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Technology Selection at INS Needs Improvement

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Before the
Subcommittee on Government Information,
Justice, and Agriculture
Committee on Government Operations
House of Representatives

Mr. Chairman and Members of the Subcommittee:

It is a pleasure to be here today to discuss our work--that is, the development of a methodology for technology selection at the Immigration and Naturalization Service (INS). Specifically, you requested an evaluation of (1) how INS currently selects technologies, (2) whether a systematic method could be developed for selecting them effectively, and (3) how current INS procedures would compare to such a systematic method.

My testimony today makes four major points. First, and most important, we found that INS lacks a formal technology selection process, even though such a process seems indispensable for successful technology selection. Second, despite the lack of a formal process at INS, we were nonetheless able to identify some promising practices inherent in its technology selections to date that could be used as a foundation upon which to build a more systematic process. Third, we did succeed in developing a method for technology selection that is appropriate to INS' needs. And finally, INS appears to be actively responding to many of the recommendations we made.

The full details of our work are presented in our report Immigration Service: INS' Technology Selection Process Is Weak, Informal, and Inconsistently Applied (GAO/PEMD-88-16). In our summary today, we respond to your questions, listed above, by

describing how we performed our study and developed our findings. Then we discuss our specific recommendations to INS and its response to these recommendations.

For the purpose of our study, we defined technology very broadly as any equipment that can be used to facilitate the performance of INS enforcement activities. We did, however, exclude two types of equipment from this definition: computer hardware systems, because they are the focus of another GAO study, and munitions, because of their auxiliary use.

HOW DOES INS CURRENTLY SELECT TECHNOLOGIES?

To answer your first question, we reviewed the organizational structure and budget history of INS. We interviewed officials and gathered data at both INS headquarters and field offices to identify the existing policies, procedures, and practices for the selection of technologies. We also surveyed all INS regional and district offices, border patrol stations, sector headquarters, and ports of entry to identify the technologies used, tested, or rejected by INS. In addition, we conducted 10 case studies of INS technology selection.

No Systematic Procedure for Selecting Technology

We found that the use of technology to perform enforcement activities is important to INS, but that it has no formal system or standard procedures for selecting technologies; rather, the process it uses is informal and varies from item to item and place to place. Although some variation in practice may indeed be appropriate, based on such factors as item cost or unique local needs, there are clearly areas in which the INS process presents problems. In some instances, the technology appears to have been selected before the need was adequately determined. In others, the need was properly determined, but the technology selected did not receive adequate testing. Further, we noted inconsistencies in obtaining input from the field into the determination of needs and the selection of solutions.

Organizational Practices Interfere With Technology Selection

We identified several organizational practices that present obstacles to effective technology selection, and we concluded that, even if INS had formal procedures, these obstacles would impede the selection process. Specifically, there is evidence of (1) problems in the interaction between the research and development and the program offices, (2) budgetary impediments to long-term planning for equipment expenditures, and (3) extensive, decentralized procurement authority.

CAN A SYSTEMATIC METHOD BE DEVELOPED FOR EFFECTIVELY SELECTING TECHNOLOGIES?

Since there were no formal procedures to review and evaluate, we developed a framework for technology selection and decisionmaking and tested it for applicability to INS. 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).

As this framework was basically theoretical, we proceeded to apply it, through case studies, to the actual technology selection policies and the decisionmaking process for one technology at each of three other agencies--namely, the U.S. Customs Service, the Federal Bureau of Investigation, and the Department of Defense. We selected these agencies for comparison because of the similarity of some of their enforcement functions and technologies with those of INS. Attachment 1 lists the three technologies we reviewed.

Our review of the cases at these agencies provided us with practical knowledge about the organization and content of our technology selection framework. After performing the case studies, we modified the framework and incorporated all practices we judged

to be important and transferable and eliminated those that seemed inappropriate or unnecessary.

We applied our modified framework to 10 case studies of INS technology selection. The technologies we studied were an image enhancement vehicle, which is a mobile unit equipped with infrared detection technology; a low-light-level 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 that provide an improved physical deterrent; a microspectrophotometer for the forensic analysis of suspect documents; a fraud intercept task force 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. These case studies are summarized in attachment 2.

