United States General Accounting Office

GAO

Report to the Chairman, Subcommittee on Government Information, Justice, and Agriculture, Committee on Government Operations, House of Representatives

April 1988

IMMIGRATION SERVICE

INS' Technology Selection Process Is Weak, Informal, and Inconsistently Applied

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GAO/PEMD-88-16

541996/135753

GAO United States
General Accounting Office
Washington, D.C. 20548

**Program Evaluation and
Methodology Division**

B-229956

April 22, 1988

The Honorable Glenn English
Chairman, Subcommittee on Government
Information, Justice, and Agriculture
Committee on Government Operations
House of Representatives

Dear Mr. Chairman:

In response to your September 1, 1986, letter, we are submitting this report on technology selection at the Immigration and Naturalization Service (INS). We have reviewed the procedures INS uses to select various technologies, and we recommend the adoption of a formal decisionmaking procedure for selecting technologies that we present as a framework and that we believe has immediate applicability at INS.

As we agreed with your office, unless you publicly announce the contents of this report earlier, we plan no further distribution of it until 30 days from the date of the report. We will then send copies to interested congressional committees, the attorney general, the commissioner of INS, and we will make copies available to others who are interested upon request.

Sincerely yours,

Eleanor Chelimsky
Director

Executive Summary

Purpose

Enforcing U.S. immigration laws has historically been a difficult effort for the Immigration and Naturalization Service (INS). Searching for ways to more effectively address this problem, INS has begun to turn more frequently to technology to augment both its effectiveness and its staff. The Subcommittee on Government Information, Justice, and Agriculture of the House Committee on Government Operations has expressed concern that INS may not be using the best possible procedures to select technologies and that, if so, the process should be improved. Based on a request from the subcommittee and on negotiations with committee staff, the following evaluation questions were addressed:

- How does INS currently select technologies?
- Can a systematic method be developed for effectively selecting technologies?
- If a systematic method can be developed, how do current INS procedures compare to it?

Background

INS has a public service mission and an enforcement mission. This report focuses on the enforcement mission of INS. GAO defined enforcement as all field activities that seek to deter illegal entry. GAO categorized such activities into six functional areas: detection, apprehension, transportation, detention, communication, and safety.

GAO defined enforcement technology broadly to include all equipment (except computers and munitions) that are used to carry out the enforcement mission of INS. The equipment included both advanced and simple technologies as well as developmental and off-the-shelf items.

Results in Brief

GAO found that although INS relies on technology to perform various enforcement activities, the agency has no standard procedures for selecting potentially useful technologies. Building on the literature and on common practice in other agencies, GAO developed a seven-step framework for technology selection and compared INS's informal practices to that framework. In a detailed examination of 10 cases in which INS sought to make use of technologies, GAO found a wide variety of processes and procedures. Promising practices fell into categories such as effective integration of field-user contributions and the use of advice by experts in other agencies or firms. Categories of problematic practices are, for example, inadequate consideration of cost and scheduling concerns, the quality of test methodology, and the dearth of information about the effectiveness of technologies after they have been employed in the field.

Principal Findings

Current INS Procedures

Current procedures for selecting technology vary from item to item. The INS has no defined, formal method of technology selection. Further, GAO found three existing organizational practices that could interfere with development of systematic methods for the selection of technologies. Specifically, GAO found evidence of (1) interaction problems between INS's research and development office and program and field offices, (2) budgetary impediments to the long-term planning for equipment expenditures, and (3) decentralized procurement practices that hindered technology selection.

A Framework for Selecting Technologies

GAO developed a systematic framework for technology selection. It has seven steps (and many substeps that are specific to INS). Identification of a need (step 1) means that an operational problem warranting attention has been described. Describing a need leads to the identification of a solution, or a menu of solutions (step 2). That is, the need must be matched to an appropriate solution or to a number of different possible solutions for further study and consideration. Often, the only way to determine if any of the potential solutions identified is reasonable is through development or testing or both (step 3) to see how well the solution works. Testing then leads to proper data analysis and report writing (step 4), which are followed by report review (step 5) by someone in a position to bring about needed changes. All the preceding steps lead to the decision point of purchasing a technology (step 6); it is at this step that major funds are obligated or spent. Finally, it is important to conduct periodically a postacquisition review (step 7) of the operations of the technology, especially as these operations relate to meeting precisely specified objectives.

The Strengths and Weaknesses of INS's Procedures

GAO used its framework as a basis of comparison with prevailing practices in 10 case studies of how INS actually selected (or sought to select) technologies. The technologies GAO studied were an image enhancement vehicle, which is a mobile unit equipped with infrared detection technology; a low-level-light television system for the detection of undocumented entrants; an optimization profile for determining the most cost-effective mechanism for detaining undocumented aliens; a barrier project of fences and concrete barriers to present an improved physical deterrent; a microspectrophotometer for the forensic analysis of suspect documents; a fraud intercept task force's equipment package that includes microscopes, fiber optics, and photographic technologies; a Convair 580 aircraft for transporting undocumented aliens; winter survival gear for use along the northern border during extreme weather conditions; a "stun gun" electronic device for use on uncontrollable aliens, particularly in crowds; and a data encryption standard (DES) radio scrambler used in antismuggling operations.

All INS cases studied had at least one promising and one problematic practice. In general, GAO found no consistent pattern of practices across cases. However, several strengths and weaknesses were identified. Only the exemplary practices and more extreme weaknesses were categorized as promising or problematic.

The major INS strengths in one or more case studies include (1) field-level input into the specification of needs and technological solutions, (2) internal coordination in the selection of technological solutions, (3) the use of expert advice in selecting solutions, and (4) management involvement in purchase decisions.

The major weaknesses in INS's technology selection include (1) the lack of an organized systematic set of procedures for identifying and reviewing operational problems; (2) the nonexistence of a policy regarding the selection and prioritization of technological solutions; (3) the inconsistent way in which expert and field-user opinion are involved with the selection of technologies; (4) methodologically weak testing, especially on developmental technologies; (5) virtually no postacquisition data collection and evaluation of technologies; and (6) the lack of a policy for management of research and development.

Recommendations

GAO recommends that the attorney general direct the commissioner of INS to establish procedures, similar to those developed by GAO, for selection, adoption and evaluation of new technologies. The procedures should be sufficiently flexible so that issues that are complex and equipment that is costly can be reviewed in detail while issues and equipment that are less complex or costly receive less extensive review.

Particularly important components of a system for selecting technologies would include

- a means of identifying operational problems that involves field-users as well as technical experts;
- a means of identifying and comparing competing technologies proposed as solutions;
- a unit responsible for the development, testing, and evaluation of new technologies;
- a means of acquiring, analyzing, and documenting postacquisition experience to inform future decisions regarding technology selection; and
- a central clearinghouse that collects and disseminates information about new technology options, purchases, and use.

Second, GAO recommends that INS reassess its research and development program and decide upon its most advantageous future. The program's management structure, resources, and role with regard to technology selection, implementation, and evaluation should be reviewed in terms of this report's findings and recommendations.

Third, GAO recommends that INS cancel or forgo the procurement of some technologies. Specifically, GAO recommends that INS (1) delay or eliminate the development of between 7 to 10 improved image enhancement vehicles; (2) not purchase the second microspectrophotometer for the Laguna Niguel document analysis unit; (3) temporarily forgo further acquisitions of fraud intercept task force equipment and consider purchasing only some portion of this equipment originally planned for in 1987; (4) not purchase an additional larger aircraft; and (5) sell existing DES scrambler radios or modify current radios to make them compatible with existing communication equipment. GAO estimates a maximum potential savings of between $1.3 million and $2.1 million could result if, after reevaluation, all procurements in question are forgone or cancelled.

Agency Comments

Written comments were requested from the Department of Justice for both INS and the Federal Bureau of Investigation. FBI provided oral comments. INS, despite an extension of time, failed to provide comments on the draft report in time to be incorporated into this report. GAO also requested comments from the Department of Defense and the U.S. Customs Service. Customs provided oral comments; DOD declined to provide comments.

Contents

Abbreviations

DES	Data encryption standard
DOD	Department of Defense
DOJ	Department of Justice
FBI	Federal Bureau of Investigation
FITF	Fraud intercept task force
FLIR	Forward-looking infrared
GAO	General Accounting Office
GSA	General Services Administration
IEV	Image enhancement vehicle
IIEV	Improved image enhancement vehicle
INS	Immigration and Naturalization Service
LLLTV	Low-light-level television
MELIOS	Mini eyesafe laser infrared observation set
OMB	Office of Management and Budget
TSQ	Triple stage quadruple

Introduction

The Immigration and Naturalization Service (INS) has a public service mission and an enforcement mission, being responsible both for service in facilitating entry and adjudicating benefits for legal aliens and for enforcement by preventing illegal entry into the United States.[1] In an effort to perform these missions, INS has begun to turn more frequently to technology to augment its staff. For the purposes of this report, we define "technology" as any equipment that can be used to facilitate the performance of INS's enforcement activities.

The Subcommittee on Government Information, Justice, and Agriculture of the House Committee on Government Operations has expressed concern that INS may not be using the best possible procedures to select technologies and that, if so, the process might be improved. Based on a request from the subcommittee, and on negotiations with committee staff, the following issues were determined to be of interest:

- How does INS currently select technologies?
- Can a systematic method be developed for effectively selecting technologies?
- If a systematic method can be developed, how do current INS procedures compare to it?

Background

The INS administrative manual states that the specific missions of the service are

1. facilitating the entry of legal immigrants and visitors and granting them the benefits to which they are entitled,

2. preventing illegal entry and benefits to those not so entitled,

3. apprehending and removing undocumented aliens, and

4. enforcing sanctions against individuals who conspire to subvert the requirements of controlled entry.

In this report we focus on INS's enforcement mission. We define "enforcement" as all field activities that in some fashion seek to deter illegal entry in accordance with the Immigration and Nationality Act

[1]Through the border patrol, INS is also participating in Operation Alliance, a program developed under the southwest border subcommittee of the National Drug Enforcement policy board. In Operation Alliance, INS has been designated the lead agency with primary responsibility for drug interdiction between ports of entry on the southern land border.

(Public Law 85-316) and its amendments. We categorized activities associated with enforcement into six interrelated functional areas: detection, apprehension, transportation, detention, communication, and safety.

Detection is focused on identifying (1) individuals attempting to cross the border illegally (that is, undocumented aliens), (2) fraudulent documents, and (3) malafide intent on the part of valid document holders.[2] Many of the technologies INS uses aid the detection of individuals, such as the use of low-light-level television (LLLTV) to spot attempted illegal entry. Technologies assisting in the detection of fraudulent documents include microscopes and "blacklights."

Apprehension refers to the capture of aliens crossing the border illegally, who use fraudulent documents, or have malafide intent. While apprehensions can be facilitated by increasing human resources, they can also be assisted by technology such as vehicles, items used for undercover activities (such as vehicle tracking transmitters), and physical structures such as the proposed barrier project.

Transportation activities include the initial movement of apprehended aliens to a holding center or a detention facility, the final removal of aliens from the United States to the nation of citizenship, and the movement of INS staff during their performance of enforcement activities. INS uses the gamut of vehicles for transportation, including the use of a large aircraft to transport aliens from one detention center to another.

Detention refers to the short- or long-term incarceration of aliens while they are processed or held for deportation or exclusion hearings. Few technologies within INS are directed exclusively at detention. An example of a detention technology being developed is an "optimization profile", which is a system to determine how best to place detainees in the various detention centers around the United States.

Communication refers to the transmission of information along airwaves between INS staff performing the various enforcement activities. Technologies currently used include handheld and car-mounted radios.

Safety refers to the protection of the INS staff performing enforcement functions, or the protection of individuals staff rescue or apprehend.

[2]Malafide intent refers to a situation in which an individual secures an authentic visa while intending to overstay the visa or to work illegally. It also includes aliens who attempt entry by making false claims to either U.S. citizenship or legal alien status

Examples of current safety technology used are all-weather jackets and pants and bulletproof vests.

Objectives, Scope, and Methodology

As stated earlier, the objective of this report was to answer the questions of the subcommittee relating to INS's selection of technologies to support its enforcement mission.[3] In reviewing the technology selection process, we defined technology very broadly. We did, however, exclude computer hardware from our analysis since INS's computer hardware systems are the focus of another GAO study. We also excluded munitions because of their auxiliary use.

In order to answer the evaluation questions listed above, we reviewed the organizational structure and budget history of INS. This involved interviews with INS officials and data gathering at both INS headquarters and field offices. An attempt was made to identify all the existing poli-

Table 1.1: Three Agencies for Comparison Cases

Agency	Case study
U S Customs Service	Parcel X-ray machine
U S Department of Defense	Mini eyesafe laser infrared observation set (MELIOS)
Federal Bureau of Investigation	Triple stage quadruple (TSQ) mass spectrometer

Table 1.2: Description of 10 INS Cases

Case	Description
Barrier project	Physical structure, including new fences and concrete barriers, currently being considered for two southern border patrol sectors
Convair 580	Aircraft owned by the detention and deportation program and used mainly for transportation of detainees
Fraud intercept task force (FITF) equipment	Equipment package, including microscopes and 35-mm cameras, used by inspections staff at some ports of entry to assist in the detection of fraudulent documents
Image enhancement vehicle (IEV)	Vehicle with mast-extended imaging device being developed for the border patrol to assist in the detection of illegal entrants
Low-light-level television (LLLTV)	Surveillance system used by the border patrol, aids in the detection of illegal entrants
Microspectrophotometer	Equipment for advanced forensic analysis of suspect documents, owned by the forensic document laboratory and being considered for purchase by another INS unit

[3]We reviewed the way in which INS selects technologies to respond to particular operational needs. However, we are not suggesting that technology is always the only or the optimal response to needs; rather, nontechnological solutions may also be appropriate This issue is discussed in our framework in appendix III

cies, procedures and practices for the selection of technologies. Appendix I lists the central offices and field locations that were visited for data collection.

We identified the technologies used, tested, or rejected by INS by conducting a survey of all INS regional and district offices, border patrol stations, sector headquarters, and ports of entry. Our response rate for the approximately 300 sites was 100 percent; appendix II contains more information on questionnaire development and data analysis. We also acquired a current inventory of technologies used at INS's forensic document laboratory and of aircraft belonging to INS (including those located at the El Paso air operations center).

Our initial interviews and data collection efforts indicated that INS does not have universally applied policies or procedures for selecting technologies. We therefore developed a technology selection framework for technology selection and decisionmaking and tested it for applicability to INS.[4] Developing and testing this framework required a multistep approach, including the application of the framework, through case studies, to the technology selection practices of three other agencies.[5] Table 1.1 describes the agencies at which GAO conducted comparison case studies and the technologies selected for study. We also applied the GAO framework to 10 case studies within INS. Table 1.2 lists the technologies studied at INS. These cases were judgmentally selected from the survey information and from other information gathered during site visits and interviews. Criteria used for selection included functional

Case	Description
Optimization profile	Software being developed for the detention and deportation program to assist in determining the most cost effective placement of detainees
Radio scrambler	DES radio scrambler used to provide secure radio communications for undercover antismuggling operations
Stun gun	Nonlethal electronic weapon being considered for use at INS to enhance the safety of officers and others in the presence of violent aliens
Survival gear	Winter survival gear items, such as parkas and heat packets, being used or considered for use specifically by the Montana border patrol at Havre

[4]Throughout this report we use the abbreviated term "framework" to denote the longer term "technology selection framework." We employ this convention for the sake of brevity and ease of reading.

[5]The framework steps and elements were developed in accordance with our Standards for Internal Controls in the Federal Government (Washington, D.C., 1983).

enforcement area, type of technology (that is, off-the-shelf or developmental), cost, and stage of selection decision. Fieldwork (such as interviews and data gathering at central office and field locations) was performed between May 1986 and July 1987. Our methodology for developing the technology selection framework is described in chapter 3. This review was performed in accordance with generally accepted government auditing standards.

Report Structure

The remainder of this report answers the congressional questions. Chapter 2 describes the current INS organization, structure, and processes for identifying and selecting technologies. Chapter 3 describes how we developed the systematic framework for better identifying and selecting technologies. Chapter 4 gives the results of comparing our framework to the procedures that were followed in the 10 INS cases.[6] (The detailed framework is in appendix III.) Chapter 5 presents our summary, conclusions, recommendations and the agencies' comments.

[6] Details on the 10 INS case studies are available, upon request, from GAO's Program Evaluation and Methodology Division

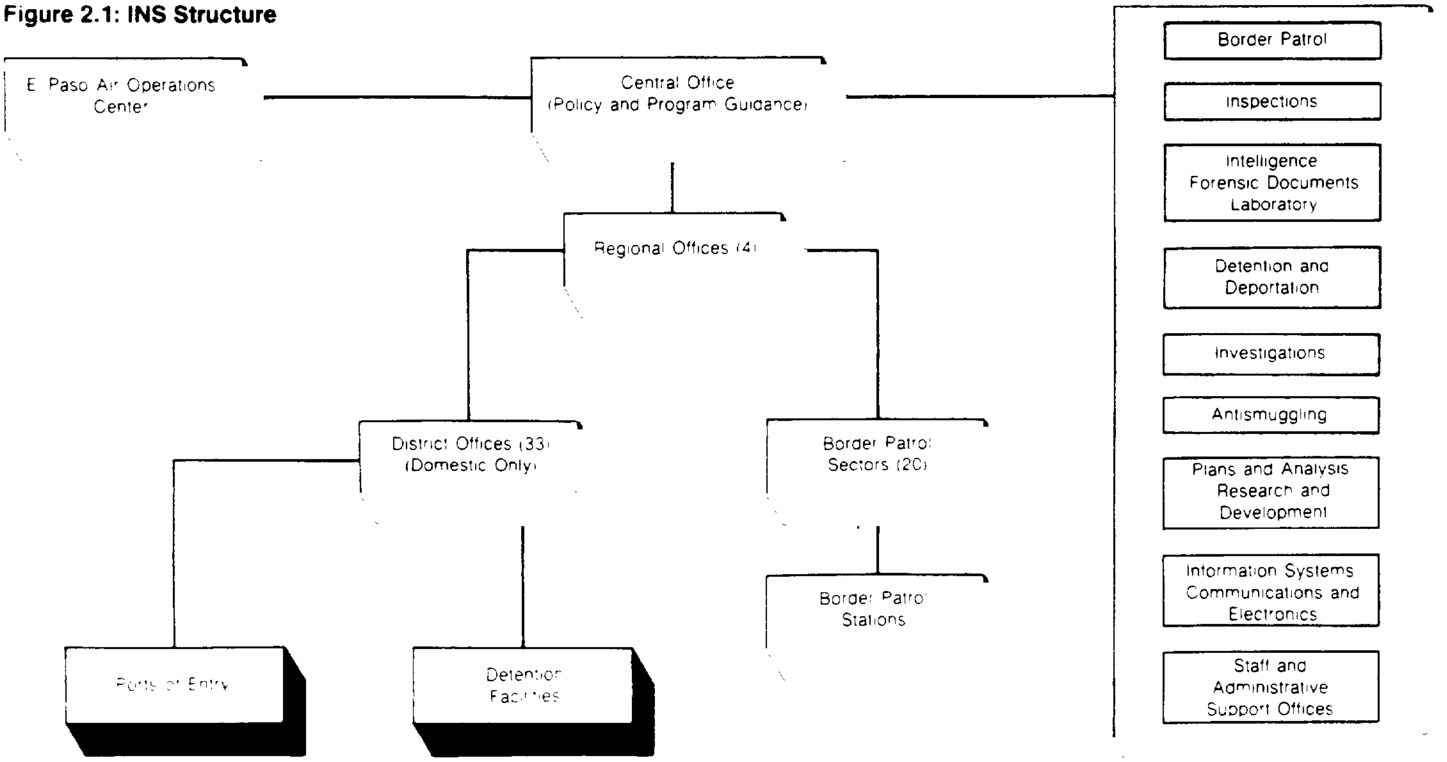
Current INS Technology Selection Procedures

In this chapter, we present general information on the organization of INS, the relative importance and use of technology within INS, some current methods of decisionmaking at INS, various practices related to the identification and selection of technology, and some current impediments to technology identification and selection. In order to answer the question "How does INS currently select technologies?" it is first necessary to understand the structure of INS.

