees) do not have AOA access. Assuming 500,000 persons with AOA access and a 15-percent annual turnover rate, about 75,000 new employee record checks per year would be needed. One plan under consideration is to run name-checks on all current employees, and fingerprint checks on those with a name check hit plus all new employees. This would translate into about 150,000 fingerprint checks the first year (75,000 on current employees, assuming 15 percent have a name hit, plus 75,000 new employees), and 75,000 (or about 300 per day) each year thereafter.

Name checks may not be sufficient for AOA access employees, given the high risk and cost of security breaches, as well as civil liberties concerns. If the FAA decided to run fingerprint checks on all other AOA-access employees, say over a 2-year period, then roughly 210,000 additional checks per year (840 per day) would be needed for 2 years. If the FAA decided to run fingerprint checks on all new AOA-access employees at the time of hiring and all current AOA-access employees on, say, a biannual basis, then an additional 325,000 checks per year (1,300 per day) would be needed on a continuing basis.

The U.S. Postal Service is planning to conduct new fingerprint checks on an estimated 60,000 to 100,000 applicants and employees per year. If implemented, this plan would mean 240 to 400 more fingerprint checks per day.

The U.S. Secret Service already has its own AFIS capability and criminal fingerprint file, and does not depend on Ident for many of its fingerprint checks. In order of priority, the Secret Service would prefer to run fingerprint checks against: 1) the Secret Service file, 2) regional or State files relevant to a particular investigation, and 3) the Ident file. Ident automation presumably would increase Secret Service 'demand for Ident fingerprint checks, but the impact on overall Ident volume is likely to be insignificant. The Secret Service believes, nonetheless, that access to the new Ident system is essential for all Federal criminal justice agencies, and that funding should be provided for the peripheral equipment and terminals needed to ensure such access.

Interpol provides an organizational link between foreign and U.S. law enforcement agencies. The U.S. Interpol office handles about 10,000 to 11,000 cases per year, of which about 20 percent require fingerprint checks by the FBI and/or States. This case level has been stable, with some short-term variations during tourist seasons, major political or sporting events, and world political and military situations. The volume of record checks might slowly increase, as other nations become more automated. But even if FBI fingerprint checks were run on all current cases (quadrupling the number of checks), the impact on Ident would be minimal (about 40 more checks per day).

The potential impacts of the possible additional Federal fingerprint checks discussed thus far are summarized in table 5. The projected increase is highest in fiscal year 1999, ranging from 3,380 to 8,240

42 Includes aircraft, maintenance areas, fuel depots, runways, and taxiways.

43 Airport, U.S. carrier, and foreign carrier personnel.

additional cards per day. The projected increase in the base level is much less—1,480 to 2,640 cards per day continuing after fiscal year 2000.

Assuming full NFF/III implementation, the fiscal year 2000 target could be increased from 34,000 cards per day (the high-end baseline growth) to 43,000 cards per day to cover these proposed new Federal fingerprint check applications. The 43,000 level would provide a cushion of about 5,000 to 6,000 cards per day for other new Federal (and perhaps State) applications after fiscal year 2000 (in non-Census years). This cushion seems adequate, especially if operational and financial conditions limit the demand for new fingerprint checks regardless of the FBI's capability. Federal officials indicate, for example, that funding for large-scale additional fingerprinting is by no means assured.

Other Fingerprint Check Proposals

Other proposals include running fingerprint checks on firearm purchasers, driver's license applicants, child care (or senior care) providers, teachers, and financial and securities officials. The efficacy and cost-effectiveness of these proposals have not been established. Detailed examinations of firearm purchaser check proposals have concluded that point-of-sale fingerprint checks are not feasible for the foreseeable future. Even the most optimistic forecast for Ident automation does not envision response times of less than hours—much longer than the seconds or minutes needed for point-of-sale checks. Point-of-sale fingerprint checks against criminal identification files would be very expensive. The limited evidence available suggests that the percentage of ineligible firearms purchasers that could be detected only through fingerprint checks (i.e., those using aliases or phony identification) may be very small.[44] Name checks may suffice, with fingerprint checks reserved for secondary verification when needed.