Based on the results of our study, we decided to develop a systematic method for selecting technologies. The seven-step framework that we produced for the general selection of equipment has immediate applicability in the current INS environment. The seven steps are:

1. identification of an operational need or problem,

2. identification of solutions,

3. testing or development, or both,

4. data analysis and report writing,

5. review of the report,

6. decision to purchase equipment, and

7. collection and use of postacquisition review information.

Attachment 3 identifies some of the decisionmaking features we incorporated within each of these steps.

HOW DO CURRENT INS PROCEDURES COMPARE TO THIS SYSTEMATIC METHOD?

When we applied our framework to the process used by INS to select the 10 technologies, we noted the specific steps and substeps where the 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.

Each deviation was then assessed in terms of its reasonableness. Unreasonable deviations--those we thought were within the control of INS to change--were treated as areas in which INS could improve its practices. For example, the inadequate performance of tests on new technologies is an unreasonable deviation, and we think there is little doubt that the testing procedures would have been improved had INS followed our framework, or some other systematic process.

We also noted that reasonable deviations derived from acceptable practice. In general, these were logical deviations 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 nondevelopmental, or off-the-shelf, equipment, nor should they be.

We identified a range of practices evident in the current INS decisionmaking process, paying special attention to practices at either end of the spectrum that appeared to be promising or problematic since these extremes denote obvious strengths and weaknesses in the INS technology selection process. We categorized the promising and problematic practices by the

relevant framework steps. A promising practice was one that matched the criteria in the framework so well that we thought the practice would be worthy of emulation. 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. Attachment 4 summarizes the extent of the promising and problematic practices across all 10 cases.

From our analysis it became apparent that INS is following some sound procedures in terms of the framework steps, although we identified no consistent pattern of practices across cases. Since all cases had at least one promising practice identified, we interpreted this as an indication of the capacity of INS to employ sound decisionmaking practices. The major strengths identified in some cases include (1) input from the field 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.

However, all 10 INS case studies had at least one, and often more than one, problematic practice. The major weaknesses in the technology selection process include (1) the lack of a systematic set of procedures for identifying and reviewing operational problems; (2) the lack of a policy regarding the selection and

prioritizing of technological solutions; (3) the inconsistent way in which expert and field-user opinions are sought and incorporated; (4) methodologically weak testing, especially on developmental technologies; (5) almost no postacquisition data collection and evaluation of technologies; and (6) the lack of a policy for management of research and development. Based on our analysis of the promising and problematic practices, we developed a number of recommendations.

RECOMMENDATIONS REGARDING TECHNOLOGY SELECTION AT INS

Need for a Formal Technology Selection Process at INS

As we have seen, INS lacks a policy regarding procedures for the identification of needs or problems as well as procedures for the identification and selection 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.

Therefore, we recommend that INS establish a decisionmaking methodology for the selection of technologies that is similar to or the same as the procedures outlined in our report. These procedures should be tailored to the scope and nature of the problem or technological solution, so that issues that are 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.

The decisionmaking methodology that INS adopts should include certain practices that we believe are critical to the appropriate identification and selection of technology. These include (1) a procedure for identifying important needs or operational problems, (2) a procedure for identifying and selecting potential solutions, (3) the establishment of a testing group, and (4) the establishment of a clearinghouse for the collection, maintenance, and dissemination of information on the effectiveness of the technologies in use.

Finally, we found some uncertainty about the scope and role of the INS research and development group. Given the importance of technology to the performance of the enforcement functions, we recommend that INS carefully examine the current research and development program and decide upon its future management structure, the amount of resources needed, and the importance of the role accorded to research and development at INS vis-a-vis technology selection.

INS Could Save $1.3 to $2.1 Million

While performing our case studies, we discovered that, in some instances, INS was planning to acquire technologies based on what

we believe was insufficient consideration of the appropriateness or need for them. These technologies are the improved image enhancement vehicle, the microspectrophotometer, the fraud intercept task force equipment, the Convair 580 aircraft, and additional radio scramblers. 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 and $2.1 million. These technologies, the actions we have recommended to INS, and projected savings are listed in attachment 5.

