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Report to the Chairman, Subcommittee on Oversight, Committee on Ways and Means, House of Representatives

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# ADP MODERNIZATION

# IRS' Automated Examination System—Troubled Past, Uncertain Future

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GAO

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Information Management and
Technology Division

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The Honorable J. J. Pickle
Chairman, Subcommittee on Oversight
Committee on Ways and Means
House of Representatives

Dear Mr. Chairman:

As agreed with your office, we have reviewed the Internal Revenue Service's (IRS) Automated Examination System (AES), a project intended to automate the examination of income tax returns. This review is part of our continuing evaluation of IRS' efforts to automate its tax-processing system. Our objectives were to determine (1) the agency's progress in developing and implementing AES and (2) AES' compatibility with the Tax System Modernization effort, which is intended to streamline the agency's tax-processing system through increased automation.

The AES project has been plagued by escalating costs, schedule delays, and elusive benefits. In addition, questions concerning the system's integration into IRS' long-range Tax System Modernization effort are not fully resolved. Achieving integration after AES has already been developed could involve difficult and costly system modifications.

Faced with the need to cut costs, the Office of Management and Budget reduced AES' 1990 budget request by 82 percent, from about $110 million to about $20 million in operations and maintenance funds. Treasury officials agreed that the project's funding should be reduced, noting that it had experienced problems with its management and direction.

We believe the budget reductions to the project are appropriate, given the system development problems, the lack of clearly demonstrated benefits, and the unresolved integration issues. Before additional investments are made in the AES project, IRS should (1) establish a sound basis for estimating AES benefits and compare these estimates with actual benefits achieved and (2) develop a strategy to enable AES to function effectively with other components of Tax System Modernization.

## Background

AES is being developed under the direction of the Office of the Assistant Commissioner for Examination. As originally conceived in 1982, AES was to automate the examination of tax returns in the agency's service centers and district and local offices, at a cost of about $77 million. The

project was significantly expanded in 1984 by adding 18,000 laptop computers equipped with off-the-shelf software for revenue agents. In 1985 the project was further expanded to include developing custom-built software. The expanded system was to be completed by 1989, at a cost of $1 billion.

As currently planned, AES would allow 30,000 IRS examination staff (revenue agents, tax auditors, tax examiners, and managers) in over 700 locations to share tax-processing information with other IRS systems and to update IRS' taxpayer accounts after examinations have been completed. Examination staff would access information maintained on IRS mainframe computers at the Martinsburg, West Virginia, Computing Center and IRS' ten service centers through minicomputers at service centers and at the district and local levels. Laptops and desktop microcomputers would be used to assist the examination staff with portions of the examination process, such as tax computation, report writing, and inventory control.

The project has cost about $187 million from its inception in fiscal year 1982 through fiscal year 1988, the latest year for which cost data are available. Major procurements include about $36 million for laptop computers and about $44 million to a contractor for AES' design, a description of user requirements, software, cost/benefit analyses, technical architecture, and other services. The remaining $107 million was spent on IRS project personnel, software design applications and development, and the lease and purchase of automated data processing equipment.

## Increasing Costs, Slipping Schedules, and Elusive Benefits Plague AES

The development of AES presents a bleak picture. Since AES' expansion in 1984 and 1985, cost estimates have risen by $800 million, and the schedule has slipped by 6 years. IRS' latest estimates show AES scheduled for completion in 1995, at a cost of $1.8 billion. Although IRS currently estimates AES's benefits at $16 billion over the projected 9-year life of the system, this estimate is questionable.[1] To date, IRS has been unable to convincingly demonstrate the benefits of the only portion of the system that is operational. The following table shows the history of AES cost and benefit estimates and projected completion dates.

[1]Benefit estimates include taxes, penalties, and interest, which IRS expects to collect as a result of examinations.

**Table 1: IRS Estimates of AES Costs, Completion Schedule, and Benefits**

Dollars in billions

| Date of estimate | Estimated cost[a] | Estimated benefits[a] | Scheduled completion of development (fiscal year) |
|---|---|---|---|
| May 1985 | $1.0 | $16.2 | 1989 |
| March 1986 | $1.2 | $36.9 | 1990 |
| January 1987 | $1.2 | $42.7 | 1991 |
| July 1987[b] | $1.6 | $13.7 | 1991 |
| March 1988[b] | $1.8[c] | $16.2[c] | 1995 |

Source: IRS data.

