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GAO

Report to the Secretary of the Treasury

April 1993

TREASURY AUTOMATION

Automated Auction System May Not Achieve Benefits or Operate Properly

GAO/IMTEC-93-28

GAO

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

Information Management and
Technology Division

B-252762

April 27, 1993

The Honorable Lloyd Bentsen
The Secretary of the Treasury

Dear Mr. Secretary:

In August 1991 a major Treasury auction participant—Salomon Brothers, Inc.—acknowledged committing deliberate and repeated auction abuses over a 2-year period. This disclosure threatened the public's confidence in this crucial market, the government's primary means of financing the over-$4-trillion national debt.

In response to the Salomon Brothers scandal, Treasury accelerated the development of a computerized auction system for large dealers, and instituted other changes to reduce the potential for fraud and misconduct and increase the government's ability to detect such misconduct when it occurs.

This report is the result of our review of the auction automation reforms taken by Treasury in the wake of this scandal. It focuses on (1) how the Treasury Automated Auction Processing System (TAAPS) will automate the current manual auction process for large (primary) dealers, (2) whether the system will realize its primary anticipated benefits of increased detection of misconduct along with reducing the time needed to process auctions and announce winners, and (3) what steps Treasury has taken to ensure that risks associated with operating such a system are adequately controlled. Details of our objectives, scope, and methodology appear in appendix I.

Results in Brief

The benefits anticipated from TAAPS are crucial to ensuring market integrity and encouraging auction participants to bid aggressively for government securities. It is unclear, however, whether TAAPS will succeed in realizing these benefits. Specifically, TAAPS cannot detect or identify collusion or fraud, but can provide some indicators of such behavior that can be probed further. However, Treasury's ability to detect this and other rule violations may not be increased substantially by TAAPS because the Department intends to indefinitely allow bidders to submit paper tenders that will not be inspected by the system. Time savings are also in doubt. For example, Department tests show that processing a combination of electronic and manual tenders does not reduce the time needed to conduct

auctions, but rather takes longer. Further, since the Department has not tested the system under the scenario in which all tenders are submitted electronically, it does not know whether the system will reduce the time needed to conduct auctions even if no paper tenders are permitted.

Finally, in developing the system, Treasury skipped critical system development steps—such as documenting detailed functional requirements—necessary to ensure that risks associated with building and operating such a system are adequately controlled.

Background

Treasury auctions (sells) debt securities—bills, notes, and bonds—to cover government shortfalls between expenditures and receipts, and to refinance maturing debt.[1] The Department publicly announces its intentions to hold an auction a week in advance. Generally, investors manually submit paper tenders (bids) to 12 Federal Reserve banks nationwide, which act as Treasury's fiscal agents in the auctions. However, depository institutions and small investors can electronically send their bids to the Federal Reserve banks through an existing automated system—the Treasury Auction System. This system is designed for those investors who generally do not wait until the last second to submit their bids, in contrast to large dealers who submit just seconds before the close. After bids are transmitted on the Treasury Auction System, the system prints them out in paper form so Federal Reserve bank staff can manually place the bids in the auction along with the other tenders.

Investors can submit either competitive tenders stating the precise yield and quantity at which they want to purchase the securities, or noncompetitive tenders stating that the investor is willing to accept the weighted average yield of accepted competitive bids. At a typical auction, there are between 75 and 85 competitive bidders and between 850 and 950 noncompetitive bidders. These bidders are primary dealers, depository institutions, their customers, and other investors active in the buying and selling of Treasury securities.[2]

After the auction closes, each Federal Reserve bank manually reviews the tenders for compliance with Treasury auction rules and verifies bid

[1]Treasury also raises funds by issuing securities, such as savings bonds, which are not sold through the auction process.

[2]Treasury also manually receives approximately 19,000 noncompetitive tenders per auction through the Department's Treasury Direct program, designed for investors who want to hold the securities until maturity.

information by telephone when needed. Each bank also summarizes the tenders and transmits the results via facsimile to the Treasury. Treasury also reviews the bids and enters bid information into a personal computer to summarize and rank the bids by yield. Treasury then selects enough winners to satisfy Treasury's borrowing needs for that auction and publicly announces the results by approximately 2:00 p.m. (eastern time), 1 hour after the auction closes. During 1991 Treasury raised over $1.7 trillion through more than 150 regularly scheduled auctions.