Organization

Figure 2.1 shows the general organization of INS. INS integrates line management and program management to support the functionally and geographically varied activities required to carry out the INS mission.[1] Line

Figure 2.1: INS Structure



[1] Under line management, the responsibility for the accomplishment of objectives is delegated to the line officers doing the work that represents the primary mission of the organization. In program management, line or staff supervisors and employees are assigned to perform their own specialized tasks or duties in a number of different functions or levels of responsibility for the accomplishment of certain short- or long-range programs. At INS, program managers function as staff who help, or make it possible for, the line management to do its work.

management provides control, direction, and program integration and is organized geographically into national, regional, and field levels. Program management functions as staff to line management and is organized around mission support responsibilities.

Central Office

The INS central office in Washington, D.C., is responsible for policy formulation and overall program direction. This includes the development, guidance, and evaluation of programs and administration, and management support activities.

The central office organization includes various program and staff offices. Program offices include border patrol, inspections, antismuggling, investigations, detention and deportation, and intelligence. Staff and administrative support offices include but are not limited to the office of plans and analysis (which includes the research and development group), program inspections, and information systems (including the communications and electronics branch). Also under the direct management of the central office are the forensic document laboratory and the El Paso air operations center.

Research and Development Office

The INS research and development office was established in 1974. It is important to consider its role in INS because three of our case studies involved research and development. The mission of research and development is to support the administration and enforcement of immigration laws by identifying and developing technologies that protect against intrusion with a minimum of resources, help with case backlogs, and solve various data storage and retrieval problems.

Since its inception, the research and development office has generally operated with the director and one staff member who works approximately half time at INS headquarters and one or two staff members at the field office at Fort Huachuca, Arizona. This field office assists in the development of prototype technologies.

The research and development office is currently funded with "no-year" funds of $400,000.[2] The office also receives some funding from other INS programs, mainly from the border patrol, since the majority of the office's effort to date has been geared toward border patrol applications. Funding is also sometimes received from outside agencies, such as the Department of Defense (DOD). Likewise, some of the hardware used in the development of prototypes or feasibility studies is actually provided by DOD. In essence, it appears that the performance of research and development at INS is made possible, to some extent, by the assistance of DOD.

Regional Offices

INS divides the United States into four regions—eastern, northern, southern, and western. Each regional office is headed by a regional commissioner who exercises direct line management responsibility for the implementation and administration of INS programs within the regional boundaries. Each region exercises a good deal of autonomy in its operations.

District Offices

There are 33 domestic INS districts, each headed by a director who reports to a regional commissioner. The district offices have responsibility for the execution of program operations, including the inspection of persons seeking entry to the United States, adjudication of claims for benefits and privileges, investigations of persons illegally in the United States and criminal organizations and aliens, detention and deportation, and maintenance of records. The district offices also have line management responsibility for the ports of entry and detention facilities within their districts.

Border Patrol Sectors

There are 20 border patrol sectors distributed among the four INS regions. Each sector is directed by a chief patrol agent who reports to a regional commissioner. Sectors are responsible for the enforcement of immigration laws within their geographical areas and perform such functions as patrol, linewatch, traffic and transportation checks, farm and ranch checks, detention of apprehended aliens, removal of apprehended aliens who agree to depart voluntarily, and investigation of criminal activity related to the smuggling and illegal transportation of

[2] "No-year" funds are money available for obligations (orders placed, contracts awarded, services received) for an indefinite time, usually until the objectives for which the authority was made available are attained.

aliens.[3] Sectors also perform coordinated antismuggling activities with the district offices. Each border patrol sector has a number of stations assigned to its jurisdiction.

Use of Technology

From the results from our questionnaire regarding technology currently being used, and from interviews with central office staff, we found that INS relies substantially on technology. Table 2.1 depicts some of the items being used or considered.

Table 2.1: Some Items INS Uses or Is Considering or Developing

Function	Currently used	Being considered or developed
Detection		
People	Binoculars, terminals and software, infrared scopes, pocket scopes, night vision goggles, on-line data bases (such as TECS), LLLTV systems, seismic sensors, buried line sensors, magnetic sensors, radar, helicopters	Image enhancement vehicles, laser aiming devices, eyeball readers, license plate readers, fingerprint comparators, forward-looking infrared (FLIR)
Documents	Blacklights Polaroid cameras, 35-mm cameras, fiberoptic illuminators, microscopes, on-line data bases (such as OASIS), microspectrophotometer	Video transmitters, photophones, infrared document readers
Apprehension	Bird dog vehicle tracking devices, body recorders, pen registers, irritant agents, road grading vehicles, sedans	Barriers, phone text encoder-decoders
Transportation	All-terrain vehicles, aircraft, boats, buses, desert bikes, four-wheel drive vehicles, motorcycles, sedans snowmobiles, vans	Alternative aircraft
Detention	Closed circuit television	Leg weights, optimization profile
Safety	Helmets, batons, bullet-proof vests, gas masks, shields, riot jackets, all-weather clothes, automobile repair gear, first-aid kits, metal detectors	Heat packets, alarms, stun guns
Communication	Radios, radio base stations, repeaters, microphone transmitters, microwave systems, pagers, scrambler radios	Cellular phone, new radio scramblers

Not all enforcement functions are equally amenable to assistance from technology. One factor accounting for this difference is the relative advantage of technology over people in effectively performing some individual enforcement functions. For example, in seeking to detect illegal entry, the border patrol relies heavily upon a number of technologies

[3]Linewatch operations constitute the first line of defense against aliens attempting to enter the United States illegally. These activities are concentrated in the immediate vicinity of the international borders and are performed to deter or prevent illegal entry (for example, by interdicting aliens in the border area before they can secure employment or by causing persons seeking admission to present themselves at designated ports of entry). Farm and ranch inspections are conducted by the border patrol to check on laborers on farms and ranches, seeking the undocumented aliens who have avoided detection at the border.

that have detection ability superior to that of humans.[4] However, in the detection of fraudulent documents, the skills of the inspector, including good knowledge of immigration law, interviewing skills, and intuition, are often more important to the success of the detection effort than technology.

Current Practices

Overall, the use of technology is important to INS. However, INS has no formal system, no standard procedures, for the selection of technology. Furthermore, while some INS officials have indicated that an informal process is followed, the lack of documentation that characterizes such informality has made it impossible to verify or closely review this. However, our interviews and case study work did reveal that the process used at INS is informal and varies from item to item.

Several current decisionmaking procedures and tools used at INS not specifically targeted to the selection of technology nonetheless illustrate currently accepted practices and suggest possible application to technology selection.

Electronics Support Policy

The electronics support program includes a fairly detailed process regarding the management of new electronic projects or the replacement of existing equipment. This process is formally outlined in the INS administrative manual and, according to an official in the communications and electronics branch, has existed for a number of years.

The electronics support program outlines the various responsibilities accorded to each of the hierarchical and geographical levels within INS for the identification of new electronic equipment needs and problems with existing equipment. It also specifies the manner in which requests for new items are to be made known and reviewed. By stipulating levels of responsibility and chains of review for requests, this policy adds a measure of formal internal control over communications and electronics systems. The general principles of such a policy, we believe, should be transferable to the identification of more general technology needs and the replacement of existing items.

[4]These technologies and the technologies used to perform the other enforcement functions are paid for by program funds, unless they are technologies in development (in which case research and development contributes some funds); electronic or communications technologies (paid for by information systems, specifically communications and electronics funds); or vehicles (in which case program offices provide funds to administration to purchase the vehicles through the U.S. General Services Administration (GSA)).

Priority Management System

The priority management system at INS was formally instituted in 1983 as a way of establishing the annual INS priorities and objectives, through which the programs develop strategies for the achievement of such priorities.

Priorities are established at an annual meeting, held in the summer before each fiscal year, at which field and program management officials are asked for input on priorities. Once approved by the INS commissioner, the priorities are provided to the various program managers, who draft program guidance in response to these priorities. This program guidance then leads to the establishment of objectives for the fulfillment of each priority. Quarterly meetings are held in order to report on the status in achieving objectives and to resolve discrepancies.

While most priorities are very general and the objectives rarely deal with technology acquisition or use, they have, on occasion, dealt specifically with the use of equipment. Further, although the priority management system is not currently used for technology selection, an official in the deputy commissioner's office who is integrally involved with the system indicated that it would be possible to make the connection between technology selection and the achievement of priorities. However, for this to occur, the budget process as it is implemented at INS would have to be modified. Specifically, the annual budget would have to be linked with the system so that funds for technology would be allocated at this time. In this way (as opposed to setting priorities for equipment use without ensurance of adequate funds for such use), the program managers would both be assured of funds for technology and have explicit incentives for the efficient allocation of technology funds. This might add more uniformity to the selection of technologies at INS than currently exists.

Decision Memorandum Process

The third decisionmaking tool we identified, which may have applicability to the selection of technology, is the decision memorandum process. This process was instituted in 1982 for coordinating, implementing, and institutionalizing policy decisions and encouraging employee participation in decisions. Decision memos can be prepared at any level in INS on any matter requiring an executive decision or policy change and are forwarded hierarchically through a standard chain of review.

The commissioner determines whether the decision memorandum warrants further attention and determines whether it should go through a full or abbreviated process. In the abbreviated process, only executive staff members participate in the review. In the full process, the memorandum is forwarded to every district, sector, region, office of professional responsibility, and central office program manager for review. Responses to or comments on the memorandum are tabulated and summarized by the program inspections office and are presented at the bimonthly management team meeting. An INS executive designated the lead responsible individual presents the decision memo for approval, disapproval, or deferral at this meeting. If all attendees at the meeting are unanimous in their vote on the issue, then the commissioner usually makes an immediate decision at the meeting. If not, the issue might be raised again at the weekly executive staff meeting.

Decision memos have generally dealt with such issues as staffing at INS field offices, revisions to regulations, and changes in field operations. There is no requirement that new technology consideration or purchase be presented by the decision memorandum process. However, in at least one instance, that of the stun gun, the decision memo process was used.

The decision memorandum process illustrates one method by which field opinion can be gathered and analyzed to make decisions. As such, it provides an example of a potential way for INS to gather opinions from the field regarding the extensiveness or severity of identified problems and needs, as well as the appropriateness or desirability of potential proposed solutions, including proposed technological solutions. However, to be used for gathering information on proposed technological solutions, the process would have to be modified to include a step for the gathering and analysis of technical and evaluation information about the technology and to provide for a verification of the accuracy of opinions and statements gathered from the field through a decision memorandum, if such opinions and statements are expected to be used as support for decisions regarding new technology.

Obstacles to Effective Technology Selection

Along with the procedures and processes at INS that might help improve the technology identification and selection process, we identified three possible obstacles. Specifically, there is evidence of (1) problems in the interaction between research and development and the program offices, (2) budgetary impediments to the long-term planning for equipment expenditures, and (3) extensive, decentralized procurement authority.

The Research and Development Office and Program Interactions

An obstacle faced by the INS research and development office is the way it is viewed by various program offices. Several officials at the central and field offices expressed negative opinions:

- the research and development process is unnecessarily lengthy,
- some items being developed by research and development will be prohibitively expensive when developed,
- the interest of the office does not reflect program office interest, and
- research and development focuses only on border patrol projects to the exclusion of other programs.

Our intent in listing these issues is not to make a judgment about whether these are true statements or not but, rather, to show that there are some problems between research and development and other INS offices that can get in the way of an effective technology selection process and, therefore, should be addressed.

In 1980, there was a proposal to establish a research and development steering committee. This proposal included a plan for reviewing current projects and initiating new projects based on a system of priorities. It also included provisions for the use of formally stated procedures when initiating and reviewing research and development projects. The proposal was never accepted by INS management.

While we were unable to ascertain the reasons why the proposal was never accepted, it nonetheless remains true that INS has no formal policy regarding the function, role, or internal management of the research and development program or process. When this is coupled with the fact that the office consists of only three to four persons and has a limited budget, it becomes clear that if it is to act as the locus for research and development management (including the selection of developmental technology), then the office, its staff size, and mission and INS policies with regard to its functioning should be reassessed and rationalized.

Budgetary Impediments

Budgetary practices related to new technology purchases include the role and authority of nonprogram offices in the expenditure of certain funds, and reallocation of funds as well as the lack of funds dedicated specifically to technology purchases. These practices appear to constitute barriers affecting the ability of INS program managers to plan for equipment purchases.

The Role of Nonprogram Offices

In certain cases, funds supporting program operations of one INS office are appropriated to another office. For example, funds for border patrol equipment purchases, replacement, and maintenance, other than for vehicles, actually are appropriated to the central office of information systems. From these funds, the communications and electronics branch is given certain amounts to be used in support of the border patrol program to purchase communications and electronics equipment. This includes funds for all radios, sensors, and imaging systems such as the low-light-level television systems and infrared scopes.

Consequently, the border patrol central office, which is responsible for determining the field resources that are needed, must request that communications and electronics actually spend funds for such items. If the border patrol chose to purchase these items from its own funds, it would have to use funds from the vehicle account or some other account, since it has no funds specifically earmarked for purchases of communication or electronic equipment. The assistant commissioner for the border patrol has indicated that many of the problems experienced with equipment purchases (as a result of communications and electronics funds being reallocated, for example) might be resolved if the border patrol received these funds directly. This would enable the program that represents the users to have more direct control over the manner in which these funds are spent. However, if programs, in general, are given this authority, communications and electronics expertise and approval should be obtained prior to the purchase of this equipment in order to ensure compatibility with other communication and electronic equipment.

The Reallocation of Funds

The practice of reallocating funds has often caused equipment purchase delays and problems. One high-level INS official indicated that purchase of smaller equipment items not included in advance procurement plans is often delayed because funds that might have been used for such purchases are actually used for other purposes.[5]

While reallocation may be necessary and justified in some instances, we noted in at least one instance when this interfered with the successful

[5]The advance procurement plan includes items costing more than $500,000. Very little INS equipment other than automated data processing systems, vehicles, and large-volume purchases falls into this category.

purchase of equipment. In some years, funds appropriated to information systems, and subsequently allocated to communications and electronics for the support of border patrol operations, have been reallocated within information systems to support other acquisitions. More specifically, in 1986, a large percentage of the budget was reallocated to cover automated data processing equipment cost overruns, maintenance, and operation. In this case, of the money allocated for the purchase of mobile radios for the border patrol, approximately only one third was actually available.

Since equipment items costing less than $500,000 are not included in the advance procurement plan, and since funds allocated for equipment purchases have, on occasion, been reallocated, long-term planning for equipment purchases is currently difficult at INS. One high-level official indicated that at least for equipment with known life cycles (such as radios), earmarking and preventing reallocation of such funds would enhance the ability to plan for such equipment purchases.

Decentralized Procurement Authority

As we stated earlier, INS integrates line and program management to perform its operations. The central office is generally the hub of program management, providing staff assistance to the line managers, but the regions maintain a great deal of autonomy.

This autonomy also pertains to the authority to purchase goods and services. In general, regional offices have unlimited authority to purchase equipment, restricted only in terms of certain items identified in the INS administrative manual (firearms, data processing equipment, communications items for new requirements or costing more than $25,000, and so on). The other exception to regional authority is that, like central office purchases, if a sole-source item costs $50,000 or more and is not on the GSA contract, or is competitive and costs $100,000 or more, the procurement action must be reviewed by the Department of Justice (DOJ) office of procurement executive.

INS recently established a new policy regarding the delegation of procurement authority within regions, apparently in response to a previous DOJ procurement management review that determined that INS was not in compliance with all applicable acquisition regulations. According to the new INS policy, each region is establishing its own guidelines and levels of procurement authority with respect to district offices and sectors within its jurisdiction. This authority (which was not yet fully established during our review) includes $25,000 to field units in at least one region; further, it includes the authority to vary procurement dollar limits accorded to each field office within each region.

This could pose special problems for even a sound technology selection process. Since the regions have fairly extensive procurement authority, and since they further vest their field units with authority up to $25,000 (with certain restrictions), it is conceivable that inappropriate technology selections may be made. Specifically, the ability of field units to purchase items below certain dollar thresholds without higher approval may be appropriate for some items while leading to the selection of equipment that other field units have already discovered to be inappropriate or ineffective when there is no clearinghouse for new technology purchases. Further, if central office program managers do not have the authority to approve or disapprove equipment purchases, and if they are not even informed of such purchases, it is hard to see how they can be held accountable for ensuring that the field carries out INS's priorities and policies and for determining the overall nature of the enforcement program, since technology use is, in some instances, related to program priorities and policies. Some mechanism for communication among various offices, especially between the central office and field offices, would facilitate the technology selection process.

Summary

In this chapter, we have described the organization and structure of INS and discussed our findings regarding the lack of a systematic process within INS for selecting technologies. We also discussed three mechanisms that are currently being used by INS and that could help improve the selection process if expanded more generally to the technology area, and we discussed some obstacles to effective technology selection.

The locus of the process for selecting technologies in development—that is, the research and development office—is weak, the budget process often works against efficient technology selection, and decentralized procurement authority may lead to duplication and waste. Given these obstacles, we believe that even if INS had an established process for making decisions regarding new technology, these obstacles could prevent it from working effectively.

A Framework for Selecting Technologies

Our intent in this chapter is to describe how we developed a framework in response to the question, "Can a systematic method be developed for effectively selecting technologies?" The aim of our framework development was to produce a set of logical steps that would apply to almost any setting where technologies must be selected and a series of substeps specific to INS. The major steps we arrived at are given near the end of this chapter; the full framework with its substeps is given in appendix III.

