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Report to the Chairman, Joint Committee on Taxation, U.S. Congress

March 1988

INTERNAL REVENUE SERVICE

Computer Readiness for 1988 Filing Season

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GAO

United States
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Information Management and
Technology Division

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March 31, 1988

The Honorable Lloyd M. Bentsen
Chairman, Joint Committee on Taxation
Congress of the United States

Dear Mr. Chairman:

As requested in your September 11, 1987, letter and subsequent discussions with your office, we have examined and evaluated the ability of the Internal Revenue Service's (IRS) computer systems to process the 1988 filing season work load. As agreed, our objectives were to determine whether

- software, including software affected by the Tax Reform Act of 1986 (Public Law 99-514), was ready for use by February 1, 1988;
- IRS' mainframe computers would have sufficient capacity to process the 1988 filing season work load; and
- IRS can rely upon its old communications processors, computers that provide IRS employees with access to taxpayer information, to achieve its availability goal of 95 percent during the 1988 filing season.

In general, we found that, as of February 1, 1988, IRS had finished modifying and testing software that will be used to process taxpayer information during 1988. A review of IRS' software tests and test results shows that the software is ready and should operate reliably.

We believe that mainframe computer capacity should be sufficient for the 1988 filing season based on our analysis of capacity utilization at three of IRS' largest service centers. Further, IRS will have to rely on its old communications processors during the 1988 filing season because installation of new processors has been delayed. The old processors should be able to meet IRS' 95 percent availability goal.

Tax Reform Act Required Changes to IRS Software

The Tax Reform Act represents one of the most comprehensive revisions of the federal tax system since its inception in 1913. Tax reform resulted in 158 requests from IRS operating divisions for changes to the computer programs used to process taxpayer information. Of these, 129 were changes the operating divisions said were needed by February 1, 1988.

We reviewed IRS' test plans for each of the 17 changes to determine whether the tests were consistent with the requirements contained in section 2600 of the Internal Revenue Manual, which contains IRS' guidance on software testing. We also traced the test conditions in the test plans to the specifications followed by the programmers and the users' requirements, to determine whether the tests were consistent. In addition, we examined the test conditions and test results to determine if the tests were sufficient. We found that the tests were reasonable, were consistent with programming specifications and user requirements, were sufficient, and that the software did process tax information correctly.

We also examined the procedures IRS uses to insure that errors identified during testing are corrected before the software is used. We analyzed problem definition reports prepared by IRS testers to determine the number and seriousness of software errors found during testing. The reports identified 647 errors that could either prevent returns from being processed or cause tax returns to be processed incorrectly. Our analysis and review of these reports, IRS resolution responses from the national office, and final test status reports indicated that the software errors were generally corrected by February 1, 1988. Since January 4, 1988, we have been analyzing the management reports collected by IRS' National Office Command Center in Washington, D.C., to identify significant software problems affecting data processing operations at service centers. Since January 25, 1988, we have been making periodic visits to selected service centers to determine if they are experiencing software-related problems. As of March 1, 1988, neither we nor IRS had found or reported any major software problems affecting the processing of tax returns filed this year

Mainframe Capacity Should Be Sufficient

The backbone of IRS' tax processing system is its large mainframe computers. In each of the 10 service centers, IRS uses large mainframe computers to process two primary work loads. The first is the weekend update work load, which involves updating tax information data bases. The second is the daily work load, which involves the immediate retrieval and updating of taxpayer accounts in response to communications between IRS and taxpayers, making adjustments to taxpayer accounts, and correcting errors.

We believe IRS should have sufficient computer capacity to support the 1988 filing season. The validity of our projection is dependent upon two key assumptions. One that tax reform will not significantly alter the mix or level of the work load to be processed; and two, that this year's

on-line processing at the three service centers during 1987 and our projections for 1988 show that IRS should have sufficient mainframe capacity for daily on-line processing during the 1988 filing season. We expect that the Fresno, Austin, and Ogden centers will use 85, 71, and 68 percent of their available mainframe capacity, respectively, during peak daily on-line processing periods. At these rates, capacity should be sufficient.

In conducting our analysis of IRS' on-line work load, we used a mathematical model we developed for representing computer utilization during typical peak hours of daily on-line processing. In projecting whether IRS would have sufficient capacity for handling its daily on-line processing during the 1988 filing season, we again used three IRS assumptions: (1) the on-line transaction mix and mainframe computer requirements reflected in IRS' 1987 work load data could be considered representative of IRS' 1988 on-line work load; (2) other daily work loads now processed concurrently with the on-line transaction processing would be shifted to less busy periods as increased on-line work loads necessitate, and (3) the daily work load would increase by 10 percent over last year's daily work load.