To ensure auction participation, Treasury and the Federal Reserve rely on approximately 40 large dealers—located in Chicago, New York, and San Francisco—to bid in all Treasury auctions. These dealers purchase large proportions of Treasury securities at every auction. For example, in a study covering January 1990 through September 1991, Treasury found that large dealers bidding for their own accounts were awarded about 72 percent of the dollar value of Treasury bills, notes, and bonds auctioned.

In August 1991, under pressure of investigation by federal law-enforcement authorities, Salomon Brothers—one of the large dealers—admitted to deliberately and repeatedly violating Treasury's auction rules during the previous two years. Specifically, although Treasury limits any bidder from winning more than 35 percent of an auction, Salomon admitted that on at least eight occasions its traders tried to evade the limit, by, for example, (1) submitting false customer bids without customer knowledge and (2) shifting securities from customer accounts to its own without customer authorization. Treasury issued the 35-percent rule to prevent an investor from restricting the supply of securities, artificially driving up prices, and making extraordinary profits.

In the wake of Salomon's admissions, Treasury, the Federal Reserve System, and the Securities and Exchange Commission (SEC) undertook a broad review of the market and recommended, among other things, automating the auction process.[3] They reported that replacing the current paper-based, manual auction process would improve detection of rule violations and make auctions faster and more efficient.

[3]Joint Report on the Government Securities Market, Treasury, SEC, and the Federal Reserve System, January 1992.

Treasury Is Automating Auction Process for Large Dealers

As a result of the Salomon scandal, Treasury accelerated its effort to automate the auction process for large (primary) dealers. Treasury and the system's developer—the Federal Reserve Bank of New York—sought to build a computerized system that would enable large dealers to submit bids quickly just before the auction closes and provide an on-line capability for back up and contingencies. This system is scheduled to be implemented in phases, beginning on April 29, 1993. Treasury estimates that the system will cost $3 million when completed in early 1995. Use of the system will be voluntary in that the Department will continue to accept paper tenders from large dealers not electing to use TAAPS. Treasury elected to do this because the Department believes that requiring dealers to use the system (1) would create an impediment to bidding and limit auction participation and (2) could discourage direct bidding, thus further concentrating the submission of bids through fewer dealers.

The first phase of TAAPS will enable large dealers to send tenders via computer-to-computer link to their respective Federal Reserve banks in Chicago, New York, and San Francisco. TAAPS will also enable bank staff in these three cities to review the electronic tenders for compliance with auction rules, summarize and rank the bids, and transmit the results to Treasury. These three banks will also use the system, rather than facsimile, to transmit summaries of manual bids received during the auctions. The other nine banks will continue to send their bid data to Treasury via facsimile. After receiving the bid data, Department staff will print the TAAPS data and combine it with the bid data received via facsimile. The Department will then manually review the bids and enter them into a personal computer to determine winners, as Treasury has done in the past.

While Treasury intends to add more functions to TAAPS during subsequent phases, the Department has not formally documented its plans and expected dates of implementation. However, Treasury officials said that during subsequent phases they want to add functions that will, for example, enable Treasury to receive bid data electronically from the other Federal Reserve banks and to review and rank bids and determine winners on TAAPS. According to these Treasury officials, the Department is currently focusing on implementing the initial phase of TAAPS and has made limited progress, if any, on the other phases.

TAAPS May Not Substantially Enhance Detection of Auction Violations

Adequate surveillance of Treasury's auction process is necessary for the Department to detect and address auction rule violations. Under the current manual process, Treasury has no means to capture all tender information it needs to perform a timely and comprehensive check that multiple bids by the same or related entities do not violate auction rules in the short time span between tender submission and announcement of results. TAAPS will enhance the capability of Treasury and the Federal Reserve banks to monitor rule violations by allowing them to review and analyze bidder data electronically, rather than having to do this manually, which is time-intensive. Specifically, TAAPS will enable auction personnel to electronically sort through tenders by such factors as customer name. The system will also have six edits that will automatically highlight tenders that potentially violate certain auction rules.