Early Framework Development

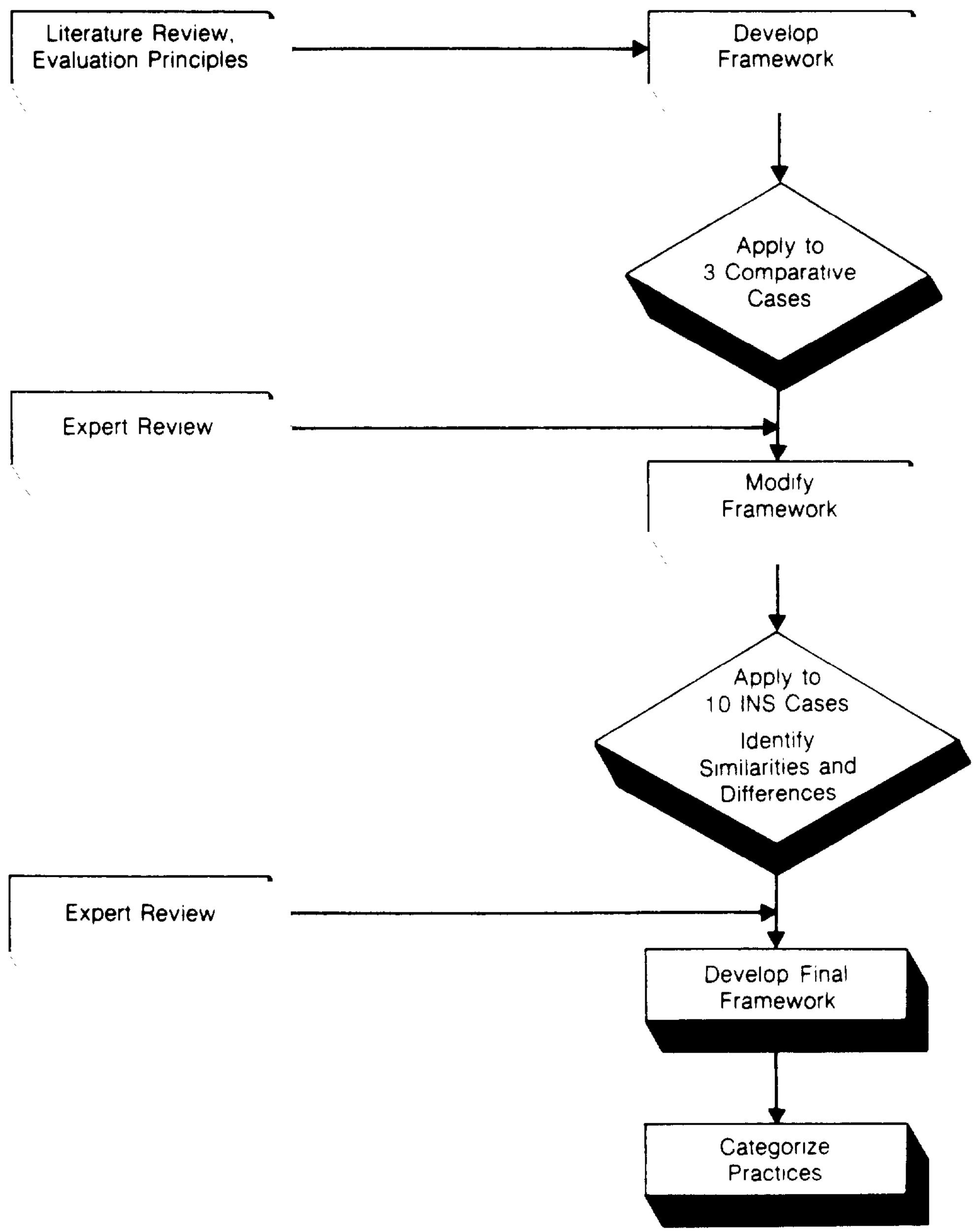
Arriving at a final framework was an iterative process, as is depicted in figure 3.1. Several versions of the framework were developed, each moving us along the path from theory to practice. We used this stepwise process to ensure that we would consider all the relevant theoretical aspects of technology selection as well as the more pragmatic considerations of whether we could develop a framework usable by federal agencies in general and INS in particular. Our various versions of the framework also provided us with a method by which to structure our data collection activities. While thus used to enhance the consistency of our data collection efforts, they were also developed as a theoretical (and, for the final framework, an operational) depiction of the decisionmaking process that can be used to select technologies.

Theoretical Foundation

During our review of the available literature dealing with the selection of technologies and performance of technological research and development, we found that there is no established or generally agreed-upon method for the selection of technologies, although preferred general research principles and decisionmaking practices have been discussed and delineated by several authors.[1] We also reviewed relevant reports of our own dealing specifically with technology acquisition and testing at federal agencies, including DOD. These approaches include the application of systems analysis or a systems approach to the process associated

[1] See the list of selected references contained at the end of this report

Figure 3.1: How We Developed Our Technology Selection Framework



with the selection of new technologies or, in general, to the process used to make decisions, whether in relation to the acquisition of new technology or some other matter.[2]

We reviewed the theoretical and applied literature related to the application of systems theory to the decisionmaking process and incorporated generally agreed-upon principles for sound evaluations (that is, principles of evaluation design, data analysis, interpretation, and so on) to develop the framework. Since this framework was basically theoretical, we proceeded to the next step of its development, which was intended to determine whether the framework could be applied in the federal environment.

Testing at Comparison Agencies

After the technology selection framework was developed, we applied it, through case studies, to the formal technology selection policies and the decisionmaking process used for the selection of one technology at each of three other agencies—namely, the U.S. Customs Service (Customs), the Federal Bureau of Investigation (FBI), and DOD. We selected these agencies for comparison because of the similarity of some of their enforcement functions and technologies with those of INS. For example, DOD resembles INS in its need to identify targets, FBI resembles INS in its need to develop intelligence and forensic information, and Customs resembles INS in its need to identify smuggled objects or illegal entrants.

As we showed in table 1.1, the specific technologies we reviewed were

- at DOD, the MELIOS eyesafe rangefinder being developed by the night vision lab at Fort Belvoir;
- at Customs, an x-ray machine for the inspection of parcels developed with the support of the research and development division within the office of enforcement support; and
- at FBI, the triple stage quadruple (TSQ) mass spectrometer requested by the scientific analysis section of the laboratory division.[3]

[2]In general, by "systems analysis" or "approach" we mean a method by which a problem and its solutions are determined and structured by the performance of certain specified, logical steps.

[3]We also reviewed the formal policies established by the FBI engineering section related to the selection of equipment or research and development projects, but we did not review a case within this section

The criteria we used to select the particular case at each agency included the resemblance of the equipment and its functions to equipment currently used by INS or functions performed by INS and the exemplary nature of the case. In coordination with these three agencies, we chose cases that would reflect "good examples" of technology selection and that would provide us with the greatest amount of documentation and information possible regarding the decisionmaking process. This selection of a nonrepresentative case was appropriate since, in the performance of these case studies using the application of our preliminary framework, we were attempting to refine the framework by identifying practices that should either be added to or deleted from the framework, based on a synthesis of the information gathered from these 3 cases. We believed our identification of promising practices would be enhanced by selecting and reviewing what staff at the agencies considered an exemplary case.

Findings From the Comparison Agencies

The review of the cases at these agencies provided us with practical knowledge about our framework's organization and content. We found some areas in which the framework was overly detailed, in that it included substeps that were not relevant to any decisionmaking process used at any of these agencies. In such cases, we omitted the substeps in the framework. However, we also found that many of the framework steps and substeps were reasonable, based on the existence of these practices at all or several of the agencies. As such, much of the framework remained intact, with minor modifications in wording, structure or content. Finally, we identified some practices not clearly defined in the framework but appearing to be well developed and implemented at all or some of these agencies. In this case, we added such practices or substeps to the framework.

For example, we considered the level of formality and number of reviews required by the DOD process to be unsuited to a general framework, but we identified some specific substeps or practices in the decisionmaking process at DOD that warranted inclusion or refinement in the framework. Such practices include the clear specification of needs, methods of achieving objectives in an acquisition plan, the coordination of users and developers so that the proposed technology clearly responds to an operational need, and the evaluation and prioritization of new technologies by an established committee.

The process we reviewed at Customs was characterized by little formality or regularity; rather, it is generally tailored to the specific nature of the case. Thus, although Customs apparently followed an appropriate process for the selection and development of the x-ray equipment, this case study provided no basis for changing the proposed framework.

Finally, at FBI we identified a number of practices that were either already in our preliminary framework (in which case they remained intact or modified) or that should be included. For example, the formal procedure with clearly defined lines of authority for identifying and selecting technologies; the existence of a panel or reviewing body to prioritize research and development projects; the consideration of appropriateness, cost, availability of alternatives, benefits, potential effectiveness, and duplication; the identification of need at the field level; and the clearly delineated role of research and development in the identification and development of new technologies are only some of the reviewed practices we used to modify the preliminary framework.

After the performance of the case study reviews, we modified the framework, incorporating all practices we judged to be important and transferable and eliminating those that we considered unnecessary. The framework was then reviewed by two experts knowledgeable about the general process by which decisions regarding new technology are made.

Table 3.1: Selection Criteria for 10 INS Cases

Case	Function
Barrier project	Apprehension and deterrence
Convair 580	Transportation
Fraud intercept task force (FITF) equipment package	Detection of documents
Image enhancement vehicle (IEV)	Detection of people
Low-light-level television (LLLTV)	Detection of people
Microspectrophotometer	Detection of documents
Optimization profile	Detention
Radio scrambler	Communication
Stun gun	Safety and apprehension
Survival gear	Safety

(See appendix IV for background information on these experts.) From comments we received from these experts, we modified the framework again, making it less theoretical and more practical.

Ten INS Cases

The framework in this modified state was then compared to how INS selected technologies in 10 particular cases. There are two reasons for applying the framework to the INS cases: to identify strengths and weaknesses in the INS procedures and to refine the framework.

Selection of Cases

The 10 cases were selected from the survey information we gathered on the technologies used, considered, or rejected by INS and from other information gathered during site visits and interviews. Cases were judgmentally selected given a broad variety of criteria, including the functional enforcement areas mentioned earlier (detection, apprehension, and so on), type of technology (that is, off-the-shelf or developmental), cost, and stage of selection decision (that is, implemented in the field; in testing, development, or being considered; or already rejected for use) and to some extent the expected availability of information. Table 3.1 lists the 10 technologies we reviewed and the criteria for selecting them.[4]

Year[a]	Per unit cost[b]	Type	Stage	Program
1982 or after	Above	Off-the-shelf	Being considered	Border patrol
1982 or after	Above	Off-the-shelf	Implemented	Detention and deportation
1982 or after	Below	Off-the-shelf	Implemented	Inspections
1982 or after	Above	Developmental	In development	Border patrol
Prior to 1982	Above	Developmental	Implemented	Border patrol
1982 or after	Below	Off-the-shelf	One implemented, one being considered	Intelligence; Legalization
1982 or after	Below	Developmental	In development	Detention and deportation
1982 or after	Below	Off-the-shelf	Implemented	Antismuggling
1982 or after	Below	Off-the-shelf	Being considered	Several, including detention and deportation and antismuggling
Prior to 1982	Below	Off-the-shelf	Implemented, some new items being considered	Border patrol

[a]First used, developed or considered

[b]Above or below $100,000

[4]Three of these cases—namely, the image enhancement vehicle, the low-light-level television system, and the optimization profile—are developmental technologies. The remaining 7 are off-the-shelf items

Description of INS Cases

As stated above, the framework was applied to the decision-making process used for each of the 10 INS case studies. In addition to identifying strengths and weaknesses in the INS procedures for each case, we developed general information on the chronology of and current decisions related to each case. Table 3.2 presents summary information about the cost of each case study technology. The following section presents brief information on the function, history, and cost of each technology we reviewed.

Table 3.2: Cost of 10 Case Study Technologies

Case	Cost
Barrier project	Approximately $3.3 million for San Diego and El Paso projects
Convair 580	$1.1 million
Fraud intercept task force (FITF) equipment package	Approximately $133,000 for equipment packages distributed to 35 ports of entry at about $3,800 each
Improved image enhancement vehicle (IIEV)	Approximately $130,417 each for 15 systems, or $2.0 million
Low-light-level television (LLLTV)	Approximately $2.5 million for six systems
Microspectrophotometer	$29,675 for unit at forensic document laboratory, $31,950 for proposed unit for Laguna Niguel document analysis unit
Optimization profile	$46,600 for first phase
Radio scrambler	Approximately $714,000 for 156 radios at $4,200 to $4,900 each
Stun gun	Unit cost approximately $60, no funds spent yet
Survival gear	Not determined

Image Enhancement Vehicle

The IEV is a vehicle-mounted surveillance system intended to provide efficient, mobile, and clandestine "linewatch" operations. The vehicle houses a segmented, extendable 25-foot mast on which an infrared scope is placed. The data from the infrared scope are fed down a cable into a monitor housed inside the vehicle. (See figure 3.2.) When the mast is lowered and rotated into a storage position, the vehicle roof doors can be closed and the vehicle takes on the appearance of a normal border patrol 4-wheel drive vehicle, except that it has tinted windows in the back, concealing the mechanical components. Figures 3.3 and 3.4 depict the IEV with its mast partially and fully extended.

The prototype IEV was tested during 1985 in the Tucson, Arizona, border patrol sector. Test data were inconclusive, but subsequent to testing, INS decided to develop 11 improved image enhancement vehicles (IIEVs) to continue exploring the effectiveness and feasibility of the vehicle. In September 1986, the research, development, and engineering center at Fort Belvoir joined the IIEV project, at which time a decision was made to fabricate 4 additional vehicles for the Army. A contract was signed on June 17, 1987, to design and fabricate the 15 IIEVs.

To date, the cost for production of the 15 IIEVs is $1,656,254. However, to fabricate all 15 vehicles, a minimum of 5 additional infrared scopes would have to be purchased. Assuming these scopes cost approximately the same as previous ones (that is, $60,000 each), the total cost of production would be $1,956,254, or $130,417 per vehicle.[5]

Currently, INS is experiencing significant delays in the fabrication of the IIEVs, reportedly because of problems in acquiring components from manufacturers. According to the contract, all 15 vehicles were to have

[5]This excludes the cost of the Army commercial utility cargo vehicles on loan to INS. These vehicles originally sold for approximately $11,500 each. Unless the Army donates these vehicles to INS, INS will eventually incur some cost for purchasing them. This cost also excludes the salaries of INS employees assigned to the IIEV project.

Figure 3.2: Control Console and Monitor Within the Prototype Image Enhancement Vehicle

Figure 3.3: The Prototype Image Enhancement Vehicle

The prototype image enhancement vehicle with mast partially extended places infrared scope at height of approximately 11 feet

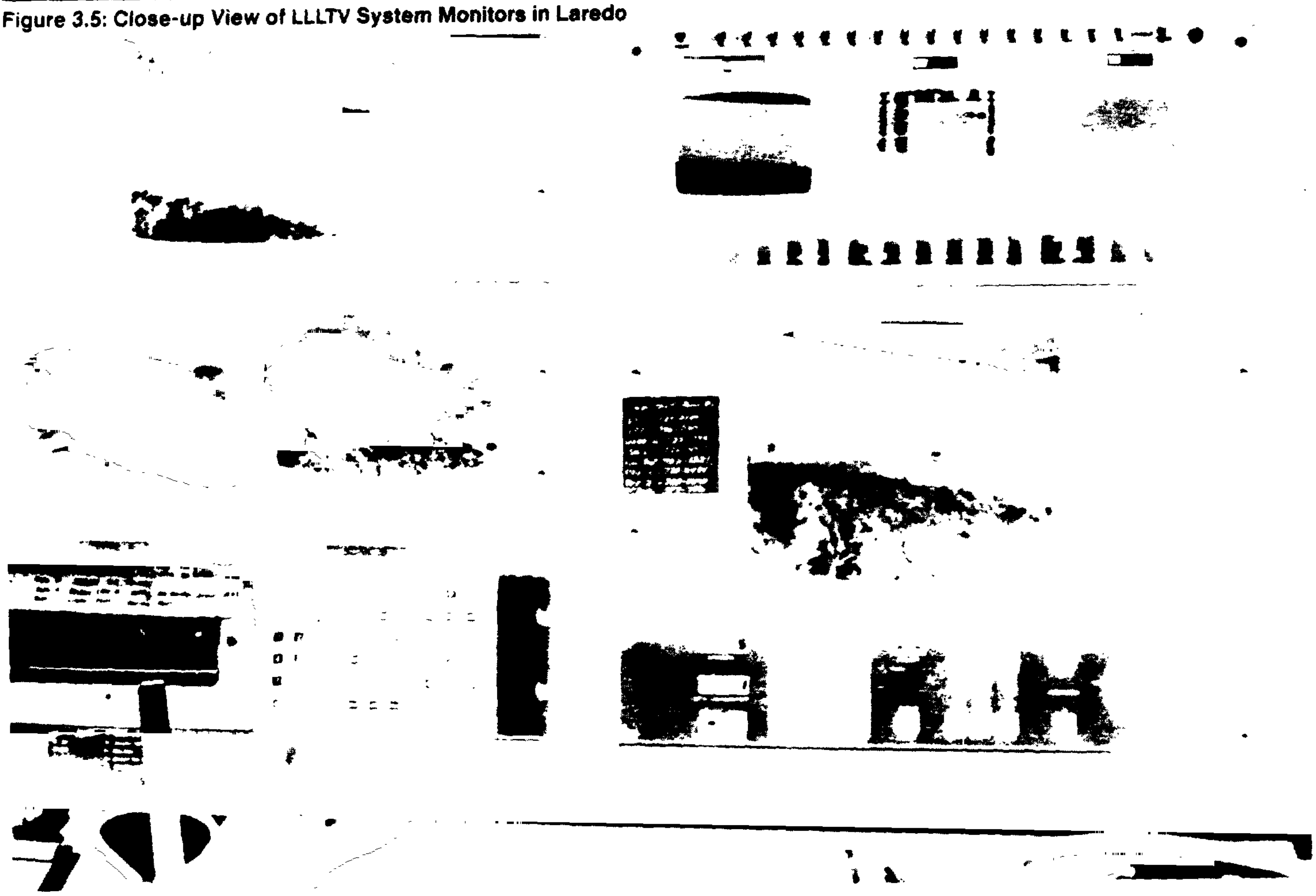
Figure 3.4: The Prototype Image Enhancement Vehicle With 25-Foot Mast Fully Extended

been built and in the field for testing by November 1987. However, by mid-December, none of the 15 had yet been completely fabricated. The costs of this delay are expected to be borne by the contractor.

Low-Light-Level Television

Low-light-level television systems use surveillance cameras that work at very low light levels as well as during daylight or normal light conditions. The cameras transmit images to a set of screens at a monitoring or base station, allowing personnel there to see images simultaneously from all the cameras in the system. Figure 3.5 depicts the LLLTV system monitors in Laredo, Texas.

Figure 3.5: Close-up View of LLLTV System Monitors in Laredo



Currently, INS has LLLTV systems installed in El Paso and Laredo, Texas; Nogales and San Luis, Arizona; Calexico, California; and Swanton, Vermont.[5] The costs of the systems varied considerably across sites and included approximately $268,000 for Swanton's system and $1.1 million

[5]During our data collection, a LLLTV system was under development for Houlton, Maine, and there were also plans to begin the installation of a system in Del Rio, Texas, within the year

for the system in El Paso.[7] Total accountable expenditures for all six LLLTV systems is estimated to be $2,492,600.

Optimization Profile

The optimization profile is planned as a three-part integrated system for use by INS units that apprehend aliens and by detention and deportation staff. The first phase of the system, currently being developed, is a procedure to indicate, for each individual alien, the most cost-efficient location and mode of transportation, based on the estimated length of time the alien will remain in detention.[8] Costs for development of the first phase have amounted to $46,600.[9]

Barrier Project

The proposed border barrier project, still before the INS commissioner for approval during our data collection, recommends improvements in the San Diego and El Paso border patrol sectors. These improvements, including repairing and modifying fences and installing concrete barriers and test sections of new fencing material, as well as high-intensity lighting, are expected to help deter and prevent the illegal entry of aliens and vehicles across the southern border or to direct the flow of aliens into other areas where monitoring and controlling their entry will be easier.