The firearm purchaser fingerprint check proposal points up the need for comprehensive research on the efficacy and cost-effectiveness of fingerprint checks for noncriminal justice purposes. The use of fingerprint checks needs to be rigorously compared with the use of name checks, or initial name checks plus secondary fingerprint checks, when: 1) the base rate of criminal

Table 5-Possible Additional Federal Fingerprint Check Requirements (thousands per day)

Agency	Possible checks	Remarks
INS naturalizations	1.6	FY95-99
INS Inspection Service apprehensions	0.4	Continuing
U.S. Border Patrol apprehensions	0.5	Continuing
U.S. Census Bureau census takers	0.1-4.0	FY1999-2000
FAA Aviation Security employees	0.3-1.3	Continuing
U.S. Postal Service	0.2-0.4	Continuing
U.S. Secret Service	Negligible	
Interpol	Negligible	
Total increased base (INS inspections, Border Patrol, FAA, Postal Service)	1.4-2.6	Continuing
Increased base plus peak load (starting FY95)		
FY95 (+ INS Naturalizations)	3.1-4.2	
FY96 (+ INS)	3.1-4.2	
FY97 (+ INS)	3.1-4.2	
FY98 (+ INS)	3.1-4.2	
FY99 (+ INS, Census)	3.4-8.2	
FY2000 (+ Census)	1.8-6.6	
After FY2000	1.5-2.6	

SOURCE: Office of Technology Assessment, 1991.

44See OTA, *Automated Record Checks of Firearm Purchasers*, op. cit., footnote 23; Oregon State Police, *Study of Retail Firearm Sales and concealed Handgun Licensing in Oregon* (Salem, OR: Oregon State Police, Criminal Investigative Division, 1990).

activity in the population being checked is very low, and 2) applicants or purchasers have an opportunity to challenge record checks that result in disapproval (as is the case with "instant" record checks of firearm purchasers at the point of sale).[45]

The use of name checks for many job applicants raises civil liberties questions, since applicants may not be told of the results or given an opportunity to challenge unfavorable findings. Name checks may be better suited for license applicants, who, like firearm purchasers, presumably are given notice and the opportunity to challenge adverse actions. Name checks may, on the other hand, miss persons using phony identification, and this risk must be carefully weighed. Consideration of each proposal for name or fingerprint record checks should involve a careful balancing of benefits against costs and risks.

Other potential sources of increases in the number of fingerprint checks are stimulation of additional demand for checks due to the convenience of electronic transmission, inclusion of some juvenile fingerprints in the State/local fingerprint submissions, and submission of an estimated 10 million State/local criminal prints held by State fingerprint repositories and not included in the FBI file.[46] The stimulation of demand depends, in part, on the efficacy and cost-effectiveness of electronic fingerprint checks. The target of 43,000 cards (paper or electronic) per day could accommodate perhaps a 5-percent stimulation of total demand (all purposes) after fiscal year 2000, in lieu of (but not in addition to) the additional margin for new applications previously identified.

The submission of juvenile prints, presumably for serious offenders, is an unresolved policy issue. The volume and timing of such submissions are unknown. Juvenile offenders (under 18 years of age) accounted for about 640,000 serious arrests in 1989, which would translate into about 2,500 fingerprint checks per day if all arrests were checked.[47] The 43,000-cards-per-day target probably could accommodate phasing in serious juvenile offender submissions by 2000, assuming that a high percentage are repeat offenders and would have fingerprints already on file. At a 3-percent annual growth rate, serious juvenile offenses would reach about 900,000 in 2000. If 35 percent were new offenders, an additional 310,000 fingerprint checks per year (1,200 per day) would be needed.