However, neither TAAPS nor any other automated auction system has the capability to detect and identify collusion—where dealers and customers agree to collaborate in violating Treasury rules—or fraud—where bidders provide false information. Treasury officials stated that although TAAPS will not be able to catch collusion and fraud, the system's rule-monitoring capability will provide indicators of such behavior that they can probe further. For example, TAAPS will allow Treasury officials to identify firms having bids approaching or exceeding the 35-percent limit.

Despite TAAPS' ability to provide indicators of collusive and fraudulent behavior, Treasury's ability to detect this misconduct and other rule violations may be limited due to the Department's decision to accept and process both electronic and manual bids. Specifically, because TAAPS can only process bids submitted electronically, bids submitted manually will not be inspected by the system, and will only be subject to manual rule-monitoring, which is counter to Treasury's reason for automating the auction process.

Whether System Will Shorten Auction Time Remains Unclear

Treasury has stated that TAAPS will reduce the time needed to conduct auctions and notify successful bidders, yet it is not clear that TAAPS can accomplish this. This potential time reduction is especially important to the large dealers because it reduces the amount of time during which they are uncertain of their financial risks and obligations when making bids worth, for example, billions of dollars. Delays between the submission of bids and the announcement of auction outcomes may have an adverse impact on bidding, because bidders are exposed to the risk of market fluctuations during this 1-hour period when they do not know whether

they have been awarded securities. As a result, Treasury believes automating the process to shorten this 1-hour period may encourage auction participants to bid higher prices for the securities.

TAAPS' ability to attain such time savings remains in doubt. Between January and March of this year, Treasury conducted five tests—simulating live auctions—to determine how long it would take to process an auction when bidders submit both paper and electronic tenders. During the tests, Treasury found that it took between 25 and 47 minutes longer to perform these auctions than the current 1-hour manual auction.

Treasury officials attribute the longer processing time to having to perform additional steps that arise from handling both manual and electronic tenders, and the fact that Treasury's auction processing steps are still manual. These officials expect that if all the large dealers are using the system to submit their bids, thus eliminating the time needed to process paper bids, and Treasury automates its auction processes during subsequent system development phases, the Department will be in a position to start reducing the time required to process auctions and notify winners. However, at this time Treasury does not know whether time will be saved because the Department has not determined what the time savings would be under a completely automated auction scenario, in which all large dealers submit electronically. Furthermore, because Treasury has no plans to require the dealers to use TAAPS, the Department has no assurance that all large dealers will use the system and cease reliance on paper tenders. Consequently, the Department does not know whether time savings will be achieved.

System Risks Not Adequately Controlled

Treasury and the Federal Reserve Bank of New York skipped certain system development steps necessary to ensure that the risks associated with building and operating a system are adequately controlled. Specifically, they did not (1) conduct cost-benefit or feasibility analyses, (2) perform a risk analysis, (3) document detailed functional requirements, or (4) test the system thoroughly. In addition, as of the time of our work, Treasury and the bank had not resolved important technical problems affecting the operation of TAAPS.

Cost-Benefit and Feasibility Analyses

Generally accepted system development principles recommend that cost-benefit and feasibility studies be performed prior to developing critical and costly systems. Such studies help agencies determine

information deficiencies with existing manual processes, whether automation is the appropriate approach for addressing the deficiencies, and the costs and benefits of the approach selected. Among other things, the studies demonstrate whether automating the process is more beneficial than staying with or improving the existing manual process.

Treasury and the Federal Reserve Bank did not perform such analyses before commencing with the development of TAAPS. Treasury and bank officials stated that these were not done because the lack of automation in the auction process contributes to a perception that auctions can be manipulated, that collusion is possible, and that insiders have an unfair advantage over other participants; automation appeared to be the logical means to dispel those perceptions. Nevertheless, Treasury and the bank have not demonstrated whether using automation is more beneficial than using or enhancing the existing manual process.

Risk Assessment

Similarly, Treasury and the Federal Reserve Bank of New York did not plan to perform a risk assessment of TAAPS because they believed that the Federal Reserve telecommunication and computer system selected for the system is already safe and secure. However, according to the Federal Reserve Bank's data security manual, whenever a new system is implemented, the bank is supposed to perform a risk assessment of the application in order to avoid potential monetary loss, productivity loss, and embarrassment. Without assessing the risks of using this new application, Treasury and the Federal Reserve Bank are taking a chance that vulnerabilities may go undetected, and that appropriate controls may not be implemented to address them.