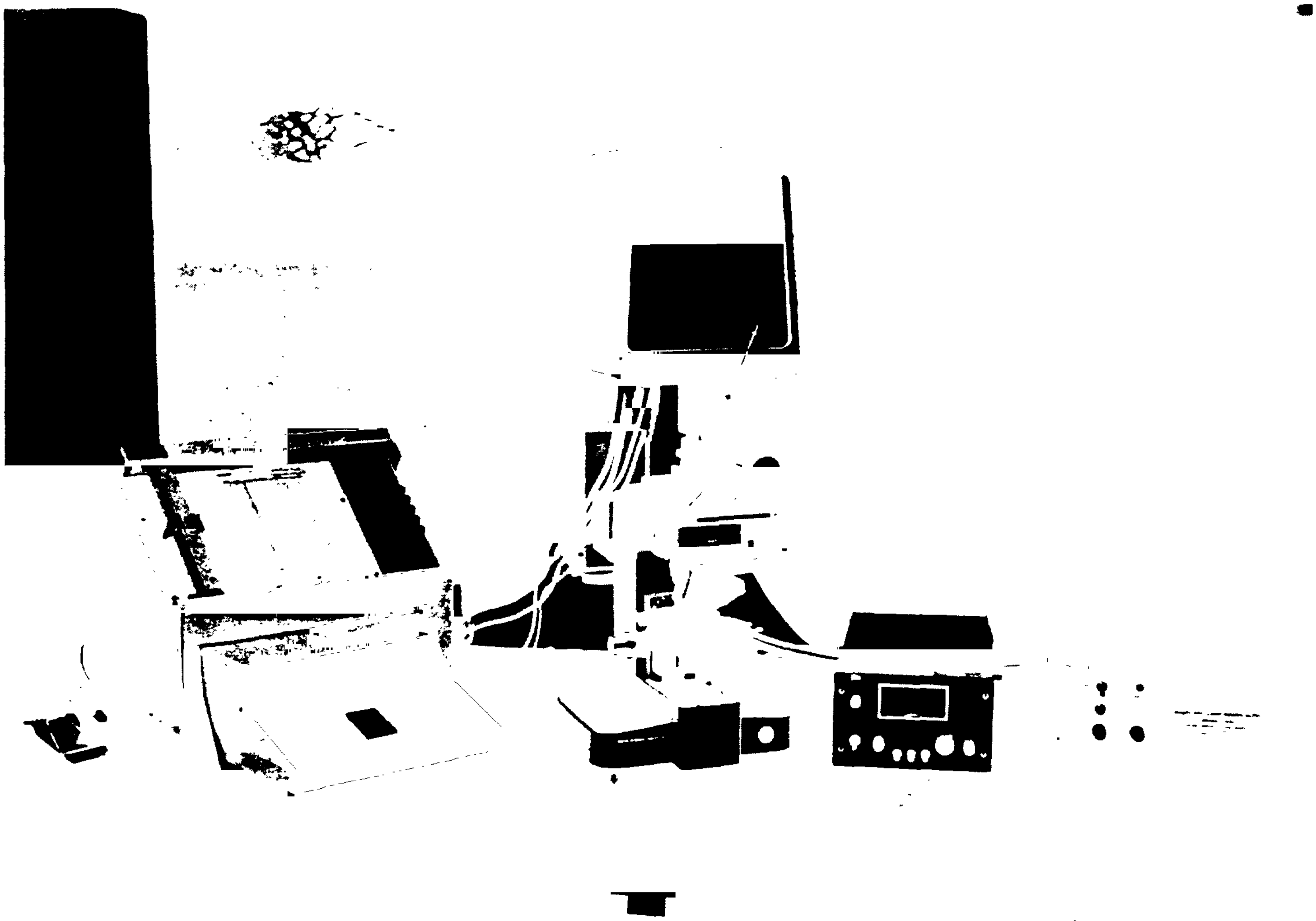
The cost estimate for the project in San Diego is $3,020,000; for El Paso, the cost estimate is $270,000. Such differences in cost are a direct result of the type of barrier projects being developed (for example, installing new fencing versus repairing old fencing), method of installation (that is, by contractor or by INS staff), and extensiveness of area covered (the area covered in San Diego is more extensive than in El Paso).

[7] The cost of the El Paso system is high in comparison with other systems because of the number of cameras, the extent of developmental planning that was done by contractors, and the need for evaluation of the system. For other sites, fewer cameras were used, the developmental work was done by INS staff, and much of the installation was conducted by local staff. It should be noted that we did not include the costs associated with INS staff time devoted to the installation or project planning and testing of LLLTV systems at various sites.

[8] Estimates of the length of time the alien will remain in detention can be based on such factors as age, sex, nationality, and marital status.

[9] This includes only contractors' fees; it does not include "sunk" costs such as salaries of INS employees working on the optimization profile.

Figure 3.6: Microspectrophotometer



The microspectrophotometer currently installed at the forensic document laboratory in McLean, Virginia
Source U S Immigration and Naturalization Service

Microspectrophotometer

The microspectrophotometer was purchased and upgraded by the INS forensic document laboratory at a total cost of $29,675. This equipment helps detect fraudulent documents through a nondestructive spectral analysis of materials such as ink samples, which are subjected to ultraviolet, visible, and infrared light. The microspectrophotometer is depicted in figure 3.6.

The profiles produced by the microspectrophotometer require training and technical expertise to interpret. The equipment was in use at the laboratory from 1983 until the summer of 1985, when the only staff member trained to use the equipment and interpret the results resigned. Since that time, the microspectrophotometer has not been used, but there are currently plans to train a new staff member to use it.

The Laguna Niguel document analysis unit is currently planning to purchase a microspectrophotometer at a cost of $31,950 for use in detecting fraudulent documents.[10] Staff at the forensic document laboratory have recommended against this purchase.

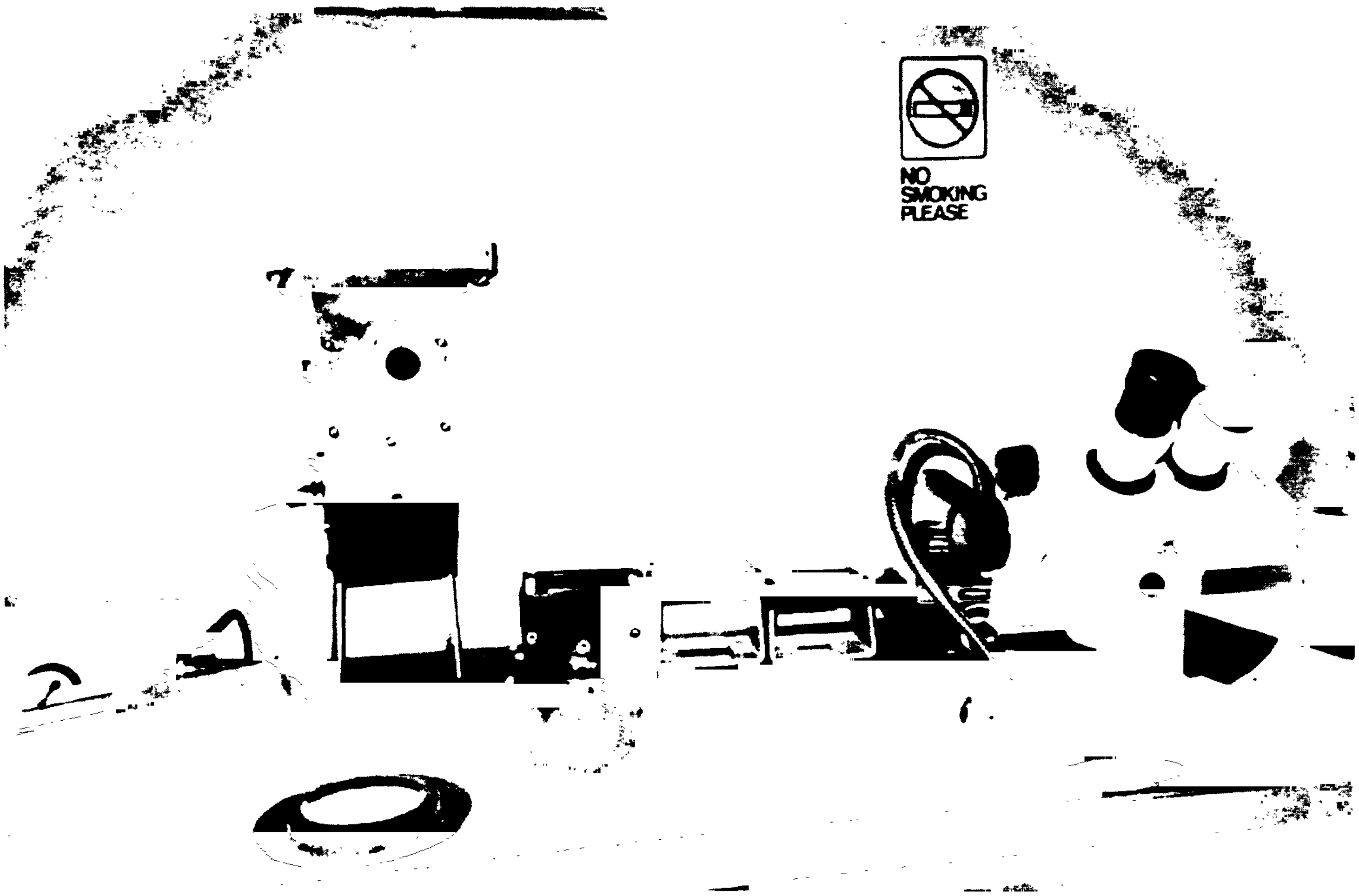
Fraud Intercept Task Force Equipment

The Fraud Intercept Task Force was a 1984-85 inspections effort of specially trained inspectors who visited selected ports of entry and conducted training and data collection activities. The task force operations included the distribution of a five-piece equipment package used to aid in the detection of fraudulent documents. These items included a stereomicroscope, fiberoptic illuminator, CU-5 Polaroid camera, 35-mm camera, and an audiovisual projector. Figure 3.7 illustrates some of these items.

While these items perform separate functions, all relate to the enhancement of document inspection methods. Specifically, the stereomicroscope allows inspectors to examine documents visually in magnified detail. The fiberoptic illuminator casts intensified light onto documents, allowing defects indicating fraud to be better identified. The CU-5 camera, which is equipped with enlargement frames, is also used to enlarge portions of documents for visual inspection. Finally, the 35-mm camera and slide projector are used to photograph documents and display such documents for training purposes, as well as to photograph documents for court cases and intelligence information dissemination.

[10] The Laguna Niguel document analysis unit is part of the western regional processing facility, one of four regional processing centers created to handle the applications of aliens who apply for residency under the Immigration Reform and Control Act of 1986.

Figure 3.7: Fraud Intercept Task Force Equipment



Stereomicroscope with fiberoptic illuminators attached, and Polaroid CU-5 camera with enlargement lenses

In 1985, the total cost of one set of the items was approximately $3,800. Between 1984 and 1986, FITF equipment was distributed to 35 ports of entry. An official in the INS central office indicated that in 1987 they had expected to purchase approximately $100,000 worth of additional FITF equipment using funds in the user fee account, but these purchases have been deferred because of shortages in this account.

Figure 3.8: Convair 580 Aircraft

Convair 580 aircraft used mainly to transport INS detainees

Convair 580 Aircraft

The Convair 580 is an INS transport aircraft operated by and for the INS detention and deportation program from the INS air operations center located in El Paso, Texas. The aircraft was purchased in used condition from the U.S. Army Corps of Engineers in December 1985 at a cost of approximately $1.1 million and was first used by INS in February 1986. It holds 48 to 56 passengers, including a crew of two pilots and three to four air transportation officers. The aircraft is pictured in figure 3.8.

The functions of the Convair 580 include (1) a safer, faster, and more cost-efficient method than commercial flights to transport high-security-risk INS detainees, such as some of the Mariel Cubans, between INS detention facilities and the border, (2) transporting extra INS officers to other areas for special operations, (3) general transportation of INS detainees to and from detention facilities or border locations, and (4) officer transportation when needed and economically feasible.

INS is considering the acquisition of additional aircraft for the El Paso air operations center. Specifically, it is investigating the acquisition via the asset forfeiture program of a smaller aircraft and the purchase of an aircraft with capacity greater than that of the Convair 580, although usage statistics for the Convair 580 during fiscal year 1986 (the latest available data) averaged only 50 percent.

Winter Survival Gear

Winter survival gear, such as cold-weather pants and jackets, is available for use in at least five northern border patrol sectors and four northern districts, and it is used for the safety of either agents or the individuals whom an agent rescues in inclement weather. We confined our review of the selection of survival gear to the Havre, Montana border patrol sector.[11]

The winter survival gear items, which are routinely contained in the survival gear kits in the Havre sector, include but are not limited to sleeping bags, flight pants and jackets, tire chains, reflector-type flares, first aid kits, and paraffin cans. In general, most items cost less than $20 each. In addition to the listed items above, this case study included the review of other survival gear items—namely, emergency heat packets, enhanced first-aid kit items, improved sleeping bags, and additional replacement parkas being considered or recently rejected for use in the Havre sector.

[11] It should be noted that we are including sectors and districts along the entire U.S.-Canada border in our classification "northern," although these units would be classified as eastern or northern by INS. Our selection of this particular sector was based on several factors. First, we thought it necessary for purposes of generalizability and completeness to include at least 1 case study that pertained to the selection or use of equipment along the northern border, since most other cases (because of the geographical concentration of equipment) would deal with equipment along the southern border. Second, our previous research uncovered information suggesting that the Havre sector was currently considering the use of new or additional survival gear items. We wanted to concentrate on this sector's process of selecting the new equipment, since our questionnaire responses did not identify any other northern sectors that were considering new survival gear.

Stun Gun

The stun gun is a small weapon that when pressed against the body with the trigger pulled delivers a 50,000 volt charge, causing momentary loss of muscle control, thus allowing the user to subdue the subject without having to resort to greater force.

Formally known as an "electronic defense module," the stun gun was considered but rejected for use at INS in 1985. Currently, it is again being considered as a possible nonlethal weapon to be used by INS officers for subduing violent aliens. At the time we completed data collection, the commissioner had not made a decision concerning the use of the stun gun, and no units at INS were actually using it. The cost per weapon is estimated to be $60.

DES Radio Scrambler

The data encryption standard model radio scrambler uses digital voice transmission, coding or encrypting voice signals before transmitting them over radio waves. While it does offer voice security, other INS communications equipment such as radios, relays, and repeaters use analog voice transmission and, thus, are not compatible with the DES radio scrambler.

The DES radio scrambler was first used by the antismuggling unit in 1984-85, when 86 mobile and 70 portable radios were purchased and placed in locations throughout the United States. Per unit cost ranged between $4,200 and $4,900, and the total cost of this purchase was approximately $714,000. Subsequent to field testing, INS decided not to purchase any additional DES radio scramblers, partially because of problems experienced with the compatibility of the radio with existing communications equipment.

Some DES model radios already purchased are still being used and do provide INS with secure communications, although because of their limitations, they are primarily used by small groups of enforcement agents working together on a project and for communications in joint operations with INS agents and other federal and local agencies that use only the DES model radio scramblers.

According to an INS official, INS is currently in the process of assessing the long-term threat and need for alternative voice privacy equipment and the subsequent purchase of other radios.

The Results of Applying Our Technology Selection Framework to INS Cases

When we applied the framework to the process used to select the 10 technologies, we noted the specific steps and substeps where the INS process either adhered to or deviated from the framework. When the process adhered to the framework, we concluded that the framework step (or substep) was appropriate. When the process deviated from the framework, we questioned both the framework and the INS process.

We found that the differences between the processes followed by INS and the framework were usually related either to some characteristic of the technology, such as cost, type, complexity of function, or stage of selection or to some institutional aspect, such as internal policies, operations, or organization at INS.

Each difference was then assessed in terms of its reasonableness. Unreasonable differences—those we thought were within INS's control to change—were treated as areas in which INS could improve its decisionmaking practices. For example, the lack of a policy related to the selection of technologies, the lack of criteria with which to prioritize selections, or the inadequate performance of tests on new technologies were determined to be unreasonable differences. In cases such as these, we believed that the INS procedures would have been improved if they had followed our framework.

Reasonable differences, however, were considered to derive from acceptable practice. In general, these were logical differences based on some aspect of the technology under review. For example, in some cases the substeps delineated in the framework were pertinent only to the selection of developmental projects and, thus, were not followed for the selection of off-the-shelf equipment. Thus, deviations from these particular framework substeps during the selection of off-the-shelf equipment was not unreasonable. In these cases, we modified the framework to account for such reasonable differences.

Final Technology Selection Framework

As a result of our assessment of the reasonableness of deviations, and given our preliminary judgments developed during the case study work performed on the 10 INS cases, we identified a spectrum of practices evident in the current INS decisionmaking process, paying special attention to practices at either end that appeared to be promising or problematic.

We analyzed and synthesized, across the 10 INS cases, this set of practices. We also again reviewed the literature on systems theory (applied to the decisionmaking process) and the FBI, DOD, and Customs case studies to identify practices that could be useful when developing a final framework, to ensure that these were still contained in the framework. From our reanalysis of this information and our synthesis of INS practices, we developed a final framework for the general selection of equipment that we feel has immediate applicability in the current INS environment. This framework also contains a separate set of additional practices that can be followed when selecting developmental projects, in particular. As with the earlier version of the framework, the final framework was reviewed by experts and was refined, incorporating expert opinion.

The final framework contains seven steps that we believe would have facilitated the promising practices we found and discouraged the problematic ones we identified across the 10 INS cases. The seven steps outlined are

1. identification of operational need or problem

2. identification of solutions

3. testing or development or both

4. data analysis and report writing

5. report review

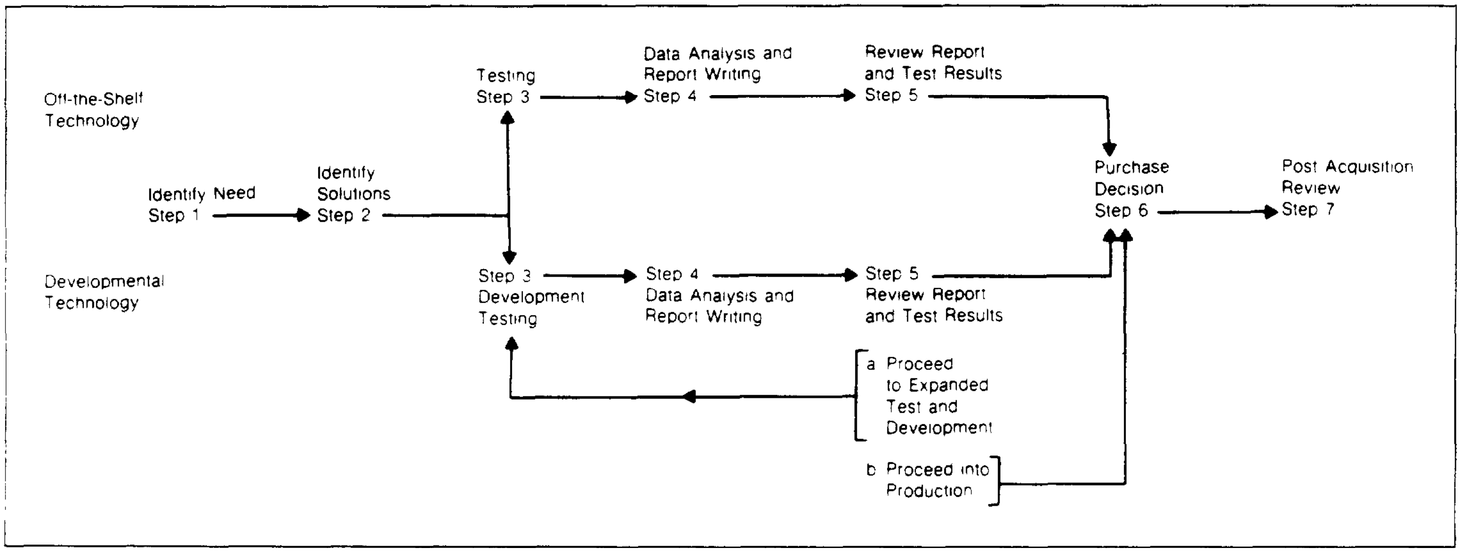
6. decision to purchase equipment

7. collection and use of postacquisition review information.