IRS officials have identified measures that can be taken if service centers experience mainframe capacity problems in 1988. To alleviate capacity shortfalls that may arise during weekend processing, the 52 hours currently available for this activity can be extended to 58 hours by reducing the number of hours available for daily on-line processing on Fridays. This would be done by shifting daily on-line work now processed on Friday evenings to other weekdays. Capacity shortfalls during peak periods of daily on-line processing can be alleviated by rearranging employee work schedules to more evenly spread computer use throughout the day. Such measures would be implemented on a case-by-case basis at the discretion of the service center directors.

Old Communications Processors Should Prove Reliable in 1988

Based on their past performance, IRS' old communications processors should be reliable during the 1988 filing season. To achieve this, service centers must continue to effectively manage the old processors' work load during peak processing periods.

During 1987, the Austin, Fresno, and Ogden service centers experienced periods when processor transaction volumes approached the capacity limit of 18 transactions a second. When transaction volume approached this level, the centers reduced the number of transactions flowing through the processors by either dividing the work load among the remaining available work hours scheduled for the processors, or extending the schedule

We believe that the old processors should be able to perform adequately during tax processing year 1988. To achieve this, service centers must continue to effectively manage the old processors' work load during peak processing periods.

Objectives, Scope, and Methodology

We carried out our field work from September 1987 through January 1988. We analyzed IRS system change reports to identify software changes requested by users and their status. To determine the extent to which software affected by tax reform was ready for use, we reviewed the process IRS used to modify and test tax reform-related software changes. To determine whether the software processed tax information correctly, we analyzed test results to determine the extent to which acceptance criteria were met and operational requirements were satisfied. To project IRS' available computer capacity for 1988 and to determine how well old communications processors were performing, we analyzed computer performance data for the 1987 tax processing season. Our work was done in accordance with generally accepted government auditing standards. Additional information on the scope of our review is included in the appendix.

Agency Comments

We discussed the contents of this report with the Assistant Commissioner for Computer Services, who agreed with the report's contents. He provided some additional technical information, which has been incorporated where appropriate.

in section 2600 of the Internal Revenue Manual, which contains IRS' guidance on software testing.

We reviewed, for each of the 17 changes, the tests IRS used to ensure that critical operational requirements were satisfied and acceptance criteria met. We traced the changes from user change requests to the functional specification statements followed by IRS programmers to the test plans to determine whether all 17 changes were included in the plans and the tests were consistent with user requests. To determine whether the software processed tax information correctly, we reviewed user change requests to identify operational requirements users expected the modified software to satisfy. To ascertain if each test measured what was intended, we examined the test plans to identify the acceptance criteria that were to be met before the software was used and compared the criteria to the operational requirements to determine if they were consistent. We reviewed test documentation to determine if the tests were successfully completed, and we analyzed the test results to determine the extent to which acceptance criteria were met and operational requirements were satisfied.

We evaluated the effectiveness of the controls IRS uses to insure that errors identified during testing are corrected before the software is placed in service. We determined if action was taken based on the findings contained in problem reports prepared by IRS' test teams. We also examined the computer programs service centers will use to process an individual's tax information during the 1988 processing season to determine the extent to which the programs had been changed and whether the changes had been made in accordance with IRS' computer programming guidelines.

To determine whether IRS mainframe computers would have sufficient capacity to process the 1988 tax processing work load, we interviewed IRS' Assistant Commissioner and Deputy Assistant Commissioner for Computer Services; the Director of the Tax Processing Systems Division, who also acts as chairman of a task force reviewing the current system capacity; and officials from the Office of Computer Services, Capacity Management Branch. We reviewed available IRS documentation on current computer capacity and the status of IRS' computer capacity improvement initiatives.

We obtained IRS computer performance data on operations at the Austin, Fresno, and Ogden service centers. These data were analyzed to develop an accurate assessment of mainframe computer utilization and available

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computer capacity at these service centers between January and June 1987. Data were obtained from these service centers because they are large and typically the first to experience computer capacity problems. Using statistical analysis techniques to analyze the data, we projected IRS' available computer capacity for 1988. We analyzed IRS mainframe utilization during both weekend update and daily on-line processing between January and June 1987. The results were then used as a baseline for projecting IRS' computer utilization in 1988.

To determine whether IRS could rely on its old data communications processors for the 1988 tax processing season, we interviewed IRS officials responsible for monitoring the old processors' performance. We also interviewed the vendor who manufactured and maintains the old processors. To determine how well the old processors were performing, we analyzed relevant performance data for 1987.