Responding to our concern about the lack of such an assessment, the Federal Reserve Bank of New York prepared a risk assessment and made it available for us to review on April 22, 1993. While the assessment identified areas of high risk, we found that it did not contain many of the key elements of a risk assessment such as valuation of assets, probability of risk occurrence, and annualized loss expectancy. Additionally, it did not describe how risks would be adequately controlled—a fundamental reason for performing such as an assessment. For example, the bank identified the risk of unauthorized disclosure of auction data by bank personnel as being high, but they did not specify the specific type of disclosure, the probability of it happening, or the controls necessary to mitigate this risk. We also found that the assessment had not yet been reviewed and approved by the bank's security department. Prior to the review and

approval of the risk assessment, Treasury had already decided on and publicly announced an implementation date. Should additional vulnerabilities be identified or additional work be needed to control the risks, there is little time to accomplish this since the system is scheduled to be implemented on April 29, 1993.

Detailed Functional Requirements

Treasury and the Federal Reserve Bank did not adequately document the system's detailed functional requirements. Requirements are typically contained in a formal document that specifically describes what the system is supposed to do. This detailed documentation is important because it is used for developing thorough test plans and for maintaining the system.

The Federal Reserve Bank developed high-level business requirements that describe system functions in general terms. According to bank officials, in over 30 meetings with dealer, Federal Reserve, and Treasury users, they obtained detailed requirements during computer-screen prototype demonstrations; these screen prototypes serve as their detailed requirements documentation. However, the screen formats do not constitute complete functional requirements. For example, the screens do not contain performance requirements such as system response time. Furthermore, because they are not documented, they cannot be used to establish a system baseline against which the system can be tested and evaluated.

Bank officials acknowledge that they did not formally document the detailed requirements because such an activity is time-consuming and, on the basis of their experience, provides questionable benefits to users. Nevertheless, until TAAPS' detailed requirements are formally documented, Treasury and the bank will not have adequate documentation for building, testing, operating, and maintaining the system.

System Testing

Thorough testing of automated systems allows problems to be detected and corrected before they are introduced in a live operating environment. In December 1992 we reported to Treasury and the Federal Reserve Bank our concerns that their testing strategy for TAAPS may be incomplete.[4] Our review of the test plan documentation (1) showed that Treasury cannot be certain that all system functions were tested; (2) indicated that the planned stress tests did not demonstrate all of TAAPS' capabilities under

[4]Treasury: Auction Automation (GAO/IMTEC-93-14R, Dec. 16, 1992).

heavy work loads; and (3) disclosed that critical quality assurance tests were not being conducted independently, as recommended by generally accepted system development standards.

Since our report, Treasury and the bank have taken steps to improve system stress testing. They conducted a series of tests that applied up to ten times as many transactions as anticipated under normal business conditions. They intend to conduct additional stress tests on TAAPS and the other applications running on the system where TAAPS will reside, to determine the potential effects the applications may have on one another.

However, Treasury does not have assurance that all system functions have been tested because it lacks detailed functional requirements documentation—which serves as a checklist for determining whether the proposed tests will include all functions. Similarly, Treasury and the bank have not taken action to ensure that the quality assurance testing is being performed in an independent manner. They are continuing to rely on the TAAPS project manager and system users to coordinate and conduct this activity, rather than having it done by a separate, independent group. Only independent quality assurance testing provides the needed confidence that TAAPS has been thoroughly tested.

Unresolved System Problems

As of March 1993, Treasury and the bank were still attempting to resolve several system problems affecting the operation of TAAPS. For example, during tests conducted between January and March 1993 to simulate auction-like conditions, some dealers (five during one test) were disconnected from the mainframe computer system. Specifically, the telecommunications connections between the dealers' terminals and the bank's computer system were not being established and sustained as required, risking the loss of bids and access to the system. The bank replaced telecommunications hardware believed to be one of the causes of such disconnections and is continuing to monitor this problem.