Table 6-Possible FY2000 Targets for Fingerprint Card Submissions
(in thousands per day)

Criminal justice:	
State/local base with 3% a.g. and full NFF/III	8.4
Federal base with 3% a.g.	1.1
Federal new applications (continuing):	
INS inspections	0.4
INS Border Patrol	0.4
Interpol/U.S. Secret Service	Negligible
State/local supplemental:	
Juvenile offender submissions	1.2
One-time criminal card submission of 1.7 million over 5 years (and then allows margin for demand stimulation, other new applications, or NFF/III slippage)	1.4
Subtotal	12.9
Noncriminal justice:	
State/local base + new applications with 5% a.g.	11.7
Federal base with 2% a.g.	11.2
Federal new applications (continuing):	
FAA security	1.3
U.S. Postal Service	0.4
Federal supplemental:	
One-time civil card submissions (including INS naturalizations FY95-99):	1.6
Census FY1999-2000	4.0
(and then allows margin for other new Federal or State/local applications and demand stimulation)	
Subtotal	30.2
Total FY2000	43.1
Plus State/local noncriminal justice base with additional 4-5% a.g. (9-10%/year total growth)	6.0
Grand total FY2000 high growth	49.1
Plus State/local criminal justice base with additional 2% a.g. (5%/year total growth) and half (rather than full) NFF/III	12.0
Grand total FY2000 high growth/half NFF/III	61.1

a.g. = annual growth.
a With full NFF/III implementation unless otherwise indicated.

SOURCE: Office of Technology Assessment, 1991.

[45] Only 1 t. 2 percent of firearms purchasers, for example, appear t. have disqualifying criminal records, and perhaps 10 to 15 percent have any kind of record. See OTA, Automated *Record Checks of Firearm Purchasers,* op. cit., footnote 23. In contrast, 60 to 70 percent of arrestees, on the average, will have a prior criminal record.

[46] Typically, such prints are not included in the FBI file becuase the State repository did not receive an extra fingerprint coPY to forward to the FBI, or the FBI rejected a fingerprint card as illegible.

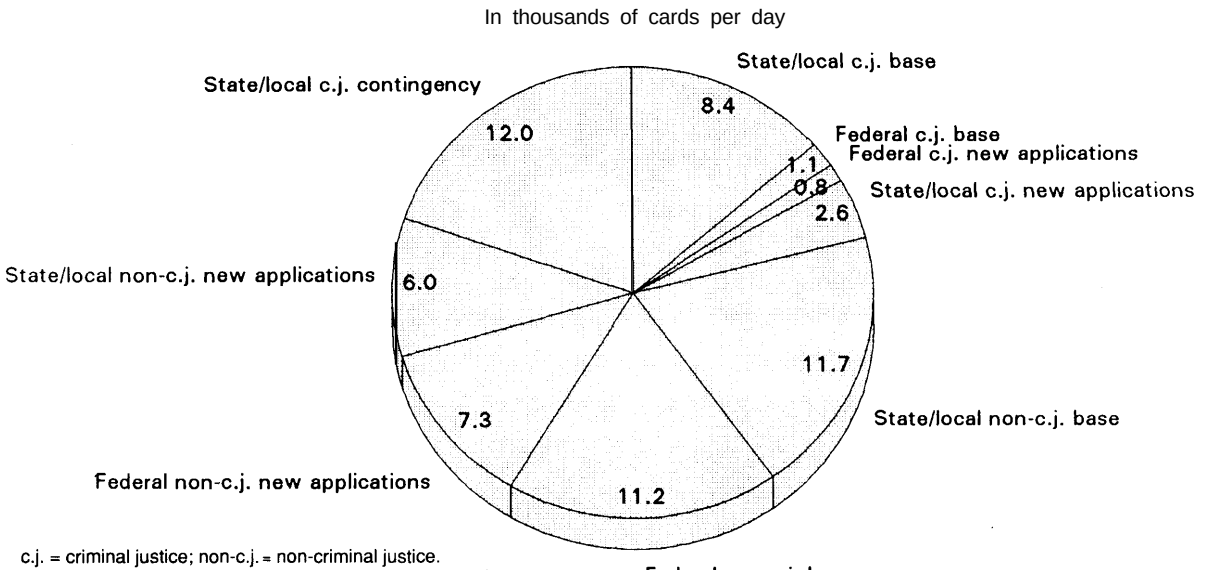
47 See U.S. Department of Justice, *Crime in the United States,* op. cit., footnote 38, p. 182. Serious arrests include murder, nonnegligent manslaughter, forcible rape, robbery, aggravated assault, burglary, larceny-theft, motor vehicle theft, and arson.

