

June 28, 1999

WILLIAM J. DOWLING  
VICE PRESIDENT, ENGINEERING

Subject: Tray Management System Software Management  
(DA-MA-99-002)

As part of an ongoing audit of the Tray Management System, the Office of Inspector General (OIG) observed Year 2000 (Y2K) compliance testing for the three Tray Management System contractors. During the tests for the Tray Management System, we identified concerns with the tracking of operating software versions for the Tray Management System contractors. This Management Advisory Report details the results of our review of these issues.

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**Observations**

The Tray Management System contractors have not satisfied all contractual requirements. Specifically:

- only one of the three contractors delivered a software configuration management plan; and
- the only contractor currently required to provide an object code comparison program did not supply the deliverable by the date specified in the contract.

Initial Y2K testing has been completed for two of the three contractors. All three contractors are scheduled for Y2K post implementation verification by August 1, 1999.

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**Objectives, Scope and Methodology**

The overall objectives of our ongoing audit are to evaluate whether the Tray Management System project is meeting performance and cost goals. As part of this audit, we reviewed Tray Management System Y2K testing.

To assess the concerns detailed in this Management Advisory, we interviewed USPS officials and reviewed the contractual statement of work. In addition, we observed Y2K

compliance testing at the Seattle Processing and Distribution Center and at two contractor testing sites.

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**Background**

The Tray Management System automates the movement and staging of mail between most mail sorting operations in a processing plant. System components include conveying equipment, staging devices and interfaces to operations and controls for moving trays of mail within the United States Postal Service (USPS) Processing and Distribution Centers.

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**Configuration Management**

The Statement of Work for Phase III, initial Tray Management System deployment, requires contractors to provide a software configuration management plan one month after contract award. All Phase III contracts were awarded as of January 3, 1997.<sup>1</sup> As of March 22, 1999, only one of the three contractors has delivered a software configuration management plan.

The statement of work specifies that documented software configuration procedures should help ensure the integrity of software during the project lifecycle. The software configuration management plan details processes and procedures to manage and control software as it is developed, released, tested and updated.

During Y2K testing, we observed incidents that highlighted a lack of attention to configuration management. Specifically:

- Software tested by a contractor was not the same version that was sent to a Y2K contractor for code scanning;
- Software tested by a contractor was not the same as the version operating at deployed sites;
- Software was changed during the Y2K test by a contractor without adhering to any standardized change control procedures; and
- Accurate documentation was lacking to show the software versions operating at each Tray Management System site.

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<sup>1</sup> The contract award dates for Phase III ranged from August 26, 1996 to January 3, 1997.

As a result of the absence of an effective software configuration management plan, we believe there is reduced assurance that the operating software will remain Y2K compliant.

USPS officials and the Y2K contractor agreed there was confusion in identifying software versions during Y2K testing. The problems with identifying software versions included the contractor who submitted a software configuration management plan. These incidents showed that development of a configuration management plan is not enough to provide effective software management. For the software configuration management plan to be fully effective, we believe contractors must adhere to the plan and provide all software changes to the USPS.

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**Object Code Comparison**

The Statement of Work for Phase III requires the contractors to provide an object code comparison program 30 days after satisfactory completion of the first article test.<sup>2</sup> The object code comparison program is designed to compare the software for each operating Tray Management System site to the latest approved software release. The object code comparison program should identify any unique software versions operating at Tray Management System sites.

Currently, two of the three contractors have operating Phase III sites that require first article testing. We found that the status of the deliverable varied among vendors, as highlighted below:

- One contractor successfully completed first article testing on September 23, 1998. As of March 22, 1999, this contractor had not supplied the USPS with the required object code comparison program.
- A second contractor turned over operation and maintenance of its first production site to the USPS approximately 18 months ago. However, completion of

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<sup>2</sup> According to USPS officials, first article testing is considered the acceptance test performed for the first production site.

upgrades to make the site fully operational, including the installation and integration of additional staging capacity, has pushed first article testing to June 1999. Accordingly, the requirement for delivery of the object code comparison program has been delayed.

- The third contractor is scheduled for first article testing at its initial production site during June 1999. Therefore, the object code comparison program is not yet due from this contractor.