In addition, Treasury is experiencing a problem with its mainframe clock. Specifically, the Department is setting the TAAPS computer clock to an independent, third-party source—the Naval Observatory time clock in Washington, D.C.—and has urged the dealers to synchronize their clocks to this source as well so that all parties are using the same time standard for submitting bids. However, Treasury found that the computer clock on the TAAPS mainframe computer drifts and has to be manually readjusted every Saturday. This poses a potential problem for those dealers who

submit bids seconds before an auction closes. For instance, should the bank's computer clock gain time, dealers could transmit timely bids that are rejected by the bank as being late. Treasury and bank officials are working to address this problem. Until these system problems are adequately resolved, however, auction participants are at risk of not being able to transmit their bids in a timely fashion. This could discourage dealers' use of the system and continue their reliance on paper tenders.

Conclusions

There is no evidence that TAAPS will provide the benefits sought by Treasury. Consequently, Treasury does not know whether TAAPS will be more beneficial than the current manual process.

In addition, given the system development weaknesses identified, Treasury has not adequately controlled the risks associated with building and operating TAAPS. This places Treasury and auction participants at risk that TAAPS will not operate properly when implemented. Such a condition could impair market integrity and hinder the ability of the government to finance the deficit at the lowest possible cost to taxpayers.

Recommendations to the Secretary of the Treasury

Since anticipated benefits are unsupported and the risk exists that the system may not operate as intended, we recommend that the Secretary of the Treasury delay placing TAAPS in operation until the Department demonstrates that intended benefits can be achieved. For example, it should be determined what effect a completely automated auction (where all large dealers submit bids electronically and Treasury's auction process is fully automated) would have on time savings and rule-monitoring. If this analysis proves that desired benefits can only be achieved cost-effectively by completely automating the auction process, then Treasury should reexamine the auction process and use of automation to determine what changes need to be made to ensure benefits will be realized.

Before the system is implemented, we also recommend that you (1) make TAAPS' risk assessment final; (2) document the system's detailed functional requirements; (3) ensure that the system is adequately tested—including determining whether all functions have been tested and that quality assurance testing has been conducted in an independent manner; and (4) correct unresolved system problems.

Agency Comments and Our Evaluation

In commenting on a draft of this report, Treasury asserted that TAAPS has been sufficiently tested, is free of problems, and will provide expected benefits. (Treasury's response is included in app. II; Treasury incorporated the Federal Reserve Bank of New York's comments in its response.) Treasury's specific comments and our response are below.

1. Treasury stated that while the system will not conclusively detect collusion and fraud, it will enhance the Department's ability to monitor bids for compliance with auction rules.

We believe, however, that the system may not substantially increase the detection of rule violations because Treasury intends to indefinitely allow bidders to submit paper bids, which will not be inspected by the system. Treasury believes that requiring all dealers to submit bids via TAAPS would impede bidding because some dealers may not fully understand and accept the system. In view of this uncertainty and the fact that there is no compelling reason to implement TAAPS immediately, it would be prudent to wait until Treasury can clearly demonstrate to auction participants that the system will indeed provide its intended benefits.

2. According to Treasury, recent testing has confirmed that auctions using TAAPS should be completed in generally the same time frames as auctions are today. We believe Treasury's statement contradicts its goal of conducting auctions more quickly than it does presently. Additionally, as of April 21, 1993, the date of Treasury's formal response, its recent testing had only consisted of parallel tests. These tests are inconclusive because they did not include the dual processing of electronic and manual bids and all dealers did not participate. Even with these limitations, some of the tests still took longer to process than the current 1-hour manual auction. Consequently, it still remains unclear whether TAAPS will help reduce auction processing time.

3. Treasury said that it viewed cost-benefit and feasibility analyses as unnecessary because the benefits of an automated auction environment were self-evident.

We disagree that benefits are self-evident because test results, for example, show that intended benefits are questionable. Consequently, Treasury does not know whether using TAAPS is more beneficial than using or enhancing the existing manual process.

4. Treasury asserted that the Federal Reserve Bank of New York recently prepared a risk assessment for TAAPS.

However, as we pointed out earlier in this report, this assessment has not yet been reviewed, contains flaws, and therefore, cannot be relied upon to determine whether TAAPS conforms to Federal Reserve security standards.