The 43,000-print target could not handle submission of the estimated 10 million previously unfiled cards unless submissions were stretched out over many years; even 10 years would be tight, at 1 million cards per year (4,000 per day). The 10-million estimate, however, may be questionable.[48] The FBI has estimated that the actual number of unfiled prints on new persons (with no prints on file from prior arrests) is about 1.7 million (of the 10 million). This figure, spread over 5 years, would result in an increase in yearly card submissions of 340,000 (or about 1,400 cards per day). States should be able to identify most repeat offenders by first running name checks against State criminal history files and the III and then making a positive identification at the State level. This procedure would reduce or eliminate the need for FBI fingerprint checks on repeat offenders.

The remaining major area of uncertainty is the rate of growth due to fingerprint checks of license applicants, financial and securities officials, child care providers, and teachers, and other new State/local noncriminal justice applications (whether pursuant to State or Federal law). The FBI has surveyed all States concerning projected noncriminal justice applications. The initial survey results suggested a year 2000 daily volume of noncriminal justice fingerprint checks at 50 percent or more above FBI expectations. Subsequent validation and adjustment of the survey results indicate that the original FBI estimate (37,000 cards per day) is still reasonable. Using OTA's analytical framework, the FBI estimate is equivalent to assuming a 9 to 10 percent (rather than 3 or 5 percent) per year increase in State/local noncriminal justice fingerprint checks. This equates to an additional 6,000 to 7,000 checks per day.@

The total daily volume target could be increased to about 49,000 or 50,000 per day in 2000 (see table 6), which should allow for substantial baseline growth, significant new applications, and a healthy margin for contingencies and perhaps some slippage in NFF/III implementation beyond fiscal year 2000. If NFF/III is assumed to be half (rather than fully) implemented in fiscal year 2000, and baseline growth in State/local criminal justice use is assumed to be 5 (rather than 3) percent, an additional 12,000 checks per day would be needed. The total fiscal year 2000 daily volume target

Figure 7—Projected Volume of Fingerprint Cards Submitted to Ident, 2000



NOTE: c.j. = criminal justice; non-c.j. = non-criminal justice.
See table 6 and accompanying text for detailed explanation.

SOURCE: Office of Technology Assessment, 1991.

[48]The 10 million includes some percentage of the 400,000 illegible fingerprint cards previously returned by the FBI to the States each year, plus an unknown number of cards never submitted. Many of these cards are, however, for repeat offenders who already have prints on file in State repositories and/or Ident.

49At lo-percent annual growth, th, FY90 State/local noncriminal justice base of 7,200 cards per day would increase to 18,674 cards per day in FY2000, compared with 11,700 cards per day at 5-percent annual growth—an increase of 7,000 cards per day.

Table 7—Range of Estimated Fingerprint Card Submissions Per Day, FY2000

	OTA-1 a	OTA-2a	OTA-3a	OTA-4 b	OTA-5 c	OTA-6 c
Criminal justice	11,000	13,000	13,000	25,000	34,000	50,000
Noncriminal justice	23,000	30,000	36,000	36,000	36,000	50,000
Total	34,000	43,000	49,000	61,000	70,000	100,000

a Full NFF/III implementation.
b Half NFF/III implementation.
c No NFF/III implementation.

NOTE: See text for explanation of OTA scenarios.