[a]System costs include both development and operational costs over a 6-year useful life. System benefits also assume a 6-year useful life.

[b]Benefit figures for July 1987 and March 1988 were provided by IRS' Office of Examination Planning and Research.

[c]The March 1988 estimates of cost and benefits included a 3-year extension of the system's useful projected life, from 6 to 9 years.

As table 1 shows, AES benefit estimates fell from about $43 billion in January 1987 to about $14 billion in July 1987. This reduction was the result of a correction by IRS in the method the AES contractor had used to estimate benefits. The $43-billion estimate was developed using an historically-based average revenue yield per hour of IRS examination. However, the contractor did not take into account the fact that IRS examines returns with the highest estimated yields first; the average yield per hour of examination decreases as more examinations are performed. In computing the value of the additional examinations anticipated from using AES, the contractor erroneously used an average yield figure that did not take into account the decreasing value of these examinations. In short, the contractor produced an estimate that greatly overstated the benefits of the system. IRS corrected this error in its July 1987 estimate of benefits.

Despite correcting this error, the estimate of benefits remains questionable. The key assumption used in computing this estimate is that AES will enable examination staff to examine more returns, thereby increasing tax revenues. However, IRS has been unable to verify that the use of laptop computers has actually resulted in the examination of additional tax returns or increased tax revenues. As a result, IRS has been unable to convincingly demonstrate any dollar benefits from the only operational portion of the project. IRS has now abandoned its original approach of basing benefits on increased tax revenues and is devising a new system for determining benefits on the basis of potential staff-year reductions.

## AES' Progress Has Been Impeded by Software Development Problems

Many of the difficulties AES has experienced have been caused by software development problems. For example, the AES contractor produced a description of user requirements—to be used in developing desktop and minicomputer software—that was incomplete and required additional work.[2] A detailed description of these requirements was necessary in order to clearly define the functions the software was to perform. However, the product delivered did not contain the level of detail needed for programming the software. This problem was a result of both the project office and the contractor underestimating the level of detail needed for programming the software. In addition, the contractor's staff assigned to the project lacked experience in writing user requirements. As a result, the contractor delivered user requirements to the project office that were 9 months late.

When project staff attempted to develop software according to the contractor's user requirements, they found that many of the requirements were inadequately defined and had to be rewritten. For example, according to project staff, had software been developed on the basis of these requirements, one program could have required IRS staff to use 50 to 60 computer screens to review the income information related to one individual's tax return. The project staff regarded this as unreasonable and indicative of the poor quality of the product delivered. In order to prevent similar problems from occuring in the future, IRS has taken measures to provide training to project managers and has issued guidance to help project managers administer automation projects.

Another example of AES' software development problems involved the contractor-produced software used for examining form 1040 returns on the 18,000 laptop computers. Unfortunately, the first version of this software that was delivered to revenue agents in July 1986 was extremely cumbersome to use. A study by a private contractor in May 1988 found that 77 percent of revenue agents were dissatisfied with this software, and only one-third used it. Another study quoted examinations field managers as expressing serious doubts that the software could ever save the agents time in performing their work. IRS had to revise the software and has now fielded a version that performs the same functions but is less cumbersome.[3]

[2]User requirements define the functions to be performed by the system. Adequately defined user requirements are important for successful software development.

[3]The first version of the software required agents to switch back and forth among 18 different disks to run the system. This software was revised and now uses seven disks.

Another problem was caused by a change in the programming language the contractor used in writing the laptop software. Although the Office of Computer Services originally approved the Turbo Pascal language for this purpose, it reversed its position after the software had been written because it did not intend to retain personnel skilled in Turbo Pascal. The AES project office is now rewriting this software in the C programming language and has completed about one-third of it.

## Integration Issues Not Fully Resolved

Through Tax System Modernization, IRS intends to create an integrated tax processing system. By integrating systems such as AES with other Tax System Modernization initiatives, IRS hopes to allow users on different systems to exchange taxpayer information and update taxpayer accounts in its master files. However, in order for this data exchange to work, the data elements in all systems must be structured consistently. For example, data elements such as a person's name must have the same structure in every system. In other words, John Peter Smith's name must appear as "John Peter Smith" in every system. If it appears as "Smith, John P." in one system and "J.P. Smith" in another, it would be difficult, if not impossible, for the two systems to recognize that both names referred to the same taxpayer.