To find out how reliable the old processors were during 1987, we analyzed processor use for each of IRS' 10 service centers. Using IRS compiled data, we calculated the average weekly hours scheduled and the average weekly downtime. We then computed processor availability for each service center as a percentage of scheduled hours.

To determine whether the old processors had sufficient capacity for the 1988 tax processing season, we analyzed IRS-compiled data for 1987 on monthly average transactions per second during service centers' peak processing hours. We also interviewed IRS officials responsible for monitoring processor capacity to determine the capacity limit of the old processors and what actions can be taken by IRS to relieve congestion if the limit is reached.

IRS officials were given an opportunity to review our methodology, analysis, and results. They agreed that our methodology was sound and that our results were valid. We coordinated our work with IRS' Internal Audit Division. Our work was done in accordance with generally accepted government auditing standards. The contents of this report were discussed with the Assistant Commissioner for Computer Services, who agreed with the report's contents. He provided some additional technical information, which has been incorporated where appropriate.

Objectives, Scope, and Methodology

At the request of the Joint Committee on Taxation and as agreed to in subsequent discussions with the requester's office, we examined and evaluated the ability of IRS' computers to handle the 1988 filing season work load. As agreed, our objectives were to determine whether

- software, including software affected by the Tax Reform Act of 1986, was ready for use by February 1, 1988;
- IRS' mainframe computers would have sufficient capacity to process the 1988 tax processing work load; and
- IRS could rely upon its old communications processors to achieve its real-time availability goal of 95 percent during the 1988 tax processing season.

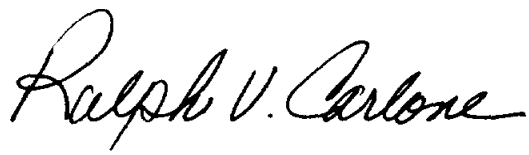
We carried out our field work from September 1987 through January 1988, at IRS' national headquarters in Washington, D.C.; National Computer Center at Martinsburg, West Virginia; and service centers in Austin, Texas; Cincinnati, Ohio; and Fresno, California. We selected the Austin and Cincinnati service centers because they were the locations at which IRS conducted tests on the software that all 10 IRS service centers will be using to process tax returns during the 1988 tax processing season. We selected the Fresno center because it was the only center in which the new communications processors were operational as of January 1988.

To determine the extent to which software affected by tax reform was ready for use by February 1, 1988, we reviewed the process IRS used to modify and test tax reform-related software changes. We analyzed Tax Reform System Change Reports, prepared weekly by the Office of Computer Services, to identify the number of tax reform-related software changes requested by users and the status of the changes. We interviewed responsible IRS national office officials to determine the effect change requests that had not been completed by February 1, 1988, could have on the 1988 processing season. To determine whether software was ready for use by February 1, 1988, we examined the approach IRS used for detecting and reporting problems with software before placing it into service. We also determined the effectiveness of IRS' process for correcting software problems found during testing.

We also evaluated IRS' test plan and procedures, as they related to the 17 tax reform-related changes IRS identified as significant (affecting 1 million or more tax returns). For each of the 17, we reviewed IRS' test plan to ascertain if the plan was consistent with the requirements contained

We are sending copies of this report to the Secretary of the Treasury; the Commissioner, IRS; the Director, Office of Management and Budget; interested congressional committees; and other interested parties on request.

Sincerely,



Ralph V. Carlone
Director

Old Processors Were Reliable During 1987

The communications processors are the computers through which IRS employees, using computer terminals, access information on large mainframe computers to correct errors in tax returns and answer taxpayers' inquiries. The old processors have experienced periods of downtime, and are operating at or near capacity. To correct this situation, IRS awarded a $150 million contract in February 1986 to have these processors replaced with processors that are more reliable and have greater capacity. The new processors—referred to as the Communications Replacement System[1] —are installed in the Fresno Service Center and are undergoing final acceptance testing in a production environment. Our on-site observations in January 1988 indicated that the system was working well, encountering only a few problems that have since been corrected. The new system is also being installed at the Austin Service Center and is to be completed by March 1988. Installation in all service centers is to be completed by January 1989.

Because the new system is not yet available at all service centers, IRS will have to continue using the old communications processors to carry it through the 1988 processing year. Our analysis of their performance during 1987 indicated that the old processors should be able to perform satisfactorily. Even though the processors experienced short periods of downtime in 1987, we found that these instances did not significantly affect IRS operations.