SOURCE: Office of Technology Assessment, 1991.

would then be about 61,000 fingerprint cards (see table 6 and figure 7). At 49,000 cards per day for full NFF/III implementation and 61,000 cards per day for half NFF/III implementation, the OTA and FBI projected totals are virtually identical, although arrived at using different methodologies.[50]

OTA has identified six scenarios for fingerprint card submissions (see table 7). The OTA-1, OTA-2, and OTA-3 scenarios assume full NFF/III implementation; the OTA-4 scenario assumes half NFF/III implementation. The OTA-5 and OTA-6 scenarios assume no NFF/III implementations. The OTA-1 scenario assumes no major new fingerprint check applications beyond what can be accommodated in the baseline growth. The OTA-2 scenario provides a margin for some new applications. The OTA-3, OTA-4, and OTA-5 scenarios provide margins for substantial additional baseline growth and new fingerprint check applications, assuming full, half, and no NFF/III implementation, respectively. The OTA-6 scenario assumes a much greater than expected growth in fingerprint checks with no NFF/III implementation, and reflects the unverified results of the FBI's user survey.[51]

Assumptions About Response Time

The plan must make assumptions about response or turnaround time for conducting FBI fingerprint checks. The current Ident system takes an average of 15 to 20 days to process fingerprint checks. Including mail delays, response time to the user can average 20 to 30 days. Many users claim total end-to-end response time can take 45 to 60 days (routinely, according to OPM), especially if the fingerprint cards must pass through several organizational levels. The FBI assumes a 2-hour criminal justice and 24-hour noncriminal justice response time, on the average, for the new system. Criminal justice checks would be given priority over noncriminal justice checks during peak periods. And the 2-hour criminal justice response would apply only to electronic (not paper) fingerprint submissions which are likely to account for only a minority of total submissions through the 1990s.

Most noncriminal justice fingerprint checks may require only about 5 to 10 days, even with a new automated system. If fingerprint checks could be consistently done this fast, the checks would no longer be the bottleneck in many employment and licensing clearances. OPM and DIS officials—two of the largest noncriminal justice users of Ident—indicate that a 5- to 10-day response time would be adequate for the purposes of Federal civilian and military (including defense contractor) screening. A faster turnaround would provide little if any advantage since other aspects of background investigations take longer. This is unlikely to change, given projected staffing and resource levels for personnel security operations.

The response time for many kinds of criminal fingerprint checks needs to be much faster. Police usually bring formal charges before a local magistrate within several hours after arrest. The results of an FBI fingerprint check of an arrestee frequently need to arrive within 2 to 4 hours to be useful. A prior criminal

50 The FBI estimated a FY2000 daily volume of 62,300 cards, after verifying user survey results and assuming 50-percent NFF/III implementation by FY2000. The FBI initially estimated a daily volume of 74,000 cards with no NFF/III and 49,000 with full NFF/III. The unverified user survey results suggested a volume as high as 100,000 cards per day.

51 The FBI subsequently adjusted its estimate from about 100,000 fingerprint cards per day, based on the unverified survey results, to 78,000 cards per day with no NFF/III, after verifying the survey results and correcting for double counting, purely speculative projections, and other anomalies.

record could be a significant factor in the magistrate's decision to release the arrestee on his/her own recognizance, set appropriate bail, or detain the arrestee in jail. A quick response is also needed to identify arrestees who may be wanted for criminal offenses in other States and jurisdictions. Fingerprint checks conducted for other criminal justice purposes, such as prosecution, sentencing, or parole decisions, usually do not require a rapid response. A response time of several days could be adequate. Under the NFF/III concept, at most only about 35 percent of arrestees would require an FBI fingerprint check in the first place. About 65 percent can be expected to have a prior local or State criminal record. Only first-time offenders in the arresting State would require a full FBI fingerprint check. All others would be positively identified at the local or State level and would already have State and Federal criminal identification numbers assigned (backed up by previously submitted fingerprints).

The implication is that the Ident automation program could more than meet criminal and noncriminal justice response time requirements with an overall average response time of about twice what is currently planned-this is still a dramatic improvement over current response times. The FBI's response time goal thus could be relaxed and still meet user needs. However, the FBI has determined that longer average response times would create queuing problems.[52] The FBI has set the 2-hour criminal and 24-hour noncriminal justice response time goals to balance the overall workload and handle peak demands without creating significant backlogs. OTA and independent experts concur that the system should be designed to avoid backlogs. The FBI has reserved weekend and night-shift operations for system maintenance. These times could be used to process any temporary backlogs that might occur, although the system is being designed to avoid backlogs altogether.