5. According to Treasury, its functional requirements are sufficient.

We disagree because the TAAPS documentation does not contain, for example, performance requirements—such as response time—that are needed to establish a system baseline against which the system can be tested and evaluated. Until these requirements are formally documented, Treasury will continue to have inadequate documentation for building, testing, operating, and maintaining the system.

6. Treasury claimed that while its initial testing efforts were incomplete when we issued our December 1992 letter, testing conducted since that time was complete because it included all system functions.

We disagree because, as we stated above, the Department has not documented all functions and therefore, cannot determine whether this testing included all functions.

7. The Department stated that parallel and simulated auctions were not performed by the system development team, and that these tests were therefore independent.

We do not disagree with this statement. Nonetheless, we found that Treasury did not use a separate, independent group to perform quality assurance testing. Independent quality assurance testing provides added confidence that systems have been thoroughly tested.

8. Treasury argued that the system problems mentioned in the report have been assessed and corrected.

We disagree that all problems have been corrected. For example, the time-drift problem with the mainframe clock persists; Treasury continues to manually reset the clock each week and monitor it daily. In our opinion, these steps constitute a work-around that (1) does not address the underlying problem and (2) only provides marginal assurance that

Treasury will be able to consistently determine which bids have been submitted in a timely fashion.

In summary, Treasury's response did not provide convincing evidence to support its claims that TAAPS has been thoroughly tested, is free of problems, and will provide expected benefits. Because the system will play a critical role in financing the national debt and because there is no compelling reason to implement it immediately, Treasury should delay placing the system in operation and implement our recommendations.

As you know, 31 U.S.C. 720 requires the head of a federal agency to submit a written statement on actions taken on our recommendations to the Senate Committee on Governmental Affairs and the House Committee on Government Operations no later than 60 days from the date of this letter. A written statement must also be submitted to the House and Senate Committees on Appropriations with the agency's first request for appropriations made more than 60 days after the date of this letter.

We are sending copies of this report to Treasury's appropriations and authorization committees and to other interested members of Congress. Copies will also be available to others upon request. We performed our work from August 1992 through March 1993, in accordance with generally accepted government auditing standards. This work was performed under the direction of Howard G. Rhile, Director, General Government Information Systems, who can be reached at (202) 512-6418. Other major contributors are listed in appendix III.

Sincerely yours,

Michael Gryzbowski

for Ralph V. Carlone
Assistant Comptroller General

Contents

Abbreviations

GAO	General Accounting Office
IMTEC	Information Management and Technology Division
SEC	Securities and Exchange Commission
TAAPS	Treasury Automated Auction Processing System

Objectives, Scope, and Methodology

Our objectives were to determine (1) how the Treasury Automated Auction Processing System (TAAPS) will automate the current manual auction process for large dealers, (2) whether the system will realize its primary anticipated benefits of increased detection of rule violations along with reducing the time required to conduct auctions and announce winners, and (3) what steps Treasury has taken to ensure that risks associated with operating such a system are adequately controlled.

To understand how TAAPS is intended to automate the current manual auction process for large dealers, we documented the manual procedures used by Treasury and the Federal Reserve banks to conduct auctions and assessed the automated system being developed by Treasury to replace the old process. Specifically, we observed how auctions are conducted and processed by auction personnel at Treasury and at the Federal Reserve Bank of New York. We also obtained and reviewed agency documentation and studies detailing how the current manual process works. Additionally, we interviewed officials at Treasury's Office of Public Debt—responsible for conducting the government's auctions—along with senior auction personnel at the Federal Reserve Bank of New York, to verify our understanding of the process.

In examining Treasury's actions to automate the process for large dealers, we reviewed the Department's specific plans for automating the auction process. This included reviewing and analyzing the Department's automation reforms proposed in the government securities market study that was conducted in the aftermath of the Salomon Brothers scandal. In addition, we obtained and examined the high-level business requirements for the Treasury Automated Auction Processing System to understand how the system would work in place of the current manual process. Further, we observed a demonstration of the system and interviewed officials at Treasury's Office of Public Debt—who are overseeing the TAAPS development—and the project manager at the Federal Reserve Bank of New York, to substantiate our understanding of how the computerized system was envisioned to work.