Improved Image Enhancement Vehicle

In the improved image enhancement vehicle (IIEV) 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 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 the operational effectiveness and reliability have been demonstrated for some of the vehicles. 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]

Microspectrophotometer

In the microspectrophotometer case, we conclude that this equipment, which has been available, yet 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. Therefore, we recommend that INS not purchase the second microspectrophotometer for the Laguna Niguel document analysis unit, unless the unit can justify why it needs a system that has not proven effective at the forensic document laboratory. Eliminating the acquisition of this second microspectrophotometer could save $31,950.

Fraud Intercept Task Force Equipment

The existing fraud intercept task force (FITF) equipment was either underused 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 a shortage of

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[1]This estimate is based on an average cost per vehicle of $130,417. We assume that a minimum of five vehicles must be produced: four to fulfill the Army agreement and one 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 three INS vehicles, meaning that it would be reasonable to produce between five and eight IIEVs, rather than 15, at this time.

funds. 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 determined that currently available equipment is fully used and where, if necessary, the existing FITF equipment could be relocated to increase use. Additionally, we recommend that INS consider purchasing only some portion of the $100,000 worth of FITF equipment originally planned for in 1987. We conclude that INS could thus save between $10,000 and $66,000.[2]

Convair 580

The Convair 580 aircraft appears to be cost-effective when compared to commercial transportation. However, in fiscal year 1986, load factors averaged about 50 percent and appear to negate the need for acquiring an additional aircraft with greater capacity. Unless load factors for the Convair 580 increase over the 1987-88 period, an additional larger aircraft does not appear to be justified. Eliminating the purchase of this larger aircraft would save an undetermined amount.

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[2]Specifically, if INS were to purchase 90 percent of the planned equipment packages, it 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.

Radio Scrambler

Finally, in the DES radio scrambler case, we conclude that these radios were not adequately tested and are incompatible with other INS communications equipment. (In addition, we believe that it was unnecessary to purchase as many as 156 radios for testing.) We recommend that INS, rather than purchase additional models, either seek buyers for the current DES radios and use the payments for purchasing compatible radios or modify current radios to make them compatible with existing INS communications equipment. Further, since we believe that the DES radios were not adequately tested, we conclude that if INS determines that another model is the most cost-effective solution, it would be more efficient to field test a limited number of such radios (no more than 50) before acquiring a sufficient supply. Seeking buyers for the current radios or modifying the radios to make them compatible with existing INS communications equipment, rather than purchasing another model as is being considered, could potentially save INS between $360,000 and $720,000.[3]

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[3]If sold for approximately half their original cost, the current radios would yield about $360,000. 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.

AGENCY COMMENTS

We did not receive official agency comments on our work in time for us to include them in our report; however, INS has since submitted them. It appears from the official comments that INS is actively responding to many of our recommendations. Some highlights of these comments follow.

As indicated above, we recommended that INS establish a decisionmaking procedure for technology selection. In response, INS indicates that it "agree(s) that a systems approach for the selection of technologies related to major research and development contracts is essential." The INS further states that it "plans to build upon the strengths of its existing technology selection framework" and that it has "assembled a team to assess GAO's technology framework and utilize it...."

We are pleased that INS is assessing our framework and plans to use it. However, several of these INS comments are sources of some concern. First, as we point out in our report, the framework is intended to be applicable not only to developmental, but also to nondevelopmental (that is, off-the-shelf) technologies, and INS needs to improve the selection of both. Further, while it is useful and important to build upon the existing strengths we identified at INS in developing a sound process for future technology selection, it is just as important to attack and

eliminate the weaknesses we found. In our opinion, even strong technologies will have less than optimal results if INS does not break down the barriers that currently impede the development and implementation of a process that provides for rational and appropriate technology selection.

This concludes my prepared statement. I will be happy to respond to any questions you may have.