These response times are for Ident processing, and do not include mail delays—which can add several days or weeks. Live scanning and electronic transmission of fingerprints are the proposed long-term solutions to eliminate mail delays. Their technical feasibility has been proven, although necessary standards are still being developed. Many Federal agency users of Ident services[53] seem enthusiastic about acquiring live scan equipment and taking full advantage of electronic transmission, which, they believe, would dramatically improve overall response time by cutting out mail delays and by reducing or eliminating bureaucratic delays in the agencies.

Federal civilian agencies, for example, typically route fingerprint checks through their own personnel security offices, then to OPM's personnel investigations processing center (or to DIS, if checking military or defense contractors), and finally to the FBI. The results of the fingerprint checks have to follow these steps back to the original requesting agency. This explains why checks can take 45 to 60 days or longer to get to the end user, even though Ident may be processing them in 15 to 20 days.

Assumptions About File Size

The plan needs to make assumptions about the size of Ident fingerprint files needed to support four kinds of fingerprint matches:

1. 10-print against 10-print fingerprints (incoming fingerprints of persons arrested are compared with fingerprints of prior offenders already on file),
2. latent prints against 10-print fingerprints in a latent cognizant file[54] (latent prints from a crime scene are compared with fingerprints of prior offenders),
3. 10-print fingerprints against unsolved latent prints (incoming fingerprints of persons arrested are compared with unresolved latent prints), and
4. latent prints against unsolved latent prints (incoming latent prints are compared with unsolved latent prints already on file).

By far the largest file is the 10-print file, which stores fingerprints on known criminal offenders. Although it is known as the 10-print file, prints for all 10 fingers are not necessarily included. Some States store fingerprints on only 2 or 4 fingers, in order to reduce storage costs. Two- or 4-finger prints are usually sufficient for

[52] Ident plans to operate 7 days a week, but all volume estimates (including OTA's) are based on a 5-day work week. If the system is designed to a 5-day week, with some built-in margin of safety, the weekends would provide an extra margin for eliminating any temporary backlogs that might result from exceptionally high peak loads.

[53] Including INS, OPM, DIS, the Census Bureau, FAA, and the Secret Service.

[54] Technically, 10-print fingerprints suitable for matching against latent prints are known as "latent cognizant" fingerprints, which for large fingerprint volumes can be retained in a subset of the 10-print file known as a "latent cognizant file."

10-print against 10-print searches, but not for comparison with incoming latent prints. The FBI plans to store images for all 10 fingers, to support a latent cognizant file and for archival purposes.

The Ident criminal 10-print fingerprint file currently contains prints on about 24 million persons. The FBI initially assumed that file size will grow to about 34 million persons in 2000, presumably based on some growth in first-time arrestees plus the addition of some portion of the prints on repeat offenders not previously submitted at the time of initial arrest. The 34 million would allow a margin for additional baseline growth in the criminal population (up to the historical rate of 3 percent per year) plus submission of a limited number of missing prints,[55] but it is possible that a file of this size would not be adequate beyond 2000. The FBI now projects that a fiscal year 2000 10-print file size of 43 million is more realistic. This revised estimate is based on user survey results and higher estimates of the number of missing prints.

Some States have found that large numbers of fingerprint arrest cards were never reported to State repositories and thus are likely missing from the FBI file.[56] Not all offenses are reportable to State and FBI repositories, but crime statistics suggest the possibility of significant underreporting. The FBI estimates that 14.3 million total arrests were made in 1989.[57] Of these, roughly 6.1 million were reportable to the FBI (after deducting juvenile and nonserious misdemeanor offenses) .58 The FBI received about 4.4 million criminal fingerprint cards in 1989, which suggests a shortfall of about 1.7 million cards. With full NFF/III implementation, the shortfall would be about 0.6 million per year (35 percent of 1.7 million), or 3.6 million over the 1995 to 2000 time frame. This number assumes about three arrests per offender, on the average, and that arrest cards for repeat offenders would not be reportable. But NFF/III may be only half implemented by 2000, in which case the 43-million-person 10-print file size could be needed to accommodate the additional submissions.[59]

The FBI currently receives about three fingerprint cards per person, but only one fingerprint card per person is retained. All other cards are discarded or returned to the States after microfilming. This procedure would be unchanged with NFF/III, except that the primary images would be received and stored as electronic fingerprint images on optical disk rather than as paper fingerprint cards in filing cabinets.