Figure 3.9 depicts the relationship between the framework steps. The complete final framework is contained in appendix III.

Identification of operational need or problem refers to the systematic or timely identification and review of an operational need or problem known to exist at some level within the organization. Identification of solutions encompasses such activities as the determination of the most appropriate process for the review of the operational need or problem and potential solutions, the identification and comparison of potential solutions (including their costs, benefits, maintenance, and training requirements), the consideration of the need for testing or developing a

Figure 3.9: Relationship Between Technology Selection Framework Steps



solution, and the conduct of a feasibility study if the solutions being reviewed are developmental.

Testing or development for solutions not available off the shelf includes the planning, designing, and implementing of development and testing of a prototype. It also includes the testing, if necessary, for an off-the-shelf solution. This step includes such tasks as the development of a prototype (if developmental), the preparation of a test design, and the conduct and monitoring of tests. Data analysis and report writing encompass such activities as the analysis and interpretation of data gathered during testing. Such analysis, done by appropriately skilled staff, in conformity with the test design, is contained in a formal report, including conclusions and recommendations regarding the need for additional testing.

Review of the report pertains to the timely review by appropriate decisionmakers of the testing report. This step includes a decision regarding the advisability of purchasing the item or expanding development.

Decision to purchase equipment refers to the decision to purchase off-the-shelf equipment as well as the decision to move into the production of operational equipment that underwent the development phase. Issues addressed during this step include a review of available evidence about such things as the resources (training, staff, maintenance) needed to use the equipment, an estimate of the anticipated costs and benefits of equipment, and the prioritization of the need for such equipment against other program, unit, or office needs.

The final step, collection and use of postacquisition review information, refers to such information as frequency of use, operating cost, and operational problems experienced with different technologies. Such information, gathered through individual reviews and an annual survey, can be used in decisions regarding future technology purchases.

It is important to note here that we believe the logic specified by the overall seven steps should remain intact, but the specific practices outlined in the substeps for each particular step should be tailored to such factors as item cost, complexity, and type (that is, developmental or off-the-shelf). For example, for a relatively simple low-cost item such as survival gear, we would expect that the seven steps be followed, but that the substeps not be followed as rigorously as for an item such as the Convair 580 aircraft, which costs over $1 million. For off-the-shelf items, standard methods of evaluating the acquisition of new capital equipment should be used and, in particular, future costs and benefits should be discounted to their present value.[12] Circular A-94 of the Office of Management and Budget (OMB) offers one approach to doing this evaluation. For developmental items, such as LLLTV, which involve new, costly, and often complex technology, the framework steps and substeps should be reviewed more closely. (Despite the uncertainties inherent in new technologies, an estimation of costs and benefits should be tried.)

Summary

Over the course of work on this project, we developed, in an iterative manner, a framework with immediate applicability at INS for the selection of new equipment. This framework, in its early stages, was theoretical, based on our analysis and interpretation of systems theory applications to the decisionmaking process. Over time, it was refined, by applying it to actual processes used at three agencies and was developed into a less theoretical and more applied framework. The final framework developed is an applied or operational framework, based on our analysis of the reasonableness of differences in current INS practices, as well as on promising practices identified at the three agencies and in the systems theory literature.

[12]To determine whether a loss or a gain will result from a decision whose costs and benefits will come at several different points in time, the dollar figures represented by gains and losses must all be expressed in terms of their present value. This process is called "discounting".

Ten INS Case Studies

Our development of a technology selection framework was not an end in itself but, rather, was important insofar as it could be applied to specific cases, thus allowing us to learn more about the technology selection process at INS. In particular, it is through this framework that we have addressed the question, "If a systematic method can be developed, how do current INS procedures compare to it?"

Promising and Problematic Practices

Promising and problematic INS practices were identified by (1) comparing INS methods, procedures, and practices to the framework and (2) again reviewing the literature and results of our case studies at the three agencies.

In applying our framework to the 10 cases, we found across the cases a wide variety of practices related to the selection of technology. Some of the INS practices were judged promising. A promising practice was one that matched the criteria in the framework so well that we thought the practice would be quite worthy of emulation. On the other end of the spectrum were practices that we judged problematic. A problematic practice was one so far from conformity with the framework that it should be changed. In between these two extremes were practices judged to be neither exemplary nor disadvantageous.

However, we focused our analysis on practices that were clearly promising or problematic, since these point to obvious strengths and weaknesses in the INS technology selection process. We categorized the promising and problematic practices by the relevant framework steps so that all practices related to the identification of a need or problem were categorized step 1 practices, all practices related to the identification of a solution were categorized step 2 practices, and so on.

When a practice was identified for any framework substep, it was listed as occurring within the associated framework step. However, the listing of a promising practice for any framework step does not imply outstanding performance of that entire step. For example, although the FITF case is associated with promising practices in the performance of steps 1, 2, and 3, this does not mean that the manner in which the need or problem was identified (step 1), the solution was identified (step 2), or testing was conducted (step 3) was entirely exemplary. Rather, it is an indication that some aspect of the way in which these steps were performed, when judged against our framework, is especially noteworthy and encouraged for the performance of these steps in a more routine or general sense at INS.

Further, any step can have both promising and problematic practices associated with it for any particular case—these categories are not mutually exclusive. In fact, many cases had both types of practice identified for the same step. Thus, the fact that a case may have a promising practice identified for the performance of a step does not eliminate the possibility of its also having a problematic practice identified for the same step. Additionally, two or more promising or problematic practices per step, per case were sometimes identified. It should be noted that although all 10 cases had at least one promising and one problematic practice identified, we did not necessarily identify practices for each framework step for each case. Consequently, in the tables and text associated with the framework steps presented in this chapter, not all cases are either represented or discussed.

As stated earlier, the promising and problematic practices presented in this chapter are extreme cases. The fact that a case does not have a promising or problematic practice identified for any particular step does not mean that there was not either something especially useful or especially undesirable about the way in which a step was performed for this case; it means only that there was inconclusive evidence regarding the nature or magnitude of the practice.

Results From Applying the Framework

Step 1: Identification of Operational Need or Problem

Proper identification of a need is especially important, since it is at this point that the technology selection process should logically begin. Proper identification ensures that at least a problem at the operational level warranting attention is being addressed. However, improper specification of needs could result in addressing the wrong problem (for example, a nonexistent problem or a problem with low priority) and, in the long run, less than optimal use of scarce INS funds.

We identified at least one promising practice per case related to the performance of the first framework step in 4 of the 10 INS cases. As table 4.1 suggests, these relate in general to the identification of needs at the local or operational level or the coordinated identification of needs.

Table 4.1: Promising and Problematic Practices in Identification of Needs

	Promising		Problematic	
	Needs identified at the field level	**Coordination in needs identification**	**Lack of constant input**	**Possible undetermined need**
Barrier project	Need identification required from local level	—	—	—
Convair 580	—	Local and central office needs identification	—	—
Fraud intercept task force equipment	Devolution of authority for local needs identification	—	—	Unused equipment showing possible misspecified need
Image enhancement vehicle	—	—	—	—
Low-light-level television	—	—	—	—
Microspectrophotometer	—	—	—	—
Optimization profile	—	—	—	—
Radio scrambler	—	—	—	—
Stun gun	—	—	—	Unclear need identification
Survival gear	Annual reminder memo, local needs identification	—	Input from field nonsystematic	—

For example, in the survival gear case, the identification of the need was done by a border patrol agent in the field. Through daily experience, the agent gained detailed knowledge of certain operational problems that he brought to the attention of his supervisors. Likewise, in the barrier project case, the actual need for a barrier-type structure was determined at the local level, although those above the local level were also involved in the needs identification, so that the identification was a coordinated effort.

Although 4 cases thus exhibited promising needs-identification practices, we also identified 3 cases exhibiting problematic practices related to this step. These practices generally involved the lack of a systematic method of identifying needs or possible misspecification of needs. One might note that the survival gear case had a problematic practice in this category related to step 1—namely, the lack of systematic input into the identification of needs. In this case, although the need for survival gear enhancements had been identified by a local agent, other information, collected unsystematically by sector management, suggests that additional needs may exist and that questions remain about the presence of at least one of the needs identified by the local agent in this case. Further, in the FITF case, the existence of unused equipment at some ports of entry may suggest that the equipment was distributed to some sites

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Image enhancement vehicle	—	—	—	—
Low-light-level television	—	—	—	—
Microspectrophotometer	—	—	—	—
Optimization profile	—	—	—	—
Radio scrambler	—	—	—	—
Stun gun	—	—	—	Unclear need identification
Survival gear	Annual reminder memo; local needs identification	—	Input from field nonsystematic	—

For example, in the survival gear case, the identification of the need was done by a border patrol agent in the field. Through daily experience, the agent gained detailed knowledge of certain operational problems that he brought to the attention of his supervisors. Likewise, in the barrier project case, the actual need for a barrier-type structure was determined at the local level, although those above the local level were also involved in the needs identification, so that the identification was a coordinated effort.

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In summary, we observed some inconsistent patterns in needs identification, sometimes resulting in both promising and problematic practices operating within the same case. We found evidence of local involvement in the performance of this step. However, inconsistencies in the performance of tasks associated with this step lead us to believe that there should be a procedure established for the systematic identification of needs and problems, especially at the local level.

Step 2: Identification of Solutions

Once a need is properly identified, a solution, or a menu of solutions, is identified. Again, this is an important step because the solutions must be matched to the need.

Nine of the 10 cases reviewed provided substantial evidence of at least one, and often more than one, promising practice related to the identification of solutions. These practices, as table 4.2 indicates, often relate to a level of coordination between INS programs in the identification of solutions or the use of expert opinion in such identification. For example, the barrier, Convair 580, LLLTV, optimization profile, radio, and survival gear cases all exhibited examples of coordination among programs, offices, or units in the identification and review of solutions. In the LLLTV case, there was a fair amount of information sharing during the identification of solutions for at least the LLLTV system established in Swanton, Vermont. Further, in the barrier, FITF, microspectrophotometer and survival gear cases, experts (either inside or outside INS) were consulted for the identification of the specific technological solution.

Table 4.2: Promising and Problematic Practices in Identification of Solutions

	Promising			
	INS internal coordination	**Use of experts**	**Local solution identification**	**Multiple solutions examined**
Barrier project	Coordinated among several groups, high level review	Outside agency experts involved in working group	Decentralized solution identification	Reviewed several types of solutions
Convair 580	Field and central office coordination	—	—	Different types of aircraft considered
Fraud intercept task force equipment	—	Experts in forensic science at INS consulted	Input from Los Angeles airport officials	—
Image enhancement vehicle	—	—	—	
Low-light-level television	Sharing of information among sites	—	Recognized local capabilities	—
Microspectrophotometer	—	Experts from FBI and other agencies	—	—
Optimization profile	Intraprogram coordination	—	—	—
Radio scrambler	INS steering committee	—	—	—
Stun gun	—	—	—	—
Survival gear	Responsiveness of upper management	Input from local experts	—	—

Unfortunately, while the process by which solutions were identified provided evidence of some promising practices, it also provided relatively equal evidence of practices on the opposite end of the spectrum. In at least 7 cases, we identified between one and three problematic practices per case related to the accomplishment of this step. For example, the stun gun case produced several examples of problems with solution identification related to the inadequate investigation of information on the potential solution. Likewise, the barrier case, although identified in the promising practices related to this step, also exhibited a lack of central office guidance in the preparation of proposals for solutions and the absence of consideration of the long-term maintenance costs of the solution.

The image enhancement vehicle case provided substantial evidence of unsound estimates of the time and costs associated with the proposed solution and generally poor planning of the development process. For example, the development of the prototype vehicle took about three times as long as originally estimated. Furthermore, delays in signing the

	Problematic			
Other	Cost and scheduling problems	Lack of information	Planning problems	Other
—	Maintenance costs not determined	—	Lack of central office guidance; research and development not involved	—
—	Lack of technical assistance with cost estimates	—	—	—
	—	—	—	—
—	Schedule delays	—	—	—
Prepurchase demonstration	Schedule delays and cost increases	—	—	—
—	—	—	Inadequate planning and priority setting	Ignored advice of experts
—	—	—	—	—
	—	Limited documentation	—	—
—	—	Lack of evaluation information	—	Reliance upon opinion
—	—	—	—	—

current contract for development of 15 improved IEVs impaired INS's ability to perform its mission. Specifically, the infrared scopes, which could have been used to support linewatch operations in various sectors, sat unused for at least 7-1/2 months at Fort Huachuca. Had those scopes been available for use in detection in various sectors, some INS agents could have been deployed for other activities. The value of the agents' work that was forgone by INS as a result is estimated to be in the range of $1.4 million to $3.4 million.[1]

In summary, we found that there was no consistent procedure used for the identification of solutions in the cases reviewed. Although the lack of a procedure did not eliminate the existence of some promising practices, it very likely encouraged the existence of some of the problematic practices. Further, the poor management of the planning process associ-

[1]This estimate is based on INS assumptions about agents' wages and the number of agents freed by introducing one scope

Table 4.3: Promising and Problematic Practices in Project Development or Equipment Testing

	Promising			
	Advice and coordination	**Design and testing**	**Contract issues**	**Inadequate design**
Barrier project	—	—	—	
Convair 580	—	—	—	—
Fraud intercept task force equipment	—	Formal test design		Lack of preestablished criteria for site selection
Image enhancement vehicle	Use of other agency expertise	—		Poor test design and methods
Low-light-level television	—	—	More than doubling of contract cost	—
Microspectrophotometer	—	—	—	—
Optimization profile	Coordination during development	—	Poor contract management in past	—
Radio scrambler	—	Operational testing conducted	—	—
Stun gun	—	—	—	—
Survival gear	—	—	—	—

ated with at least one developmental project leads us to believe that more rigorous review of developmental projects should be conducted in the step 2 phase.

Step 3: Testing of Equipment and Project Development and Testing

Often, the only way to determine if any of the potential solutions identified is appropriate is to test to see how well the solutions work. As with the performance of steps 1 (need) and 2 (solution), we identified a spectrum of practices across a number of cases associated with the performance of testing (and development for developmental projects). Table 4.3 summarizes our findings.

In 4 of the 10 cases reviewed, we identified one promising practice per case associated with step 3; 2 of these 4 cases were developmental projects. For example, we found that the optimization profile case provided examples of sufficient coordination during the development of the

Problematic				
Schedule delays	**Communication**	**Testing issues**	**Lack of information**	**Planning**
—	—	—	—	—
—	—	—	—	—
—	—	—	—	—
Schedule delays and lost opportunities	Lack of communication and coordination	—	—	—
Excessive delays in development	—	Limited testing	Inadequate use of available information	Base station not monitored, failure to plan for maintenance; failure to match equipment to sites
—	—	Lack of prepurchase testing	—	—
—	—	—	—	—
—	Limited communications and electronics involvement	Questionable test procedures	Limited documentation	—
—	—	No technical evaluation	—	—
—	—	—	—	—

profile. Further, the image enhancement vehicle case provided ample evidence of the reliance upon other agency resources and expertise in the development and testing of the vehicle. We would also like to point out that the FITF and radio cases provided some evidence of at least one promising practice associated with the testing of equipment. (This is especially noteworthy in the FITF case, which included the preparation of a test design that was closely adhered to during testing.)

There was, however, substantially more evidence of problems associated with this step. Specifically, we identified between 1 and 7 problematic practices per case in 7 of the cases reviewed. All three developmental cases evidenced undesirable aspects of the management of the contracting process or the actual development process. For example, the LLLTV and image enhancement vehicles cases both provided evidence of delays in the development process and inadequacies in the design or testing of the equipment or both. For example, in the LLLTV case, the test design called for a 1-year test, although the actual testing lasted only 10 weeks. Likewise, the IEV tests were performed without a final and complete test design and produced inconclusive and insufficient data.

Problematic practices related to the design or conducting of tests were also identified in 4 of the 7 off-the-shelf cases. For example, although the radio case was noted in the promising practices for demonstration of knowledge of the need for testing, the testing procedures followed were extremely questionable. Specifically, there was neither a written test design nor any documentation of data collected or analyzed for the radio testing period.

To summarize, some of the cases reviewed produced evidence of good development or testing practices, although the overwhelming majority of practices related to this step were not promising. All 3 developmental cases provided evidence of problematic practices, and in 2 cases this evidence was quite extensive and apparently detrimental to the effective project development and testing. Undesirable aspects of the testing process for off-the-shelf equipment also suggests that this could be done better in the future, perhaps with the assistance of persons knowledgeable about testing procedures.

Step 4: Data Analysis and Report Writing

Since testing was performed for only 4 cases, we considered data analysis and report writing appropriate for only these cases (if testing is not performed, data analysis will probably not occur and a report will not likely be written). Of these 4 cases, 3— namely, the image enhancement vehicle, LLLTV, and FITF cases—did have written reports associated with the testing process, although no promising practices related to this step for these cases were identified, and testing was performed in the radio case, although no report was written.[2]

We did, however, identify problematic practices associated with this step in 3 cases. Table 4.4 summarizes these practices. For example, although the FITF case had a written report, we identified what we consider to be inadequate data analysis, related to the failure to involve an individual skilled in statistical methods with such analysis. This, we believe, led to the presentation of some questionable findings.

[2]Our criteria for noting the actual writing of a report as a promising practice did not apply, since the writing of a report was the actual step itself, not some practice associated with the performance of the step

Table 4.4: Problematic Practices in Data Analysis and Report Writing[a]

	Analysis problems	Lack of information
Barrier project	—	—
Convair 580	—	—
Fraud intercept task force equipment	Inadequate data analysis	Lack of input into report
Image enhancement vehicle	—	Lack of communication and coordination and input to report
Low-light-level television	—	—
Microspectrophotometer	—	—
Optimization profile	—	—
Radio scrambler	Questionable test and data analysis	Limited documentation
Stun gun	—	—
Survival gear	—	—

[a]No promising practices were identified for this step

Furthermore, for both the FITF and IEV cases, we considered the lack of input into the report by field staff involved with the testing to be undesirable. The radio case also provided several examples of poor practices associated with the analysis of data and limited documentation.