Without the object code comparison program, we believe the USPS has no tangible assurance that site software corresponds to the approved current release. As a result, during Y2K testing, the USPS and the Y2K contractor often relied on verbal assurance from the contractors that software versions tested were identical to deployed versions. In one instance, the contractor provided a written handout listing the software version currently operating at a Tray Management System site. However, we found the version number provided to us by the contractor was not the version actually operating at the Processing and Distribution Center.

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**Issue Affecting  
Software Contract  
Deliverables**

USPS officials were aware of issues concerning software contractual requirements for the three Tray Management System contractors. One official stated that staffing resources along with other high priority work has impacted USPS efforts in enforcing delivery of software requirements.

Our observations indicate the current staffing level may not provide adequate resources to successfully manage all Tray Management System software issues. These issues include aspects of system installation and integration along with other items such as configuration management and acceptance testing. In addition, we believe the staffing issue could become more significant as additional Tray Management Systems become operational.

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**Suggestions**

The Vice President, Engineering, should:

- 1) Direct USPS program officials to work with Tray Management System contractors to ensure timely delivery and adherence to both a software configuration management plan and an object code comparison program.
- 2) Instruct the program manager to review the resources dedicated to software issues for the Tray Management System and obtain additional staffing as needed to ensure the interests of the USPS are being met satisfactorily. In the event that hiring additional personnel is not feasible, we would suggest exploring the option of detailing or reassigning sufficiently skilled employees.
- 3) Instruct USPS Engineering software officials to develop procedures to track software versions, ensure software deliverables such as the configuration management plan and object code comparison are updated by the contractors, and ensure all software changes are documented and approved by the USPS.
- 4) Direct USPS Engineering software officials to verify that deployed software is identical to software tested and certified as Y2K compliant at each facility utilizing a Tray Management System.

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**Management Comments**

The full text of management comments is in Appendix A. Management agreed that the software issues highlighted in this report have been a cause for concern and could become even more serious within the context of Y2K issues.

Management has taken the following actions to address concerns with software configuration management as related to the Tray Management System program:

- Tray Management System software personnel have begun working with the Engineering Software Management group to ensure timely delivery and adherence to a software configuration management plan and an object code comparison program.
- The Tray Management System manager has been instructed to review the resources dedicated to software issues and determine if additional staffing is required, and how any additional staffing might be best obtained.
- USPS Engineering software personnel have begun to work with the Engineering Software Management group to track software versions and ensure all software changes are documented for the Tray Management System program.
- Upon completion of the Software Configuration Management plans, Tray Management System software personnel will be tasked with verifying that deployed software is identical to software tested and certified as Y2K compliant at each facility utilizing a Tray Management System.

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**Evaluation of  
Management  
Comments**

We believe management's comments are responsive to the software issues raised in the report. The actions being taken by management should strengthen overall software management for the Tray Management System Program.

We appreciate the cooperation and courtesies provided by your staff during this review. If you have any questions, please contact [REDACTED], Director, Developmental Audits at [REDACTED], or me at (703) 248-2300

*//Signed//*

Colleen McAntee  
Assistant Inspector General  
for Performance

Attachment

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**Major Contributors  
to This Report:**

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WILLIAM J. DOWLING  
VICE PRESIDENT  
ENGINEERING



June 4, 1999

COLLEEN MCANTEE  
ASSISTANT INSPECTOR GENERAL  
FOR PERFORMANCE

SUBJECT: Tray Management System Software Management (DA-MA-99-XXX)

The issues highlighted in your report on the Tray Management System (TMS) Software Management have been a cause for concern prior to receipt of the advisory report. However, within the context of the Year-2000 (Y2K) testing that was performed during your observations, the issues you note have potentially more serious consequences.

#### ***Observations***

Engineering is in concurrence with your observations during the Y2K testing that only one of three contractors delivered a software configuration management plan. Subsequent to your observations, the two TMS vendors have delivered Software Configuration Management (SCM) plans. The two outstanding deliverables by Siemens and Accu-Sort were delivered in late March and early April, respectively. These plans are currently in review by TMS Office software personnel and Engineering Software Management personnel specially trained in SCM. We anticipate completing the review by June 15, 1999.