To determine whether TAAPS will realize anticipated rule-monitoring and efficiency benefits, we obtained and reviewed agency documentation describing key Treasury auction rules and the problems and abuses generally associated with them, including those committed by Salomon Brothers from 1990 through 1991. We also obtained and analyzed TAAPS system development documentation that explains the system's ability to detect auction rule violations. For time savings, we documented how long

it currently takes Treasury to manually process an auction and compared this with results from system tests conducted by Treasury to determine how long it will likely take the Department to process auctions using TAAPS. In addition, we met with and interviewed Treasury and Federal Reserve Bank of New York officials to obtain their views on the benefits anticipated from TAAPS, and whether they are attainable.

To determine whether Treasury has taken the necessary steps to ensure that the risks associated with operating TAAPS are adequately controlled, we analyzed TAAPS system development documents, including a description of TAAPS system development methodology, the business requirements document, the test plan, and test results. We also interviewed Treasury officials and the system development staff at the Federal Reserve Bank of New York to document the process followed in developing the system, and to assess how the risks associated with using automation were being controlled. In addition, we met with intended TAAPS users, such as large dealers, to determine their involvement in the TAAPS development process, what benefits they anticipate from the system, and whether they believe the system is likely to meet their needs.

Comments From the Department of the Treasury

DEPARTMENT OF THE TREASURY
WASHINGTON

ASSISTANT SECRETARY

April 21, 1993

Mr. Ralph V. Carlone
Assistant Comptroller General
U.S. General Accounting Office
Washington, D.C. 20548

Dear Mr. Carlone:

This letter responds to the April 12, 1993, draft GAO Report B-252762 entitled Treasury Automation: Automated Auction System May Not Achieve Benefits or Operate Properly (GAO/IMTEC-93-28, code 510868). Treasury appreciates the interest shown by GAO in the Treasury Automated Auction Processing System (TAAPS) and the suggestions and recommendations offered. Although we gave careful consideration to the report's conclusion, we believe that the current phase of the TAAPS project is ready to be placed into production. As you know, TAAPS is scheduled for implementation on April 29, 1993. We are confident that TAAPS will function as expected and will provide important initial automation benefits to Treasury and to participating bidders in Treasury auctions. We have provided our reaction to and some additional information on the key points in the draft GAO report.

Auction Violations

The draft report indicated that TAAPS may not significantly enhance detection of auction violations. We agree with the GAO that neither TAAPS nor any other automated system has the capability to conclusively detect and identify collusion--where dealers and customers agree to collaborate in violating Treasury rules, or fraud--where bidders provide false information. The effective enforcement of Treasury's rules and detection of fraud will continue to require the diligent efforts and judgement of competent staff. However, each phase of the TAAPS implementation, including this initial one, will enhance Treasury's ability to review bids and monitor tenders for compliance with auction rules. We do not claim that this implementation of TAAPS will provide the ultimate capability for the detection of auction violations, only that it is a clear and positive step in the right direction.

The decision to implement TAAPS without requiring large bidders to use the system immediately was made deliberately and is, in my view, a prudent and careful way to proceed. We have been working closely with the large dealers, and we expect that within a few months following implementation, most of them will be using TAAPS. The Treasury has several reasons for not requiring all large bidders to submit their bids via TAAPS immediately. For one thing, we do not wish to create impediments to bidding that would artificially limit participation in our auctions. Requiring automated access could discourage direct

bidding and further concentrate the submission of tenders as bids were funneled through fewer dealers. In addition, it is important to ensure that every user of TAAPS has the expertise necessary to be comfortable with bidding by computer. Everyone benefits if the TAAPS system is understood and accepted by those using it.

Time to Conduct Auctions

The draft GAO report stated that it was unclear whether the TAAPS system will shorten the time needed to conduct auctions. The question of the timeliness of auction results has been a concern of the Treasury's throughout this process. During some of our earlier testing of TAAPS, it took longer to complete the auction than it does under the current non-automated process. This is no longer the case. All recent testing has confirmed that the auctions using TAAPS should be completed in generally the same time frames as the auctions are today. System improvements, tighter controls, streamlined procedures, and additional training have improved test performance. We believe that this phase of TAAPS will provide an important foundation on which to build future automation and that it will lead to a compression of the time necessary to compile auction results.