Attachment 1: Comparison Agency 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

Attachment 2: Summary of 10 INS Cases

Case	Description	Cost
Barrier project	Physical structure, including new fences and concrete barriers, currently being considered for two southern border patrol sectors to aid in apprehension and deterrence	Approximately $3.3 million for San Diego and El Paso projects
Convair 580	Aircraft owned by the detention and deportation program and used mainly for transportation of detainees	$1.1 million
Fraud intercept task force 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	Approximately $133,000 for equipment packages distributed to 35 ports of entry at about $3,800 each
Image enhancement vehicle	Vehicle with mast-extended imaging device being developed for the border patrol to assist in the detection of illegal entrants	Approximately $2.0 million for 15 systems at $130,417 each
Low-light-level television	Surveillance system used by the border patrol; aids in the detection of illegal entrants	Approximately $2.5 million for six systems
Microspectrophotometer	Equipment for advanced forensic analysis of suspect documents; owned by the forensic document laboratory and being considered for purchase by another INS unit	$29,675 for unit at forensic document laboratory; $31,950 for proposed unit for Laguna Niguel document analysis unit

Attachment 2: (Continued)

Case	Description	Cost
Optimization profile	Software being developed for the detention and deportation program to assist in determining the most cost-effective placement of detainees	$46,600 for first phase
DES radio scrambler	Data encryption standard radio scrambler used to provide secure radio communications for undercover antismuggling operations	Approximately $714,000 for 156 radios at $4,200 to $4,900 each
Stun gun	Nonlethal electronic weapon being considered for use by INS to enhance the safety of officers and others in the presence of violent aliens	Unit cost approximately $60; no funds spent yet
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	Not determined

Attachment 3: Selected Decisionmaking Features of GAO's Technology Selection Framework

Step	Selected Features
1. Identification of need or problem	-- Identification of needs done systematically and annually
	-- Identification of needs at any time by field
	-- Determination of evidence regarding the need or problem
2. Identification of solutions	-- Determination of most appropriate review process
	-- Identification and comparison of potential solutions
	-- Consideration of need for testing or development of a solution
3. Testing or development	-- Planning, designing, and implementing of testing or development or both
	-- Involving research and development group in testing process, when appropriate
4. Data analysis and report writing	-- Analysis and interpretation of data
	-- Preparation of formal report with conclusions and recommendations
5. Review of the report	-- Timely review by appropriate decisionmakers
	-- Decision regarding advisability of purchase or development of item

Attachment 3: (Continued)

6. Decision to purchase equipment	-- Review of available evidence about resources needed to operate equipment -- Estimation of costs and benefits -- Prioritization of need for equipment against other program, unit, or office needs
7. Collection and use of postacquisition information	-- Collecting and reporting on information such as frequency of use, operating cost, and operational problems -- Gathering data through individual reviews or an annual survey or both -- Using information in future acquisition decisions

Attachment 4: Cases With Promising and Problematic Practices for each Step[a]

Framework Step	Promising Practices	Problematic Practices
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) DES radio scrambler (1) Survival gear (2)	Barrier project (3) Convair 580 (1) Image enhancement vehicle (1) Low-light-level television (1) Microspectrophotometer (2) DES radio scrambler (1) Stun gun (2)
3	Fraud intercept task force equipment (1) Image enhancement vehicle (1) Optimization profile (1) DES radio scrambler (1)	Fraud intercept task force equipment (1) Image enhancement vehicle (3) Low-light-level television (7) Microspectrophotometer (1) Optimization profile (1) DES radio scrambler (3) Stun gun (1)
4		Fraud intercept task force equipment (2) Image enhancement vehicle (1) DES radio scrambler (2)

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

Attachment 4: (Continued)

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) DES radio scrambler (1) Survival gear (1)
7	Convair 580 (1)	Convair 580 (1) Fraud intercept task force equipment (1) Low-light-level television (1) DES radio scrambler (1)

Attachment 5: Estimated Cost Savings[a]

Case	Action	Savings
Improved image enhancement vehicle	Cancel procurement of 7 to 10 vehicles	$913,000 to $1.3 million
Microspectrophotometer	Cancel procurement of additional unit	$31,950
Fraud intercept task force equipment package	Relocate unused equipment and forgo procurement of 10-66 percent of additional planned equipment packages	$10,000 to $66,000
Convair 580	Forgo procurement of larger aircraft	Unknown
DES radio scrambler	Sell current radios or modify radios to make compatible with existing equipment	$360,000 to $720,000

[a]These dollar amounts, 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 maximum potential amounts INS could save if certain planned acquisitions are not made.