The Office of the Assistant Commissioner for Information System Development is responsible for establishing the standards—including standards for structuring data elements—required for Tax System Modernization to be successful. However, the development office has yet to fully define components of the modernized system and has not determined all the standards needed to ensure that these components will function effectively together.

In the absence of data standards, the AES project developed its own structures for the data it uses. IRS has not yet resolved how it will make AES data structures consistent with data structures of other systems that are part of the modernization effort. Additional data exchange issues include determining how data will be distributed among the different systems and how it will be kept current. Unless issues such as these are resolved, these systems will not be able to function together effectively.

IRS decided to develop AES independently and to incorporate it into Tax System Modernization later because it believes that AES provides important immediate benefits and should not be postponed. By implementing

AES before determining how it will be integrated into Tax System Modernization, however, IRS risks having to make potentially difficult and costly system modifications to enable users to automatically exchange data.

## AES 1990 Budget Sustained Major Cut

Faced with the need to cut government expenditures, the Office of Management and Budget reduced AES' 1990 budget request by 82 percent, from about $110 million (for continued development and operations and maintenance) to $19.5 million (for operations and maintenance alone). Treasury officials agreed that the project's funding should be reduced, noting that the project had experienced problems with its management and direction. A senior IRS official stated that the budget cuts resulted from the project's inability to validate tangible benefits from the 18,000 laptop computers provided to revenue agents. Both the IRS Deputy Commissioner for Planning and Resources and the Deputy Assistant Commissioner for Examination have stated that the AES project will not be abolished because they believe automating the examination function will provide major benefits. Instead, IRS intends to restructure the project and may seek increased funding in the fiscal year 1991 budget.

## Conclusions

To date, despite spending about $187 million, only the laptop computer phase of AES is operational, and tangible benefits for that phase have not been demonstrated. The AES project is 6 years behind schedule, has been troubled by software development problems, and lacks clearly demonstrated benefits. In addition, questions concerning AES' integration with Tax System Modernization have yet to be resolved. For example, IRS needs to determine how it can make AES data structures consistent with the data structures of other systems that are part of the modernization effort. We are concerned that eventual integration may require costly efforts to modify or redesign software and data bases to permit the exchange of data between systems.

Given the system development problems, the lack of demonstrable benefits, and the unresolved integration issues, we believe the 1990 budget reductions to the AES project are appropriate. In addition, we question the advisability of committing additional funds to this project—beyond IRS' $19.5 million budget request for continued operation of the 18,000 laptop computers—until these issues are resolved.

## Recommendations

In light of AES' troubled past, we recommend that before additional investments are made in this project, the Commissioner of Internal Revenue establish a sound and consistent methodology for estimating its benefits. To validate this methodology and measure the success of further development efforts, we also recommend that estimated benefits be compared with actual benefits achieved as components of the system are deployed, and that the Commissioner make this comparision available to the Congress as part of the agency's annual budget submission.

In view of the unresolved questions concerning AES' integration with Tax System Modernization, we recommend that the Commissioner develop a strategy to enable AES to function effectively with other components of the modernized system. In particular, IRS should determine how AES standards for data structures can be made consistent with the standards of other systems within the modernization effort.

## Scope and Methodology

We performed this review from May 1988 through February 1989 at the IRS National Office and the Department of the Treasury, Washington, D.C.; the AES Dallas Development Center; and the AES Cincinnati Development Center. In order to determine the agency's progress in developing and implementing AES, we assessed AES cost/benefit analyses, reviewed actions that AES project management has taken to develop adequate user requirements and implement software programs for laptop computers, and reviewed various AES design and contracting documents. We also interviewed IRS and contractor officials, including present and former AES project managers and the Deputy Commissioner for Planning and Resources.

To develop information concerning AES' compatibility with the Tax System Modernization effort, we met with responsible AES and Tax System Modernization officials regarding key integration issues, including questions surrounding the need for common data standards. We also reviewed IRS' Tax System Modernization plan and related documents. Our work was performed in accordance with generally accepted government auditing standards.

We discussed the information in this report with responsible IRS officials and have incorporated their comments where appropriate. This report was prepared under the direction of James R. Watts, Associate Director. Other major contributors are listed in the appendix.

As agreed with your office, unless you publicly announce its contents earlier, we plan no further distribution until 30 days from the date of this letter. At that time, we will send copies to interested parties, including the Commissioner of Internal Revenue, and will make copies available to others upon request.

Sincerely yours,

Dan White

for Ralph V. Carlone
Assistant Comptroller General

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