Cost-Benefit and Feasibility

The report correctly states that neither a cost-benefit nor feasibility analysis was conducted prior to starting the development of TAAPS. These analyses were not performed because they were viewed as unnecessary in this instance and because the long-term benefits of an automated environment were self-evident. During the TAAPS development, the Treasury auction process was being examined in substantial detail by Treasury, the Federal Reserve, and the Congress. I believe it is fair to characterize the views expressed as unanimous in support of a shift toward automated auctions.

Despite the absence of formal analyses, Treasury was convinced that automation of the auction process made sense and had the potential to provide significant benefits. Among the benefits expected from this and future phases of TAAPS are an increase in monitoring capability, an improvement in the quality of bid submission as a result of providing bidders with automated editing and immediate documentation of their submission, and the eventual reduction in the time required to conduct an auction with the associated reduction in bidder uncertainty. To the extent that the bidder's risk is reduced by an earlier completion of the auction, Treasury should benefit from more aggressive bidding and reduced borrowing costs.

Risk Assessment

The Federal Reserve Bank of New York has recently completed the risk assessment referred to in the draft report and verified that the system conforms to applicable Federal Reserve security standards.

In addition to the formal assessment, substantial attention has been paid in TAAPS to reducing risk. The system makes use of proven and encrypted communications. All bids are transmitted to two Federal Reserve locations and subsequently remote-logged to the other site. The auction can then be conducted from either of the two physically separate locations. Further, the functions performed by the Federal Reserve Banks and Treasury can be performed by other locations in an emergency.

Functional Requirements

The report questioned the adequacy of the documentation of system requirements. While there is no doubt that more requirements documentation could have been produced, it was not deemed necessary for the system development to be effective and controlled. In order to develop this phase of TAAPS quickly, we decided to use Information Engineering methodologies incorporating Computer-Aided Software Engineering tools for the system design. This methodology produces substantially less paper documentation than more traditional systems development approaches. It requires a close working relationship between knowledgeable users of the system and the developers. This relationship was particularly evident and effective during the TAAPS development. The documentation created as a result of this process both computer-based and paper-based, provides a solid foundation for the successful implementation, operation and maintenance of TAAPS.

System Testing

Several issues were raised by GAO regarding the testing of TAAPS. There was an indication in the report that testing may have been incomplete. TAAPS testing was, in fact, incomplete when GAO issued its December 1992 letter. After that letter, substantial additional testing was performed. While it is always possible to do even more testing, TAAPS has been sufficiently tested at this point to ensure that auctions can be processed effectively and reliably. Test scripts for data entry, other functionality, and tender processing have been developed, successfully executed, and documented. In addition, dealers and other TAAPS participants have performed more than fifty simulated and parallel auctions to evaluate system capabilities and test operational contingency plans. This testing has exercised the system for all functionality that it will be expected to perform in this phase of implementation. Further, several successful

stress tests have been completed. During these various tests, problems were encountered and corrected, and the system has proven to be very stable. A significant amount of this testing occurred after the GAO review.

The question of independent testing was also raised in the report. The methodology employed to test TAAPS made substantial use of knowledgeable users in the testing. While some of the early tests were coordinated by the development team, users, independent from the development team, reviewed and validated the results. For the parallel and simulated auctions, none of the testing was done by the development team. Such testing was performed by representatives from Federal Reserve operations, the Treasury, and the dealers. This group of testers had considerable experience and solid expectations and would not have recommended the system for production if it was not ready.

Unresolved System Problems

The report referenced some system problems that had not been resolved at the time of the GAO review. The system problems mentioned in the report have been assessed and corrected. To be accurate, additional problems were identified in subsequent testing. These too either have been corrected or specific procedures have been identified and documented to deal with the situations should they arise. There are no outstanding problems of any significance that will prevent the system from performing well.

Summary

We believe that this phase of TAAPS is an important step in the long-term evolution of Treasury auction automation. It will, for the first time, allow the largest participants in Treasury auctions to bid electronically and will establish the groundwork for additional auction automation that will benefit both Treasury and investors.

Thank you for your efforts and recommendations regarding the TAAPS development.

Sincerely,

Gerald Murphy
Fiscal Assistant Secretary

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