The lack of promising practices in this area is readily apparent. Of the 4 cases considered appropriate for this step, 3 had written reports and 1 performed testing without producing a written report. In 3 of these cases, there was at least one problematic practice.

Step 5: Review of Report

Preparation of a written technical report is not always helpful without review by persons who have both technical ability and are in a position to bring about needed changes based on the report. Dealing with the 3 cases in which a written report was produced, we identified no cases with promising practices related to the report review process. (Included with this step is the decision to proceed into expanded development or testing of developmental projects.)

The 3 cases with written reports were FITF, IEV, and LLLTV. In 2 of the cases, the IEV and LLLTV, we identified at least one problematic practice each related to the report review process. In the FITF case, neither type of extreme practice was associated with this step.

For example, as table 4.5 indicates, in the image enhancement vehicle case, we found limited empirical support for the expanded development decision, suggesting that this may have been a premature decision based on findings presented in the prototype testing report that were not reviewed closely prior to making this decision. Likewise, we found a questionable need for current efforts associated with the LLLTV case. The efforts have resulted in an expansion of the LLLTV project beyond its original scope and possibly in a less-than-optimal use of funds.

Table 4.5: Problematic Practices in Report Review[a]

	Safety problems	Lack of communication or coordination	Development decision
Barrier project	—	—	—
Convair 580	—	—	—
Fraud intercept task force equipment	—	—	—
Image enhancement vehicle	Inadequate response to safety concerns	Central office and field interchange lacking	Lack of empirical data for full scale development decision
Low-light-level television	—	—	Questionable need for current efforts
Microspectrophotometer	—	—	—
Optimization profile	—	—	—
Radio scrambler	—	—	—
Stun gun	—	—	—
Survival gear	—	—	—

[a]No promising practices were identified in this step

Thus, while we can make only limited judgment about the performance of step 5, since this step was relevant for only 3 cases, 2 of the 3 cases had important problems associated with this step. This means that decisions regarding the furtherance of development projects may have been made without adequate attention to operational need or report findings and may lead to the ineffective use of already limited funds.

Step 6: Decision to Purchase Equipment

The importance of this step, in which the decision to purchase equipment is made, is obvious. It is during the performance of this step that major INS funds may be obligated or spent or both.

Referring to table 4.6, we identified promising practices related to the purchase decision itself in 5 cases. This does not mean that we are making a judgment about whether the technology purchased was the proper technology or not; rather, we judge only that some elements of the process were appropriate.

Table 4.6: Promising and Problematic Practices in Decision to Purchase Equipment

	Promising			Problematic	
	Decision level	Management involvement	Other	System planning and operation	Other
Barrier project	—	Reviewed by commissioner	—	—	—
Convair 580	—	—	—	Lack of technical assistance with cost estimates	—
Fraud intercept task force equipment	Devolvement of purchase authority	Related to priorities system	—	Unused equipment, lack of continuous training	—
Image enhancement vehicle	—	—	—	—	—
Low-light-level television	—	—	Equipment tailored to sites	Base station not monitored; failure to plan for maintenance; some equipment not tailored to sites	—
Microspectrophotometer	—	—	—	Lack of staff and training	Questionable solution
Optimization profile	—	—	—	—	—
Radio scrambler	—	—	—	—	Limited documentation
Stun gun	—	Decision memorandum process	—	—	—
Survival gear	Local purchase authority	Responsive upper management	—	—	Nonresponsive middle management

In two instances, these practices were related to the appropriateness of the level at which the purchase decision was made.[3] For example, in the survival gear case, clear criteria exist for the role of the local units in purchasing certain items. Further, in the FITF case, the devolution of authority for the purchase of equipment to the regional level is not only appropriate but also helps encourage the future procurement of FITF equipment for only the sites that are in need of such equipment. The stun gun case provided an example of the way in which a current decisionmaking tool, the INS decision memorandum, can be used to gather field input into the purchase decision. And, finally, in some instances,

[3]The level at which purchase decisions were made in these cases is appropriate, given the cost and relative simplicity of the technologies. Local authority would not be appropriate for all cases, as we discussed in chapter 2. Furthermore, we believe that, although the decision level was appropriate in these cases, a mechanism ensuring that some central clearinghouse be informed of new technology purchases would enhance the selection process at INS.

the LLLTV case exemplified the practice of procuring equipment tailored to individual site needs.

Although we observed several instances of promising practices related to the performance of step 6, we also identified 6 cases that demonstrated weaknesses related to this step. Several of the problematic practices identified revolve around the failure to adequately plan for

resources necessary for the continuous use of the equipment. For example, in the LLLTV case, there was a failure to plan for the long-term maintenance needs of the LLLTV systems. In the microspectrophotometer case, there was inadequate consideration of staff resource and training requirements needed to efficiently and effectively operate the equipment. Further, there is current action to purchase a second microspectrophotometer for use in a regional processing unit, although the only other microspectrophotometer purchased by INS has stood unused at the forensic document laboratory since summer 1985, and experts at the lab have argued against this second purchase. Finally, in the FITF case, there was a lack of attention to the importance of continuous training for the operation of the equipment, which may account for some of the apparent nonuse of this equipment at some ports of entry. A poor practice equally important was identified in the Convair 580 case—namely, the lack of technical assistance with the preparation of cost estimates.

Thus, there appears to be an inconsistent pattern operating in relation to the performance of step 6 tasks. While some cases provided evidence of good practices, a similar number of cases exhibited problematic practices. While a foundation thus exists at INS for the proper execution of this step, a good deal of additional work is still needed to perform this step well.

Step 7: Collection and Use of Postacquisition Review Information

The selection, purchase, and installation of a technology needs to be periodically reviewed to determine whether that technology continues to meet the need, whether it is used, and whether new needs have arisen. However, as table 4.7 reveals, in our review we found only 1 case—namely, the Convair 580 case—in which there was evidence of the collection and use of postacquisition information. Specifically, INS maintains monthly and annual records on the usage, cost, and comparison to commercial cost of its air transportation program, including the operation of the Convair aircraft. In addition, the annual report by users contains information on the effectiveness of the program, including equipment used as well as problems and future considerations.

Table 4.7: Promising and Problematic Practices in Postacquisition Review

	Promising	Problematic	
	Post acquisition information	Technical issue	Inadequate use of information
Barrier project	—	—	—
Convair 580	Monthly use and cost statistics	Lack of technical assistance with cost estimates	—
Fraud intercept task force equipment	—	—	No review although future purchase expected
Image enhancement vehicle	—	—	—
Low-light-level television	—	—	Inadequate use of available information
Microspectrophotometer	—	—	—
Optimization profile	—	—	—
Radio scrambler	—	—	No review although equipment is in use
Stun gun	—	—	—
Survival gear	—	—	—

Conversely, we observed problematic practices related to the performance of postacquisition review in 4 of the cases. Interestingly, although the Convair 580 case is the only case in which postacquisition information is regularly collected and used, the lack of technical assistance in the preparation of these cost statistics is undesirable.

Other cases in which this type of information was either not collected or not adequately used include the FITF, LLLTV, and radio cases. In these cases, available information about the usefulness of the currently used equipment is not being collected, although future procurements are expected.

Because only 1 case exhibited the collection and use of postacquisition information, we believe that INS could enhance decisions regarding future acquisitions of technologies that are either similar to or the same as ones currently used, if such information were routinely gathered and incorporated into such future decisions.

Conclusion

Table 4.8 depicts the breakdown of cases for each type of extreme practice by the relevant technology selection framework step. As we review some of the promising practices in a more general sense, it is apparent that INS is following some sound procedures in terms of the framework steps. Using the Convair 580 case as an example, we observe that the need for the aircraft was determined in conjunction with field users, that several alternatives were evaluated prior to acquisition, and that INS is collecting postacquisition information on this aircraft. Furthermore, all cases had at least one promising practice, and often two or more were identified per case. We interpret this as an indication of INS's capacity to employ sound decisionmaking practices, which, as outlined in the framework, should be addressed in future decisions regarding technology selection in order to encourage the consistent use of promising practices.

Table 4.8: Cases With Promising and Problematic Practices for Each Step[a]

Step	Promising	Problematic
1	Barrier project (1), Convair 580 (1), fraud intercept task force equipment (1), survival gear (2)	Fraud intercept task force equipment (1), stun gun (1), survival gear (1)
2	Barrier project (5), Convair 580 (2), fraud intercept task force equipment (2), low-light-level television (3), microspectrophotometer (1), optimization profile (1), radio scrambler (1), survival gear (2)	Barrier project (3), Convair 580 (1), image enhancement vehicle (1), low-light-level television (1), microspectrophotometer (2), radio scrambler (1), stun gun (2)
3	Fraud intercept task force equipment (1), image enhancement vehicle (1), optimization profile (1), radio scrambler (1)	Fraud intercept task force equipment (1), image enhancement vehicle (3), low-light-level television (7), microspectrophotometer (1), optimization profile (1), radio scrambler (3), stun gun (1)
4		Fraud intercept task force equipment (2), image enhancement vehicle (1), radio scrambler (2)
5		Image enhancement vehicle (3), low-light-level television (1)
6	Barrier project (1), fraud intercept task force equipment (2), Low-light-level television (1), stun gun (1), survival gear (2)	Convair 580 (1), fraud intercept task force equipment (2), low-light-level television (3), microspectrophotometer (2), radio scrambler (1), survival gear (1)
7	Convair 580 (1)	Convair 580 (1), fraud intercept task force equipment (1), low-light-level television (1), radio scrambler (1)

[a]Numbers in parentheses refer to actual number of practices identified in this case for this step

However, as we review some of the problematic practices identified in the current INS method of selecting technologies, it becomes apparent that there was no framework step for which we identified fewer than 3 individual problematic practices. Furthermore, all 10 INS case studies had at least one, and often many more than one, problematic practice. For example, the LLLTV case demonstrated undesirable aspects related to the selection process (step 2), the testing process (step 3), the report review process (step 5), the purchase decision (step 6), and the collection and use of postacquisition information (step 7).

Throughout this chapter, we have indicated areas in which improvements could be made in the performance of certain steps. For example, we believe the adoption of a procedure for the identification of needs and problems (step 1) and for the identification of solutions (step 2), better testing methods and procedures (step 3), and the routine collection and use of postacquisition information (step 7) might have avoided some of the problematic practices identified within these steps. Furthermore, the adoption of better procedures, as well as practices identified in the individual framework steps, might encourage the consistent and routine application of some of the promising practices identified in the 10 INS cases.

Summary, Conclusions, Recommendations, and Agency Comments

Summary

The objective of this review was to examine the methodologies and practices INS uses to select technologies for the enforcement of immigration law and to recommend procedures that INS could adopt to improve its technology selection practice.

In chapter 2, we introduced the organization of INS, discussed the relative use and importance of technology for the performance of the various enforcement activities, and identified current decisionmaking practices that could possibly be modified or applied more generally to the selection of new technologies. We also identified some factors that we believe impede the effective selection of technology. We concluded that INS has no institutionalized or systematic process for selecting technologies.

In chapter 3 we detailed the methodology we used to develop our technology selection framework, targeted specifically to technology selection at INS.

In chapter 4, we discussed our findings regarding the promising and problematic practices that we identified during our case study work associated with the 10 INS case studies. These practices relate specifically to the manner in which INS selected the technologies of the 10 case studies.

Concluding Statements

Conclusions Regarding Technology Selection at INS

No Systematic Procedure for Selecting Technology

Throughout our review of the INS organization and practices, and from our detailed case reviews, we identified no general agency procedures for the selection of new technology, whether developmental technology or off-the-shelf items. While the electronics support policy does detail some procedures, these pertain specifically to the management of new electronics projects or the replacement of existing equipment and, thus, are not currently applicable or transferable to other items. Furthermore, we do not know the extent to which these procedures are actually followed at INS. In addition, the only other related agency policy pertains specifically to the dollar thresholds at which various field and regional offices can procure equipment without either regional or central office approval or involvement.

Thus, INS lacks a policy regarding the procedures for the identification of needs or problems as well as the procedures for the identification of solutions. Likewise, there is no agency policy regarding the types of items that should be tested or the scope and methods for the testing process. Further, there is no agency policy regarding the use of the research and development office or interaction between that office and program offices and users.

Procedures Often Lacking, Vary Across Cases

While we identified a number of promising practices in current use at INS, we identified many problematic practices as well. We found that the manner in which technology is selected is not consistent, as is evidenced in the diverse practices identified across cases. Although some variation in practice may indeed be appropriate, based on such factors as item cost, there are some areas in which the INS process is clearly in need of improvement. In some instances, the technology appears to have been selected prior to an adequate determination of the need. In other instances, the need was adequately determined prior to selection of a technological solution, but the technology selected did not receive what we consider to be adequate review or testing. Further, the input of the field into the determination of needs, as well as into the selection of technological solutions, is inconsistent across cases.

No Central Inventory of Field Technologies

We found that the central office did not have a current or complete inventory of items being used in the field. We also found that the inventories that are kept by the regional offices are often incomplete or outdated. Since the regional and field offices have various levels of authority to procure many items without central office involvement, it is unlikely that the central office will have such knowledge of all items being used (or considered for use) in the future unless certain actions are taken.

While we do not believe that the regional and field offices should have no authority in determining how resources are distributed or funds are spent, we are concerned over the lack of inventory control by the central office.

We believe that the central office could maintain this information if it were kept informed of all new technologies procured or being considered for use by the various field offices, regardless of whether central office authority for procurement is required. One advantage of such information being available to the central office is that it would allow the program managers to periodically review the items being used, in order to determine whether a broader need for such items exists. Likewise, such a clearinghouse might provide useful information when determining the appropriateness of new technology purchases.

Information About Technology Effectiveness Is Lacking

We found that INS does not generally gather or maintain information about the overall effectiveness of the items that are used. Since no data are kept, there is of course no central clearinghouse to provide this type of information to prospective purchasers and users. If the central office were informed prior to the purchase of items by field units, and if there were a mechanism for feedback from the field to the central office regarding the effectiveness of items, the central office would be in a position to disseminate this information to the prospective users (in the field or regions) prior to the acquisition of the technology. This would require that users maintain and report on the overall effectiveness of items to the central office. Establishing such a clearinghouse would entail examining the best size and scope of the clearinghouse and its activities, so that the costs and benefits of such a mechanism would be well balanced.

Organizational Practices Interfere With Technology Selection

In chapter 2, we identified several current practices or organizational features that we believe hamper the effective selection of technology. For example, current features of the budget process, such as the lack of long-term planning for equipment purchases and instances of reallocating funds, should be investigated further. It might be useful for INS to consider establishing a way in which programs can earmark funds for equipment purchases and have greater control over expenditures for electronic and communication equipment used in field offices.

Technology Selection Process Could Be Improved

Our review of the processes used by Customs, DOD, and FBI indicates that current practices used at these agencies could be modified and instituted at INS to improve the technology selection practice. Furthermore, our application of the framework to the 10 INS cases identified a number of areas, such as identification of needs and problems and testing, in which the selection of technology at INS could be improved. In chapter 2, we identified several current decisionmaking practices, such as the priority management system and the decision memorandum process, which might lend themselves in some manner to the selection of technology. These practices could be modified and incorporated, when appropriate, into the relevant framework steps. In our opinion, there are instances of technology selection for which the decision memo process could prove useful, although it is certainly not necessary or appropriate for all technology decisions.

INS Could Save $1.3 Million to $2.1 Million

During our case study reviews we discovered that, in some instances, INS was planning the acquisition of technologies (namely the improved image enhancement vehicle, microspectrophotometer, fraud intercept task force equipment, alternative aircraft, and new radio scrambler) based on what we believe to be insufficient consideration. We believe that reassessment of the need for these technologies, and possible elimination of additional purchases of such items, could save INS somewhere between $1.3 million to $2.1 million. (See table 5.1.)

Table 5.1: Estimated Cost Savings

Case	Action	Maximum potential savings
Improved image enhancement vehicle (IIEV)	Cancel procurement of 7-10 vehicles	$913,000 to $1,300,000
Microspectrophotometer	Cancel procurement of additional unit	$31,950
Fraud intercept task force (FITF) equipment package	Relocate unused equipment and forgo procurement of 10%-66% of additional planned equipment packages	$10,000 to $66,000
Convair 580	Forgo procurement of larger aircraft	Unknown
Radio scrambler	Sell current radios or modify radios to make compatible with existing equipment	$360,000 to $720,000

The dollar amounts in table 5.1, from which we draw our conclusions, are estimates, and as such, they should not be considered precise figures. However, we do believe that these figures are reasonable estimates of the amounts INS could save if certain planned acquisitions are not made.

Specifically, in the IEV case, we conclude that the decision to produce an additional 15 vehicles was not the most appropriate action. Rather, INS could have refabricated the original prototype vehicle and performed additional operational tests, thus saving much of the cost expected for the fabrication of the 15 improved image enhancement vehicles. We also conclude that, if current contract specifications allow, INS should delay the development of 7 to 10 IIEVs until the system has proved its cost-effectiveness and reliability. If the effectiveness and reliability cannot be demonstrated through testing, then INS could save between $913,000 and $1.3 million by eliminating the development of some of these improved image enhancement vehicles.[1]

In the microspectrophotometer case, we conclude that this equipment, which has been available yet generally unused at the forensic document laboratory for years, has not proven its effectiveness in the INS environment and, thus, the acquisition of a second one is not justifiable at this time. Eliminating its acquisition could potentially save $31,950.

We also conclude that the existing fraud intercept task force equipment was either underutilized or not considered necessary by INS staff in about two thirds of the sites we visited. Current plans to purchase additional FITF equipment have been delayed by shortages of funds. However, we conclude that INS could save between $10,000 and $66,000 by spending only some portion of the $100,000 originally targeted in 1987 for such purchases.[2]

We also conclude that the Convair 580 aircraft appears to have been cost effective when compared to commercial transportation in fiscal year 1986 but that load factors, which averaged about 50 percent during 1986, appear to negate the need for the acquisition of an aircraft with greater capacity. This would save an undetermined amount for INS.

Finally, in the DES radio scrambler case, we conclude that despite the fact that 156 radios were purchased for testing (which we believe to be an unnecessarily large number), these radios were not adequately tested. We also conclude that INS could potentially save between $360,000 and $720,000 by seeking buyers for the current radios or by

[1]This estimate is based on an average cost per vehicle of $130,417 We assume that a minimum of 5 vehicles must be produced. 4 to fulfill the Army agreement and 1 for the research and development facility at Fort Huachuca We also assume that operational testing could be adequately conducted on either the Army vehicles or an additional 3 INS vehicles, meaning that it would be reasonable to produce between 5 and 8 IIEVs, rather than 15, at this time

[2]Specifically, if INS were to purchase only 90 percent of the planned equipment packages, this would save $10,000. If it purchased only 33 percent of the packages (reflecting either usage rates or the perceived need we observed or both), the associated savings would be about $66,000.

modifying the radios to make them compatible with existing INS communications equipment, rather than purchasing new models, as is being considered.[3]

Conclusions Regarding the Transferability of Our Framework

In chapter 3, we discussed the methodology we used to develop our framework, or the decisionmaking process one may follow to select a technology. Initially, the framework was fairly general and theoretical in nature, but it was made less theoretical and more practical by applying it to cases at DOD, FBI, and Customs. By applying the framework to 10 INS cases, we developed a final framework for the general selection of technology that we feel has immediate applicability in the current INS environment.