The FBI must also determine the size of the latent cognizant fingerprint file, against which incoming latent prints can be compared. The 24-, 34-, or 43-million person file discussed above is known as the 10-print fingerprint file. This file is designed for storing 10-print fingerprints coming into the FBI for later comparison with other fingerprints. The matching of fingerprints is actually done by comparing fingerprint minutiae (e.g., details on the location of fingerprint characteristics). State and Federal AFIS experience indicates that matching 10-print fingerprints with each other works extremely well, with very high accuracy levels, when minutiae from only 2 or 4 fingers (usually the thumbs and forefingers) are compared.

The more difficult challenge is matching latent prints from crime scenes against the latent cognizant fingerprint file. Latent prints are single or partial fingerprints lifted from door handles, glasses, walls, firearms, clothing, and other items found at or near the scene of a crime. The latent print contains much less information than a standard 10-print fingerprint. To compensate, the number of fingers and the number of

55At 3-percent annual growth, a file of 24 million persons would grow to 32.25 million in FY2000. This would allow a margin of 1.75 million for the addition of missing fingerprints.

56Comprehensive data are not available. The FBI may wish to more systematically survey the States on unreported and unfiled criminal fingerprint cards.

57FBI, *Crime in the United States.. .1989,* op. cit., footnote 38, p. 172.

5814.3 million less 2.15 million juvenile arrests (estimated at 15 percent of the total) and 6.1 million nonserious misdemeanor arrests (defined for estimating purposes to include vandalism, liquor law violations, drunkenness, disorderly conduct, vagrancy, curfew and loitering violations, runaways, and all other) equals 6.1 million reportable arrests. These are gross approximations, since some juvenile offenses (when the offender is charged as an adult) and some nonserious misdemeanor offenses (e.g., for repeat offenders depending on State law) not included in the 6.1 million may be reportable. In addition, some serious misdemeanors (e.g., simple assault, stolen property, drug abuse violations) included in the 6.1 million may not be reportable (e.g., for first-time petty theft offenders, depending on State law). See FBI, *Crime in the United States.. .1989,* op. cit., footnote 38, pp. 172, 176.

59Eventually the growth rate of the 10-print file size should decline to that of the underlying growth in criminal activity, currently about 3 percent per year. If two out of three crimes are committed by repeat offenders, then the growth rate of new offenders added to the 10-print file (not old offenders previously unreported) would be about 1 percent per year if present trends continue.

minutiae on the fingerprints for the latent cognizant file must be increased to produce satisfactory search accuracy. This is typically done by extracting minutiae on all 10 fingers and creating a separate latent cognizant file that can be used for searching latent prints. Thumbs and forefingers alone would not suffice for comparison with latent prints, which could be from any finger.

The cost of storing and searching a latent cognizant file is much higher than the cost of storing and searching a 10-print file. The FBI found that extracting, storing, and searching for the additional fingerprint minutiae for all 24 million persons in the criminal 10-print fingerprint file (or the 34 to 43 million persons projected for 2000) would be prohibitive in cost. Current FBI plans propose a latent cognizant file on about 10 to 13 million persons (one-third the size of the 10-print file), selected to include serious multi-state offenders, with priority placed on violent offenders. Since Ident is planning to store full fingerprint images, the latent file could be expanded or modified in the future if technically and financially feasible. The ultimate size, composition, and geographic coverage of the FBI's latent cognizant file needs careful consideration to make sure that the file meshes with related State, regional, and local efforts and optimizes the Federal role. Decisions on the latent cognizant file are especially important in light of the high rate of success of automated latent searches conducted at the State/regional/local level. Many States report that old and/or difficult criminal cases have been solved due to latent matches that could not have been conducted manually (see boxes A and D).