The only contractor currently required to provide an object code comparison program did not supply the deliverable by the date specified in the contract. The TMS Phase 3 Statement of Work requires the TMS vendors to submit this deliverable concurrent with the production machine source code (30 days after successful completion of the first article test). In order to protect the significant investments in the design, development, and implementation of the TMS system software, the USPS contracting officials allowed two TMS vendors to amortize the cost of this investment over several TMS installations. This had the positive effect of allowing the USPS to avoid an abnormally high cost for the initial TMS by normalizing the non-recurring engineering cost of the initial development. Unfortunately, it produced the adverse impact of delaying the delivery of the production machine source code and may have incorrectly led the vendors to, accordingly, delay the object code comparison program.

#### ***Configuration Management***

The reported incidents, that highlight lack of attention to software configuration management, focus on the control of software versions during the update process. The statement of work requirements dictate that all production sites shall have the same software version unless otherwise approved by the USPS contracting officer. During this stage of the TMS program, with enhancements and deployments of software at TMS sites on an ongoing basis, any given site may differ in software versions until the upgrades are completed at all of the sites. The TMS vendors have the latest versions of all software modules installed at their in-house facilities while this effort is ongoing.

In the cases where the software tested by a contractor was not the same version that was sent to a Y2K contractor for code scanning or not the same as the version operating at deployed sites, the goal is to ensure that the source code sent for scanning and subjected to testing is installed at



all existing sites for that vendor. At a minimum, any differences between code sent for scanning and installed software shall be reviewed and analyzed to ensure that no Y2K sensitive date handling routines were overlooked in the process.

The USPS has admonished the contractor responsible for changing software during the Y2K test. This action violates generally accepted configuration control principles. The contractor's management has been contacted regarding the incident, advised of the serious nature, and requested to ensure no repeat of the incident will occur. The contractor's management has responded that the individual has been advised. Strict adherence to a USPS approved SCM plan will aid in avoiding future incidents of this nature.

Documentation showing the software versions at operating sites was provided during the Y2K testing of TMS. The accuracy of the documentation is being reviewed, with contractor assistance, to ensure it reflects the true status of the operating system software at each TMS site.

#### ***Object Code Comparison Program***

The TMS Phase III Statement of Work requires the delivery of the object code comparison program 30 days after the successful completion of the first article test. This deliverable has not been submitted to the USPS by any of the three TMS vendors. As noted in the advisory report, one TMS vendor has successfully completed the first article test and, therefore, is required to provide the deliverable as contractually required. The TMS Office is in process of generating a formal request for the signature of the contracting officer to ensure delivery in timely manner.

In order to provide tangible assurance that software versions at existing operating sites correspond to the approved current release for that site, the USPS will be requesting accelerated delivery of the object code comparison program from the remaining two vendors.

#### ***Suggestions***

The following actions have been taken, to date, to address the concerns with software configuration management on the TMS program.

- 1) TMS software personnel have been directed to ensure timely delivery and adherence to a software configuration management plan and an object code comparison program. The TMS Office will interface and cooperate with the Engineering Software Management group to benefit from the skilled expertise in SCM that exists in that group. This cooperation and request for assistance in SCM implementation has already been underway for several months.
- 2) The TMS manager has been instructed to review the resources dedicated to software issues and determine if additional staffing is required. However, due to the current budgetary climate within the USPS, if resources are required, it may not be feasible to hire additional personnel with specific software expertise. The option of reassigning skilled employees from other groups within Engineering will be investigated. The workload status and availability of sufficiently skilled employees from other groups will determine the feasibility of this alternative.
- 3) USPS Engineering software personnel have already been tasked with development of procedures to track software versions and ensure all software changes are documented and approved by the USPS. This effort has been ongoing within the Engineering Software Management group. However, until recently, the effort has not yet included the TMS program. As noted above, the TMS Manager has been instructed to coordinate with the Engineering Software Management (ESM) group to ensure that TMS SCM related issues are being addressed in a timely manner with the appropriate expertise. TMS personnel are

working with the ESM group to ensure all SCM issues—version control, build processes, and software release management—are being handled.

- 4) Upon completion of review of the Software Configuration Management plans, TMS software personnel shall verify that deployed software is identical to software tested and certified as Y2K compliant at each facility utilizing a Tray Management System.



William J. Dowling