Throughout the development of the framework, the major steps and logic flow, represented by the major decisionmaking steps in the framework, remained fairly constant. The specific content of the detailed practices specified for each of the major framework steps in the early version of the framework was modified in response to our analysis of practices at DOD, FBI, and Customs and our expert reviewers' comments. However, these changes did not alter the overall nature of the decisionmaking process. Likewise, the content of the steps outlined in the final framework was modified, after our review of the 10 INS cases and expert opinion but, again, did not significantly alter the logic of the decisionmaking process.

We found that the framework was applicable in varying degrees to the 10 INS cases. Difficulties experienced in applying the framework to specific cases often resulted from differences in the current INS process, which we considered unreasonable differences, such as the unclear establishment of an operational need prior to the identification of what may be only one of several solutions, not from problems with the logic or overall content of the framework.

Since the framework has its foundation in systems theory and general evaluation principles, and has been developed to some extent in response to comments from experts familiar with technological decisionmaking practices, we believe the framework's major steps and some of the substeps could be applicable in other federal agencies.

[3] If sold for approximately half their original cost, they would yield about $360,000 for INS. If INS modified existing scrambler radios, it would potentially save at least $720,000, minus the cost of modification, which is still an unspecified amount.

However, the transferability of the framework may have some limitations. Specifically, it was applied to only 13 cases in total, all judgmentally selected. Consequently, since it was tested on only a limited number of cases, the extent to which it can be considered transferable to other technology selection cases in agencies other than INS is untested. Further, the final framework was developed specifically for INS, not for agencies in general. Thus, to apply the framework, an agency would have to review the content of each step carefully and determine if the outlined substeps or practices are applicable or could be incorporated into its own technology selection situation.

Recommendations to the Attorney General

Our conclusions regarding the technology selection process at INS lead us to recommend that the attorney general direct the commissioner of INS to do the following.

Establish a Decisionmaking Methodology for Selecting Technologies

INS should establish a decisionmaking methodology, similar to or the same as the procedures outlined in our final framework as presented in appendix III, for the selection of technologies. These procedures should be tailored to the scope and nature of the problem or technological solution, so that issues that are more complex or items that are costly or technically sophisticated receive a level of review commensurate with their complexity and cost, and items or issues that are less complex or less costly receive less extensive review.

Include Certain Elements in the Methodology

The decisionmaking methodology that INS adopts should include certain practices that we believe are critical to the appropriate identification and selection of technology. These practices should be tailored to the particular item under review and should link the amount of effort and resources dedicated during review to such factors as cost, complexity, and stage of development.

A Procedure for Identifying Needs or Operational Problems

A procedure for the identification of needs or problems should be developed and adopted. This procedure should include a mechanism that involves the field users in the identification of such needs or problems and also stipulate that problems should be identified prior to the identification of solutions.

A Procedure for Identifying Solutions

A procedure for the identification of solutions should be developed or adopted. For developmental technologies, INS should establish a steering committee for the review of these projects. Members on the committee should be from a broad range of INS offices, such as representatives from each central program office, each associate commissioners' and the commissioner's offices, research and development, plans and analysis, contracting and procurement, communications and electronics, the field, and the testing group.

An Established Testing Group

INS should establish a testing group to assist with the testing of new technology. This group should be responsible for designing and conducting tests and for the evaluation and reporting of test results. Members of this group should include individuals skilled in evaluation design methods and statistical analysis techniques as well as representatives of the potential users; some members of this group should remain constant, and some should rotate, depending on the features of the technology being tested. The first responsibility of this testing group should be to develop guidelines for the preparation of test designs.

Collection and Analysis of Postacquisition Information

INS should collect and analyze postacquisition information. This would provide data on the experiences gained through use of technologies for input into future decisions regarding technology purchases. The collection of postacquisition information would be particularly useful for items that are relatively expensive, purchased in multiple numbers, or replaced periodically or regularly.

An Established Central Clearinghouse

INS should establish a central clearinghouse for the collection and dissemination of information. This would enable INS to make better technology selections. The clearinghouse should be responsible for collecting pre- and postacquisition information about technologies and for dissemination of information to prospective users or purchasers and to the steering committee established for reviewing research and development projects. Specifically, this clearinghouse should be informed of all new technologies that are being considered or being purchased (preacquisition) and should routinely collect information from users about the appropriateness and effectiveness of currently used technologies (postacquisition). When the clearinghouse is informed by prospective users of a new technology purchase, this unit would then disseminate any information it has collected from pre- and postacquisition reviews to assist with making judgments about appropriateness or effectiveness. Prior to the establishment of such a clearinghouse, INS should assess the relative costs and benefits of various approaches, linking the anticipated comprehensiveness and scope of the clearinghouse and its data gathering and dissemination activities to such factors as cost, type, and complexity of technologies used.

Assess the Adequacy of the Research and Development Program

Given the importance of technology to the performance of the enforcement functions, we believe that INS should carefully examine the current research and development program and decide upon the most advantageous situation with respect to the future management structure, amount of resources, and role accorded to research and development at INS. We found that the program has historically had limited resources when contrasted with the number of projects being considered or worked on by research and development and the cost of such projects. Further, data collected during interviews and case study reviews suggest that research and development suffers from overall management problems and problems in interaction with some of the enforcement programs.

Cancel or Forgo the Procurement of Some Technologies

INS should cancel or forgo the procurement of some technologies currently being considered or developed, based on the questionable need for such equipment at this time. We recommend that if such action is allowable under the current contract, INS examine the feasibility of delaying or eliminating the development of 7 to 10 IIEVs until operational effectiveness and reliability have been demonstrated for some of the vehicles.

We also recommend that INS not purchase the second microspectrophotometer for the Laguna Niguel document analysis unit. To purchase the microspectrophotometer, the Laguna Niguel unit should justify why it needs a system that has not proven effective at the forensic document laboratory.

Further, we recommend that given the apparent underutilization of FITF equipment at some ports of entry, it would be appropriate for INS to forgo further acquisition until it has been determined that currently available equipment is fully used and where, if necessary, the existing FITF equipment could be relocated to increase utilization. Additionally, we recommend that INS consider purchasing only some portion of the $100,000 worth of FITF equipment originally planned for in 1987.

We recommend that an additional, larger aircraft not be purchased at this time. Unless load factors for the Convair 580 increase over the 1987-88 period a larger aircraft does not appear to be justified.

Finally, we recommend that INS, rather than purchasing new models, either seek buyers for the current DES radios and use the payments for purchasing new radios or modify current radios to make them compatible with existing INS communications equipment. Further, since we believe that the original DES radios were not adequately tested, if new radios are determined to be the most cost-effective solution, we conclude that it would be more efficient to field test a limited number of such radios (no more than 50) prior to expanded acquisition.

Agency Comments

We requested comments from FBI through the Department of Justice, Customs through the Department of the Treasury, and the Department of Defense. None of these three agencies provided official comments, although FBI and Customs did provide oral comments. These comments pertained mainly to typographical or editorial issues and we responded to them all.

We also requested INS, through the Department of Justice, to comment on this report. After the original 30-day comment period, we granted INS an extension of time. However, after a total of 15 weeks, we have not received any formal comments from DOJ. Therefore, we issued the report without agency comments.

Locations of Interviews and Site Visits

We gathered data from interviews conducted with staff at INS's central office and several field locations. This appendix lists the offices we contacted or visited during our work on this report.

Central Office Program Offices

- Adjudications
- Antismuggling
- Border patrol
- Detention and deportation
- Inspections
- Intelligence
- Investigation

Central Office Staff Offices

- Administration
- Budget
- Communications and electronics
- Contracting and procurement
- Personnel
- Plans and analysis
- Program inspections
- Research and development

Border Patrol Sector Headquarters and Stations

- Nogales, Arizona (station)
- Tucson, Arizona (headquarters)
- Brown Field, California (station)
- San Diego, California (headquarters)
- Miami, Florida (headquarters)
- Havre, Montana (headquarters)
- Sweetgrass, Montana (station)
- El Paso, Texas (headquarters)
- Laredo, Texas (headquarters)
- Blaine, Washington (station)

District Offices

- Phoenix, Arizona
- Miami, Florida
- Baltimore, Maryland
- Helena, Montana
- New York, New York
- El Paso, Texas

Ports of Entry

- Nogales, Arizona
- Los Angeles International Airport, California
- San Ysidro, California
- Miami International Airport, Florida
- Port Everglades, Florida
- O'Hare International Airport, Chicago, Illinois
- Piegan, Montana
- Sweetgrass, Montana
- Wild Horse, Montana
- Niagara Falls, New York
- Bridge of the Americas, El Paso, Texas
- Paso del Norte, El Paso, Texas
- Dulles International Airport, Virginia

Other Offices and Units

- Fort Huachuca, Arizona (INS research and development field office)
- Western regional office, San Pedro, California
- Northern regional office, Twin Cities, Minnesota
- Southern regional office, Dallas, Texas
- El Paso air operations center, El Paso, Texas
- Eastern regional office, Burlington, Vermont
- Forensic document laboratory, McLean, Virginia
- Office of the associate commissioner for management, Washington, D.C.
- Office of the deputy commissioner, Washington, D.C.

Questionnaire Objectives, Scope, and Methodology

In order to review the INS technology selection process and identify ways in which it could be improved, it was necessary to determine the technologies INS was using, considering for use, or had previously considered and rejected for use.

Early in our data collection activities we discovered that the INS central office does not collect and store complete inventory information on the various technologies used in the field. Furthermore, while the INS regional offices do maintain inventories on equipment used, we discovered that these inventories were of varied quality, some were incomplete or outdated, and did not contain information on all technologies used by INS staff or information on equipment used by INS that actually belongs to other agencies. Therefore, we developed a survey instrument intended to identify technologies INS was using, considering, or had previously considered and rejected.

Since we wanted to collect precise information on all technologies, including those belonging to other agencies but used by INS, it was necessary to gather this information directly from all field units that had such equipment available for use.

INS helped us identify the locations to include in the survey. After compiling a current mailing list of all INS field locations, we sent the inventory questionnaire to supervisory staff at approximately 300 INS units in the continental United States that are involved in enforcement activities and actually use enforcement technologies in daily operations. This included INS district offices, ports of entry, border patrol sector headquarters and border patrol stations. We also sent a modified questionnaire to management personnel in the regional offices and to selected central offices (program and staff offices), gathering information on the items that they were currently considering for use or had previously considered and rejected.

The questionnaire was divided into three parts. Part 1 requested information on the technologies currently available at each location, including the name of the item; if it was available before or after 1982; the total number of each item owned, leased, and borrowed; and the approximate unit cost.

Part 2 requested information on equipment being considered or tested at each location, including the name of the item, its function, date identified, who identified the item, stage of review, and a contact person.

Part 3 requested information on equipment considered but not selected for use over the past 5 years. Information requested included the name of the item, year it was considered, function, reason for not selecting, and a contact person.

Once the final questionnaire was developed, it was mailed to all INS field locations in November 1986. To increase our response rate, a follow-up questionnaire was sent to all nonresponding locations in December 1986. Phone call follow-ups made after the second mailing resulted in a 100-percent response rate to our questionnaire. A modified questionnaire was also sent to all regional offices and selected central offices in January 1987.[1]

The data received from the questionnaires were analyzed in a variety of different ways, including by location, technology function, and stage of selection (in use, being considered or tested, or rejected). While we have some questions about the accuracy of some of the responses, we considered the data reliable enough to select judgmentally 10 technologies for in-depth review of the technology selection process as it actually exists at INS and to develop general information about the types of items being used or considered for the various enforcement functions. This type of information was presented in chapters 2 and 3 of this report.

[1] The central offices and regional offices do not use enforcement technologies in their daily activities. Thus, the modified questionnaire collected information only on items being considered, or items previously considered but rejected.

Framework for Selection of Technologies at INS

FRAMEWORK FOR SELECTION OF TECHNOLOGIES AT INS

This appendix contains the final framework for selection of technology specifically developed for application at the Immigration and Naturalization Service. It is broken into two sections. The first section details the decision making procedures pertaining to the selection of off-the-shelf items. The second section addresses these procedures as they relate to the selection of developmental technologies.

PROCEDURES FOR SELECTION OF OFF-THE-SHELF (OTS) TECHNOLOGY

Step 1: Identification of Operational Need/Problem

1. There is evidence that the need/problem exists at some operational level within the organization.

2. The Central Office gathers information from the field regarding needs/problems in a systematic, institutionalized process conducted at least annually. This information is fed back to the field.

3. A mechanism exists so that needs/problems can be identified at any time at the field level.

4. Needs/problems are identified prior to the identification of solutions.

5. Needs/problems identified are reviewed by, at least, the next higher level in the organization. In some cases, it may be appropriate to use a process similar to the Decision Memo process to collect information about the need and possible solutions, if the normal needs identification process has not addressed the specific need.

6. Needs/problems are identified by INS personnel, not by vendors.

Step 2: Identification of Solution(s)

1. The person identifying the need is given an opportunity to identify a solution(s).

2. The individual decision-maker who reviews the needs-identification follows one of four courses of action:

   A. The decision-maker can decide that the need/problem identified does not warrant any action at that time. If the decision-maker selects this option, this decision and the rationale for it are made known to the person identifying the need/problem.

   B. The decision-maker can decide that he/she will attempt to identify proposed solution(s) or alternatives. If this option is selected and pursued, the decision-maker proceeds to option "C" below, if some or all of the following categories apply:

      1. more than one solution is identified

      2. the cost of the solution(s) is high

      3. there is limited information about the potential operational effectiveness of the solution(s)

4. the solution(s) are technically complex

C. The decision-maker can decide that a working group may be helpful in identifying proposed solutions. This option can be selected immediately upon receipt of the need/problem or, as stated in "B" above, can be pursued under the above listed conditions. The working group may consist of representative(s) of field users, in-house experts, and appropriate level decision makers. When forwarding the need/problem to the working group, the decision-maker may provide guidance on establishing criteria for comparing alternatives which are consistent with the criteria which will be used when making the selection decision.

D. The decision-maker can decide that it would be appropriate to have the need/problem reviewed at a higher level within the organization. If this option is selected, the rationale for forwarding of the need/problem is to be documented.

3. Regardless of whether option B, C, or D is selected, the following steps can be considered and/or performed.

A. Consult the following sources, among others, to identify solution(s) or alternatives:

1. in-house experts or technical staff

2. outside agencies or consultants

3. trade shows, manufacturers, vendors (including demonstrations)

4. journals or professional associations

5. potential user(s) of technological solution

B. Determine whether there are existing resources within the agency to respond to the need/problem. Also, consider the appropriateness of a non-technological, rather than a technological, solution.

C. Consider the potential technical barriers with the solution(s) and availability of funding.

D. Establish and use a set of criteria with which to compare all alternatives. Some criteria may include, but not be limited to:

1. cost

2. expected benefits

3. maintenance/maintainability of solution

4. training requirement/complexity of use

5. staff/resources needed to operate, maintain solution

6. duplication or complimentarity to other equipment or operational procedures

7. geography/climate/physical location

8. political/public acceptance of solution

9. safety of solution

10. life expectancy of solution

11. potential effectiveness/advantages

12. availability/potential production backlogs

13. future cost growth

14. negative system impacts of using solution

F. Decide:

1. Whether an off-the-shelf solution(s), not requiring testing, is available. If so, proceed to Step 6 of Framework.

2. Whether the proposed solution(s) needs testing. If so, proceed to Step 3 of Framework. Some reasons why testing might be necessary include:

    a. the complexity of the solution(s)

    b. little prior evidence of operational effectiveness

    c. solution never previously used at agency or elsewhere for the stated need/problem

3. Whether further research development is needed to identify solution(s). If further research/development is needed, consider forwarding the need/problem to the Developmental Technology Steering Committee (DTSC) for review.

    a. The DTSC may decide, upon initial review of the problem, which of three courses of action is most appropriate, and can report this decision back to the initial working group which forwarded the need problem to the DTSC for review:

        1. Research & Development (R&D) can pursue the project (refer to procedures for developmental projects). In this case, a Project Manager is assigned from within the R&D office.

        2. Other technical office (OTC) within INS, which may include a field level unit, can pursue the project (refer to procedures for developmental projects). In this case, a Project Manager is assigned from within this OTC. This option may be appropriate if:

            a. The project is expected to be short-term, requiring few resources from the OTC

b. Staff in the OTO hold significant amount of expertise required to do the project, which is not held by staff in R&D

3. Project is not to be pursued at this time (refer to notes for step 2).

4. Regardless of the option selected, there is a need for the following conditions to be met:

   A. Document all steps, conclusions and recommendations and forward, if applicable, to appropriate decision maker. The performance of steps is done in a timely manner.

   B. Forward all conclusions and recommendations to the individual who identified the need.

   C. Document and forward the identified need and solution(s) to the appropriate Central Office Program Office. It is the responsibility of the Central Office, when such information is received, to consider whether the need and potential solution has a larger application at the agency.

   D. Set priorities for the problem/need under consideration against other needs/problems.

   E. Make cost estimates by or with the assistance of an individual skilled in principles of cost analysis.

<u>Step 3: Testing of Equipment</u>

1. If the solution(s) identified in step 2 requires testing, it may be appropriate to forward the need and solution(s) to the Central Office Testing Group. For high cost items, consideration can be given to borrowing or leasing equipment for the test period.

2. The testing group:

   A. Is responsible for the design, monitoring, evaluation and reporting features of the testing process, and for conducting such activities in a timely fashion.

   B. Can be autonomous of the programs, but coordinate with the program/user.

   C. Can include members consisting of individuals skilled in evaluation design and methodology, statistical analysis, representative(s) of field users, any other technical staff skilled in some aspect of the solution(s) (e.g., communications and electronics (C&E) staff), representatives of the appropriate Central Office Program Office, and appropriate level decision makers.

3. The test design may be written by Testing Group, prior to the initiation of testing.

4. The test design specifies the following:

   A. operational steps in testing process

   B. amount and type of data to be collected

   C. operational measures for concepts, variables

D. time frame for testing and reporting of results

E. potential interfering factors in performing test or data analysis

F. experimental design and data analysis techniques

G. physical requirements for testing locations

H. standards for acceptability and generalizability of findings

I. who is responsible for data collection

J. who is responsible for monitoring testing process, and how monitoring is to be performed

K. safeguards to be taken to ensure validity/reliability of data

L. disposition of data

M. scope of test

5. The testing group can decide if there are adequate in-house resources to conduct the test, or if some or all of the testing process should be done by consultant or outside group.

6. Testing conforms to the test design at all possible times. When situations arise that require modifications in the testing process, or deviations from the test design, such modifications may be:

A. agreed upon by the Testing Group

B. documented and contained as amendment to the test design

Step 4: Data Analysis and Report Writing

1. Data analysis is done by appropriate member(s) of the Testing Group.

2. Data collected are analyzed in conformity with the data analysis plan established in the test design.

3. The Testing Group writes report on testing. However, it would be appropriate to give individuals involved in testing an opportunity to review and comment on draft report prior to its final issue.