Assumptions About Storage Requirements

The plan must make assumptions about the storage requirements for each set of fingerprints in the file. The FBI needs to store the entire image of each fingerprint to facilitate the extraction of minutiae by whatever vendor equipment the FBI ultimately procures and to permit fingerprint examiners to verify the minutiae-based candidate matches provided by the AFIS. With current technology, the AFIS identifies and ranks the most likely fingerprint matches, but a human examiner must make the final determination. Adequate image resolution can be provided at 500 pixels (picture elements) per inch, or 250,000 pixels per square inch, based on research conducted in support of the NIST image transmission standard-setting process. The standard fingerprint card includes 5 rolled finger blocks, 1 four-finger block, and 1 thumb block per hand, or a

Box D-Cal-ID: An Early Success Story

The automated latent cognizant fingerprint database of the California Identification (Cal-ID) system became operational on October 9, 1985. Automated latent fingerprint searches have proven effective in helping solve old or difficult cases. During the first year of operation, over 100 California law enforcement agencies used the latent database to identify criminal suspects:

- The Los Angeles Police Department used the Cal-ID latent system to identify and arrest four suspects in the kidnapping and execution-style murder of two college students, based on a latent print lifted from the victims' vehicle.

  The Sacramento County Sheriff's Department used Cal-ID to identify and arrest a suspect in the murder of a Sheriff's Department employee, based on a bloody latent print found at the crime scene.
- The San Diego County Sheriff's Department used Cal-ID to identify and arrest a suspect in a 3-year-old rape case, which led to the identification of the suspect as a serial rapist.
- The Anaheim Police Department used Cal-ID to identify and arrest a suspect in a 9-year-old homicide case.

  The Marysville Police Department used Cal-ID to identify and arrest a suspect in a 2-year-old homicide case.

  The Los Angeles Police Department used Cal-ID to identify and arrest a suspect in the axe attack and robbery of the California Secretary of State, which led to identification of the suspect in connection with numerous other robberies and burglaries.

SOURCE: California Department of Justice, *California Identification (CAL-ID) System and Remote Access Network (RAN) Status Report: 1986* (Sacramento, CA: California DOJ, Division of Law Enforcement, Bureau of Criminal Identification, 1987).

total of 14 blocks. Fingerprint images in these blocks typically cover about 24 square inches,[60] which equates to 6 million pixels per fingerprint.[61] The total block size (including white space) is about 39 square inches (or a maximum of 9.8 million pixels) .[62]

The FBI could store on optical disk the images of fingerprints using various gray scales, ranging from binary (black and white only) to 16, 64, or 256 shades of gray. The emerging industry norm seems to be to store images of all 10 fingers on a 256 gray scale. Eight bits or 1 byte per pixel are required to capture a 256 gray scale. Minutiae may, in comparison, be extracted and stored for as few as 2 or 4 fingers for the 10-print file, and 8 or 10 fingers for the latent cognizant file.

The FBI plans to store the images of all 10 fingers in order to have a complete electronic fingerprint archive. This would provide full backup and permit the possible expansion of the latent cognizant file at a future time, should technology and resources permit. The FBI, NIST, and vendors are working on data compression techniques to reduce the image storage requirements. A compression ratio of 8:1 provides acceptable image quality with existing technology; the FBI expects that compression ratios of 15:1 or greater will be feasible with new methods. Thus the image data per fingerprint card will be reduced from 9.8 megabytes to at most 1.2 megabytes (at 8:1 compression), and probably to 0.65 megabyte (at 15:1 compression) or less.

60(1.25 square inches x 10 rolled finger blocks) + (0.94 square inches x 2 four-finger blocks) + (4.5 square inches x 2 thumb blocks) = 12.5 + 1.88 + 9.0 square inches= 23.38 square inches per fingerprint card.

61250,000 pixels per square inch x 24 square inches = 6 million pixels per fingerprint card.

62FBI estimate.