To determine how well the old processors supported IRS operations during the 1987 filing season, we compared the number of hours scheduled for the processors by each service center with the number of hours the processors were available to users. Overall reliability of the old processors averaged 99.3 percent during 1987. This level of performance exceeded IRS' 95 percent performance standard for the old communications system.

The old processors proved to be reliable during 1987 for two reasons. First, both IRS and the vendor responsible for maintaining the old processors emphasized maintenance. Second, at service centers where old processors approached their capacity limit during peak processing periods, the centers either rescheduled work or spread the work load over additional hours so that the processors could handle the volume of transactions.

[1] We have reported twice on IRS' progress in installing the Communications Replacement System: Data Communications: Thorough Testing and Workload Analysis Needed for IRS' Processors (GAO/IMTEC-87-3BR, Oct. 14, 1986), and Data Communications: Delays Hampering Installation of IRS' Communications Replacement System (GAO/IMTEC-88-1, Oct. 8, 1987)

work load does not increase by more than 10 percent over last year's work load. IRS does not expect the mix or level of the work load to significantly change as a result of tax reform, based on projections made by its Research Division in late 1987. Also, a 10 percent increase in work load looks realistic, based on last year's growth of about 6 percent.

To determine whether IRS mainframe computers would have sufficient capacity to process the 1988 tax season work load, we analyzed IRS national office computer utilization data for the Austin, Fresno, and Ogden service centers. These centers were selected because they are large and typically the first to experience computer capacity problems. We analyzed mainframe utilization during both weekend update and daily on-line processing between January and June 1987. The results were then used as a baseline for projecting IRS' computer utilization in 1988.

Weekend Update Processing

The three service centers reviewed should have sufficient mainframe capacity to process their weekend work load during the 1988 filing season. To determine whether IRS would have sufficient mainframe capacity for weekend processing during the 1988 filing season, we analyzed computer utilization between January and June 1987 using a mathematical model we developed for representing computer utilization during peak hours of weekend processing.

In making our analysis, we used three IRS assumptions: (1) each service center would continue to allocate 52 hours for weekend processing, (2) a portion of the weekend work load that is not part of weekend update processing and that is now processed along with the updates would be shifted to less busy periods or other computer systems as the weekend update work load increases, and (3) the weekend work load would increase by 10 percent over last year's work load.

Our analysis shows that the Fresno, Austin, and Ogden service centers will use approximately 93, 87, and 75 percent of the total time available, respectively, during peak processing on the weekends in 1988. At these rates, mainframe capacity should be sufficient.

Daily On-Line Processing

IRS' daily on-line work load is generated by IRS employees who access the mainframe computers through computer terminals. Our analysis of daily

As of February 1, 1988, IRS' Office of Computer Services had completed software modifications needed to implement 118 of the requested changes. Of the remaining 11 change requests, 4 were under review by the Office to determine whether software modifications were warranted, and 7 were being completed. IRS expects to have six of the seven changes completed by July 5 and the seventh change completed by December 1988.

We spoke with responsible national office officials for the divisions whose 11 change requests had not yet been completed to ascertain what effect the delay would have on their operations. The officials stated that they had agreed to later completion dates, and that the delays should not adversely affect taxpayers or IRS operations. For example, the Tax Reform Act revised the rules relating to alimony payments. Software needed to accommodate this change has yet to be written. This delay should not affect taxpayers, according to responsible IRS officials, because the change is designed to compare, over a 3-year period, alimony payments that were reported with the payments allowed to be claimed under tax reform. In other words, the software will not be needed until the 1990 filing season.

Software Testing Complete

Testing is crucial to ensure that software meets users' needs, functions correctly, and identifies and corrects errors before an agency's operations are adversely affected. Between August 1987 and January 1988, IRS conducted tests to determine if the software needed for processing 1988 tax returns was ready for use. We found that the tests IRS conducted were adequate and that the software, including software affected by tax reform, was generally ready for use by February 1, 1988, the start of IRS' peak processing period.

IRS teams, comprised of individuals from IRS' Compliance Systems Testing Branch and from the service centers, developed tests based on the changes users requested and the programming specifications IRS programmers followed in making changes. To determine the reasonableness of the tests IRS conducted on 57 major tax reform-related software changes, we analyzed 17 changes that IRS estimated will affect 1 million or more tax returns filed in 1988. For example, one of the Tax Reform Act changes imposes a limitation on the amount of personal interest that can be claimed as a deduction. IRS conducted tests to determine whether the software would process only amounts meeting the limitation.