4. The report may present information on:

A. the steps of the testing process

B. the test design and any deviations from such design

C. findings, including factors affecting effectiveness of item

D. conflicting results, and possible threats to the validity of findings

E. whether more tests are suggested

F. conclusions and recommendations

5. The report is written and forwarded to appropriate decision maker(s) in a timely fashion.

Step 5: Review of Report

1. The review of the report is conducted by appropriate decision makers without undue delay. The result of the review is made known in a timely fashion.

2. Such decision makers can have criteria established prior to the initiation of testing by which they will evaluate the test results, e.g., what percentage increase in detection is necessary to approve the purchase of such equipment. As part of the testing group, the decision maker(s) can specify those issues for which they want data collected.

3. If solution appears to warrant purchase, proceed to step 6.

4. The decision resulting from review of report is reported back to individual who initially identified need/problem, and to the decision-maker or working group who forwarded the need/problem to the Testing Group, in a timely fashion.

Step 6: Decision to Purchase Equipment[1]

1. Decision is made regarding what, if any, solution is to be purchased. This decision is made as promptly as possible.

2. Based on cost of item, and/or other pertinent factors, the decision either remains at the level at which problem was initially reviewed, or is forwarded to a higher level within the organization. At this point, use of tools such as the Decision Memo may be appropriate.

3. Regardless of level at which purchase decision is made, the following apply:

    A. Decision to purchase is based on a review of available evidence about the equipment, such as vendor demonstrations, other agency evaluations or experiences, results of information developed by the working group, or results of tests performed within agency. Some, or all of the following factors can be considered in this review, and plans for addressing relevant areas (e.g., maintenance) may be made:

        1. maintenance/maintainability of solution

        2. training requirement/complexity of use

        3. staff/resources needed to operate, maintain solution

        4. duplication or complimentarity to other equipment or operational procedures

        5. geography/climate/physical location

[1]This step pertains to the decision to purchase off-the-shelf equipment as well as the decision to move into production of operational equipment which underwent the development phase outlined in the procedures for selection of developmental technologies.

6. political/public acceptance of solution
7. safety of solution
8. life expectancy of solution
9. potential effectiveness/advantages
10. availability/potential production backlogs
11. future cost growth
12. negative system impacts of using solution

4. It may be appropriate for the decision regarding appropriate number and type of items to be based on field input. Items may need to be varied (in terms of type or number) to account for sites which differ in geography, climate, or other factors.

5. An estimate of the cost and anticipated benefits of the solution is established and documented. This can include:

   A. Estimates of costs required for training and maintenance for the life of the product

   B. Identification of funding or budget restrictions which affect the ability to perform maintenance, training and procurement of replacement parts for life of product

6. The decision to purchase is based on a prioritization of the need for such equipment when compared against other needs within the program, unit or office.

7. The purchase is to be made in compliance with Federal Procurement Guidelines and agency policy (e.g. based on cost of item). If appropriate, information can be solicited from the DTSC regarding selection of final vendor if product underwent DTSC review in the developmental stage.

Step 7: Collection and Use of Post-Acquisition Review (PAR) Information

1. Data can be collected continuously from the field and reported periodically (monthly/quarterly) to the decision makers who conducted the original analyses supporting the decision to purchase the technology and the decision maker who made the final purchasing decision. The data reported might include, but not be limited to:

   A. Frequency of use of the technology

   B. Costs of operating the technology, including maintenance and personnel costs (which may be reported separately). When necessary, cost estimates may be prepared by or with the assistance of individual(s) skilled in cost analysis, in order to ensure the accuracy and validity of such estimates.

   C. User satisfaction with equipment

   D. Problems experienced with obtaining adequate number of pieces of equipment, new equipment, or maintenance of existing equipment

E. Operational problems due to unreliability, technical failure, lack of training, lack of staff to adequately operate/monitor/repair equipment

F. Impacts, both positive and negative, of equipment on operations

2. This information as well as that from all other post acquisition reviews (PARs) of other technologies can be compiled and analyzed by the Central Office Program Office in a centralized file. This information could be augmented by information gained by Central Office annual assessments of technology use and satisfaction gathered, perhaps, in the form of an annual survey. This information may include, but not be limited to:

   A. Perceived overall utility and value of equipment for operations

   B. Additional operational needs/problems which may or may not be answered with technological solutions

3. The information gathered from both the individual PARs and an annual survey can:

   A. Be considered in all decisions regarding future purchases of OTS equipment or future development of non-OTS technologies

   B. Be used to develop information on an annual basis regarding field operational problems/needs, especially as they relate to equipment

   C. Be shared, when appropriate, among Program Offices and Regional and field offices

<u>PROCEDURES FOR SELECTION OF DEVELOPMENTAL TECHNOLOGIES</u>

<u>Step 2: Identification of Solution</u>[2]

1. Project Manager reviews the problem which was forwarded from the DTSC, and performs all steps related to the identification of a solution in a timely fashion.

2. Project Manager develops information on potential solutions to the problem. In identifying solutions, Project Manager can:

   A. Consult the following sources:

      1. in-house experts or technical staff

      2. outside agencies or consultants

      3. trade shows, manufacturers, vendors (including demonstrations)

[2]The process for identification of solutions which are developmental technologies may require somewhat different steps than the process for identification of non-developmental solutions. In performing the steps associated with developmental technologies, the Project Manager is an individual assigned as such from within either R&D or OTS as described in Step 2 of the procedures for selection of off-the-shelf technology.

4. journals, seminars, professional associations

5. potential user(s) of technological solution

B. Perform a feasibility study, addressing the following issues:

1. scientific integrity and feasibility of underlying concepts

2. potential technical barriers with the solution(s)

C. Consider the following when reviewing the feasibility and appropriateness of potential solution(s):

1. maintainability

2. training requirement/complexity of use

3. staff/resources needed to operate, maintain

4. duplication/complimentarity to other equipment or operational procedures

5. geography/climate/physical location

6. political/public acceptance

7. safety

8. life expectancy

9. potential effectiveness/advantages

10. availability/potential production backlogs

11. future cost growth

12. negative system impacts of using solution

D. Establish and use a set of criteria with which to compare alternative solutions. Criteria may include, but not be limited to, potential costs and benefits of solutions.

3. It may be appropriate for the Project Manager to coordinate activities when identifying solutions with a staff level advisor (designated by DTSC) from any other INS technical offices which are appropriate to the problem or project (e.g, C&E).

4. Project Manager develops an initial ranking and recommendation regarding potential solutions. This may include:

A. Preliminary estimates of costs and benefits of each alternative

B. Preliminary estimates of need for (and tasks of) outside contractors or assistants

5. Project Manager presents the preliminary estimates and recommendations to the DTSC.

6. The DTSC again determines, based on information supplied by Project Manager, whether:

A. Project Manager pursues the development project

B. Project is not to be pursued at this time

If option 6.a is selected (have Project Manager pursue the project), continue with procedures outlined for selection of developmental technologies.
If option 6.b is selected, see notes for Step 2.

7. At any point in the review by the DTSC, if group consensus cannot be reached regarding an appropriate course of action, or if the Project Manager disagrees strongly with the DTSC decision, the issue can be raised to a higher level within the agency, such as to the Management Committee.

8. This decision can be reported back to the individual or initial working group which forwarded the problem to the DTSC for review.

Step 3: Project Development and Testing[3]

1. Project Manager plans, designs and implements the development project in an expeditious manner. During this time, Project Manager:

   A. Coordinates project plan and design with a staff level advisor (designated by DTSC) from any other INS technical offices which are appropriate to the problem or project (e.g, C&E). Consideration can be given to varying the technology if sites for test vary.

   B. Develops refined task plan and time frame for project, and refined cost estimates for project.

   C. Prepares technical requirements, such as Statement of Work, specifications, and modifications to inter-agency agreements, maintenance agreements, staffing plans, and any other administrative paperwork necessary which may be presented as Project Manager recommendation to the DTSC.

   D. Identifies whether and how resources from other agencies could be utilized for development and testing.

2. Project Manager forwards written information developed in substep 1 above to members of the DTSC, and presents such information to the DTSC, perhaps at a meeting.

3. The DTSC reviews information and makes decision regarding whether the project should proceed, or defines what issues Project Manager must reconsider and present again to the committee.

4. After approval is received from the DTSC, the Statement of Work, specifications for bids, or modifications to inter-agency agreements can be sent out, if applicable in this project.

5. After approval is received from the DTSC, Project Manager proceeds with project tasks.

6. Project Manager develops a test plan early in tasks. This can

[3]Testing is not separated from project development, since in order to test a developmental technology, a prototype must first be developed.

be done prior to the receipt of bids or proposals from outside sources, if applicable in this project (e.g., so that baseline data can be collected while prototype is being developed, etc.) When developing this test plan, Project Manager may use the assistance of the Central Office Testing Group for development of test plan and for data analysis activities. The test design may specify the following:

A. operational steps in the testing process

B. amount and type of data to be collected

C. operational measures for concepts, variables

D. time frame for testing and report of results

E. potential interfering factors in performing test or data analysis

F. data analysis techniques

G. physical requirements for testing locations

H. standards for acceptability and generalizability of findings

I. who is responsible for data collection

J. who is responsible for monitoring testing process, and how monitoring is to be performed

K. safeguards to be taken to ensure validity/reliability of data

L. disposition of data

M. scope of test

7. Test design is submitted to DTSC for approval. The DTSC may suggest changes in the test plan. If changes are substantial, plan may need to be presented again to DTSC. If not, Project Manager can make changes, with the assistance of Testing Group, and proceed without DTSC review.

8. When bids or proposals are received, these may be reviewed by the DTSC for final selection; other reviewers could also be involved. Selection of contractors can be based on formal pre-determined criteria and efforts may be made to ensure that contractors are qualified and reliable.

9. During course of all work on the project, Project Manager submits regular progress reports to the DTSC. These progress reports may address the following issues, among others:

A. progress to date on project

B. problems and or successes encountered, and suggested solutions and related requests for additional resources (funds, manpower assistance, materials, equipment), if required

C. expenditures to date

D. anticipated total remaining expenditures

The DTSC may make recommendations concerning the progress of the project, including suggestions for addressing issues such as delays and contractor performance. Based on review of such progress reports, or other available information, the DTSC has the option of discontinuing project at any time, provided any contracts are not violated by such action. <u>At any point in time that the DTSC recommends discontinuing project, refer to notes for step 2.</u>

10. At any point during project development and testing, if DTSC group consensus cannot be reached regarding an appropriate course of action, or if the Project Manager disagrees strongly with the DTSC decision, the issue can be raised to a higher level within the agency, such as to the Management Committee.

11. During course of all work on the project, all significant changes to the design, funding estimates or timeframe are submitted to and approved by the DTSC.

<u>Step 4: Data Analysis and Report Writing</u>

1. Data analysis is performed by appropriate members of the office which conducted the research and testing, with the assistance of the Central Office Testing Group.

2. Data collected are analyzed in conformity with the data analysis plan established in the test design.

3. After testing and data analysis are completed, Project Manager writes a project report. This report may include information on:

   A. steps followed in project development and testing

   B. the test design and any deviations from such design

   C. findings, including factors affecting effectiveness of item

   D. conflicting results, and possible threats to the validity of findings

   E. conclusions and recommendations by Project Manager regarding the need for future testing, development or purchase

4. It would be appropriate for individuals/offices involved in the development or testing process to have an opportunity to review and comment on the draft report.

5. The report is written and forwarded in a timely manner to the DTSC for review.

<u>Step 5: Review of Report</u>

1. The DTSC reviews the project report without unnecessary delay.

2. The DTSC members can have criteria established prior to the initiation of testing by which they will evaluate the test results, e.g., what percentage increase in detection is necessary to approve the purchase of such equipment. As part of their approval of the testing design, the DTSC members can specify those issues for which they want data to be collected.

3. After reviewing report, the DTSC can recommend one of two courses of action:

A. Proceed beyond the initial development phase of the project with an expanded test or development.

B. Proceed into production of operational technology (rather than developmental technology).

C. If the DTSC recommends option (A), to proceed beyond initial development into an expanded test or development, then:

1. This decision may be based on a consideration of such factors as:

   a. maintainability

   b. training reouirement/complexity of use

   c. staff/resources needed to operate, maintain

   d. duplication/complimentarity to other equipment or operational procedures

   e. geography/climate/physical location

   f. political/public acceptance

   g. safety

   h. life expectancy

   i. potential effectiveness/advantages

   j. availability/potential production backlogs

   k. future cost growth

   l. negative system impacts of using solution

2. This decision can be based on user and/or program office input regarding the desirability of expansion of project.

3. It would be appropriate for this decision to be reported back to the individual or initial working group which forwarded the problem to the DTSC for review.

4. The process in Steps 3, 4 and 5 of the procedures for selection or developmental technologies can be repeated for the lifetime of the development project.

D. If the DTSC recommends option (B), to proceed into production of operational technology, then:

1. The DTSC forwards recommendation to appropriate level decision maker for procurement decision.

2. This decision is promptly reported back to the individual or initial working group which forwarded the problem to the DTSC for review.

3. The process outlined in Step 6 of the procedures for selection of off-the-shelf technologies is to be followed at this point.

Note for Step 2

1. When problem is first presented to DTSC, or at other points when decision is made regarding continuation of project, DTSC has the option of deciding that the project may not be pursued. Criteria can be established by which to make this decision, and may based on:

   A. the priority assigned to the problem by the DTSC

   B. the availability of funding for the project

   C. the availability of resources to conduct project

   D. perceived possibility of developing viable operational solution

2. If B above, the availability of funding, is the most significant reason for not pursuing (or continuing project) the appropriate program office representatives on the DTSC can offer available program funds to assist with the project development.

3. If the availability of funding offered by the program office changes the decision, and the DTSC recommends to pursue or continue project based on this availability of funding, then the appropriate framework step (2 or 3) may be followed.

4. It would be appropriate for this decision to be reported back to the initial working group which forwarded the problem to the DTSC for review.

Project Consultants

The methodology used on this project included expert review and comments on our framework, case study findings, and findings regarding the organization and practices at INS. This appendix contains information on the experts involved with these reviews.

INS Organization and Practices

One consultant, Leonel Castillo, reviewed our findings on the INS organization and practices. Mr. Castillo has been president of the Hispanic International University in Houston, Texas, since 1983. He also heads the Immigration Institute at the university and consults for several groups working on immigration policy. He was the commissioner of INS from 1977 to 1979.

Framework Development

Two consultants with considerable knowledge of or experience with the technology decisionmaking process provided expert review and comments on our framework. They reviewed our framework twice during its development for its logic, content, and reasonableness.

Sidney Ross

Dr. Sidney Ross has a Ph.D. in physics and is a registered professional engineer with 20 years of experience in executive management and the technical direction of a variety of defense-related research and development programs. He has served as chair and a member of numerous Department of Defense working, study, and steering groups. He has expertise in a wide variety of technical areas, including electro-optics and electromechanical devices, as well as extensive knowledge of the technology decisionmaking process. Dr. Ross was also involved with our case study reviews.

Robert K. Yin

Dr. Robert K. Yin has a Ph.D. in psychology from the Massachusetts Institute of Technology and is president of COSMOS Corporation, a research and technology firm in Washington, D.C. He is also an adjunct professor in the department of computer science and information systems at American University in Washington, D.C. His research is focused on organizational processes, including decisionmaking and innovation, the use of new technologies, and the implementation of public programs. He has authored numerous books and articles on the technology development process, organizational process, and case study methods.

Case Studies

Three consultants with various technical experience assisted in drawing conclusions about the promising and problematic practices identified in the 10 INS case studies. Besides the two consultants listed below, Dr. Sidney Ross also assisted with this task.

Denzil Pauli

Mr. Denzil Pauli is an independent consultant in engineering, technical planning and management. He holds bachelor of science and master of science degrees in electrical communication engineering. His technical planning and engineering background spans 40 years and includes engineering, physics research, and development and testing experience at the project, program, consultant and corporate director levels. Recent technical government reviews in which he has participated include the interdiction of illegal narcotics and the detection of plastic weapons.

Giovanni (John) Ulibarri

Mr. Giovanni Ulibarri is a security systems engineer employed by Holmes and Narver in Albuquerque, New Mexico. He holds bachelor of science degrees in electronics technology and computer engineering. He has more than 12 years of experience in systems analysis engineering and the technical development of high-technology electronic systems. He is currently working with state-of-the-art programs to facilitate the effective design of security systems for high-security installations.

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Glossary

Apprehension	An INS enforcement function for the safe and effective capture of aliens crossing the border illegally, using fraudulent documents, or having malafide intent.
Barrier Project	Physical structures, including new fences and concrete barriers, currently being considered for two border patrol sectors.
Convair 580	An INS-owned aircraft seating 48-56 passengers, operated by and for the detention and deportation program, used mainly for transporting INS detainees.
Decision Memorandum Process	Instituted in 1982 at INS, a system for coordinating, implementing, and institutionalizing policy decisions and encouraging employee participation in decisions. Decision memos can be prepared at any level in INS on any matter requiring an executive decision or policy change and are forwarded hierarchically through a standard chain of review for a final decision by the INS commissioner.
DES Model Radio Scrambler	A data encryption standard radio scrambler used to provide secure radio communications for antismuggling undercover operations.
Detention	An INS enforcement function that refers to the short- or long-term incarceration of an alien while being processed or held for deportation or exclusion hearings.
Developmental Technology	A technology that is being developed or modified, especially for use by INS.
Fraud Intercept Task Force	A task force, including equipment, such as microscopes and 35-mm cameras, used by inspections staff at some ports of entry to assist in the detection of fraudulent documents.

Image Enhancement Vehicle	Four-wheel-drive vehicle with mast-extended imaging device being developed for the border patrol to assist in the detection of illegal entrants into the United States.
Low-Light-Level Television	Surveillance system used by the border patrol to aid in the detection of illegal entrants into the United States.
Microspectrophotometer	Designed for advanced forensic analysis of suspect documents; one unit is currently owned by the forensic document laboratory and another is being considered for purchase by a regional INS unit.
No-Year Funds	Money that remains available for obligations (orders placed, contracts awarded, services received) for an indefinite time, usually until the objectives for which the authority was made available are attained.
Off-The-Shelf Technology	A technology that can be bought commercially for use by INS, without major modifications or further development.
Optimization Profile	Software being developed for detention and deportation to assist in determining the most cost-effective placement of INS detainees.
Problematic Practice	A particular aspect of the performance of a framework step so far from conformity with our framework that it should be corrected or eliminated from INS decisionmaking practices.
Priority Management System	A formal system instituted in 1983 by INS as a way of establishing its annual priorities and objectives. Field and program management officials are asked for input on priorities. Once approved by the INS commissioner, the programs develop strategies for achieving priorities. Quarterly meetings report on the status in achieving objectives.
Promising Practice	A particular aspect of the performance of a framework step so well matched to the criteria in our framework that it could be performed more routinely or generally at INS.

Stun Gun	A nonlethal electronic weapon being considered for use at INS to enhance officers' safety in the presence of violent aliens.
Survival Gear	Winter survival gear items, such as parkas and heat packets, being used or considered for use specifically by the Havre, Montana, border patrol.
Technology	Any equipment that can be used to facilitate the performance of INS's enforcement activities, excluding computer hardware and munitions. Includes both off-the-shelf and developmental technologies.

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