

DEPARTMENT OF THE STATE TREASURER

The mission of the Department of the State Treasurer is to:

- Serve as the State's banker and chief investment officer
- Assist units of local government in the State to maintain strong fiscal health
- Administer the public employee retirement systems and other employee benefit plans for State employees that are assigned to the Department
- Administer the escheat and abandoned property program

The Information Resource Management (IRM) group is responsible for supporting all information technology initiatives in the department. The goal and objective of the Information Resource Management group is to:

- Develop, implement, and support quality automated systems to meet the programmatic requirements of the Treasurer
- Ensure that information resources are utilized in the most efficient and cost-effective manner

The Department of the State Treasurer has its own mainframe computer where it processes the majority of the application systems supporting its programs. The State Treasurer recently upgraded the mainframe computer to an ES/9000-135, which also included upgrading all the operating and system support software. This is considered to be a small mainframe computer. The State Treasurer's computer is connected to the SIPS mainframe via the State Telecommunication Network, which facilitates the State Treasurer sharing information with other agencies through the SIPS computer.

Most of the State Treasurer's application system efforts are maintenance work on the current production system. Many of these systems are very old, but have had much of the code rewritten over the years. The only new project efforts under way are:

- **Imaging, records management** - Currently records are handled by fiche. Two million records are maintained today with half to three-quarters of a million records processed yearly.
- **Voice response** - State Treasurer is in the very early stages of investigating the use of voice response.

The State Treasurer has the smallest data processing organization with its own mainframe computer in North Carolina State government.

The major findings and recommendations concerning information technology and telecommunications within the Department of the State Treasurer follow.

Finding 97 - State Treasurer does not follow a formal life cycle management approach in the development of its application systems.

No life cycle management methodology is followed in the development and maintenance of the State Treasurer's applications. A very high level LCM plan was found in the review of the department's documentation, but according to the IRM staff, it is not followed.

Recommendation - Adopt and follow a life cycle management methodology.

State Treasurer should adopt a standard LCM methodology, and should give serious consideration to Andersen's Method/1 and FOUNDATION CASE tools that contain all the necessary components. Most of the large State agencies, including SIPS, have decided to standardize on this methodology and set of CASE tools. Further State standardization on a single LCM methodology and set of CASE tools will facilitate sharing resources and hiring staff for data systems positions within the State.

Because the system development projects at State Treasurer tend to be small, the LCM methodology chosen should include guidance on how to apply the methodology to small development projects and maintenance efforts.

Finding 98 - There is no single individual responsible for the application system development group nor for the computer operators.

The current IRM organization chart is dated January 1990 and has a number of weaknesses associated with it:

- No manager is in charge of the application systems' staff. All eight of the application programmers report directly to the director of the IRM group. Although the most senior analyst in the application development area informally acts as the leader of the group, he has no formal responsibility or authority.
- There is no single individual responsible for the computer operators, although other units in computer operations do have lead personnel.

Recommendation - Individuals should be appointed to manage application systems and the computer operators.

The senior application analyst should be formally placed in charge of the application system group, and the senior operator should be placed in charge of computer operations.

The programmer/analysts should be organized into teams, each headed by a working team leader, and all reporting to the new Manager of Application Systems.

Computer operators should also be reorganized into an operations unit to be headed by a senior operator reporting to the current Computer Operations Manager.

Finding 99 - State Treasurer does not have a rigorous quality assurance process in place.

There are only eight programmer/analysts in the application programming area of the Department of State Treasurer. As such, they do not have an independent quality assurance function and the internal development process is informal.

Programmers work closely with the users during testing, but most testing is done by the programmer who performed the system modifications. State Treasurer does not use formal structured walk-throughs, but claims to having informal reviews among programmers.

Recommendation - Develop a formal quality assurance process.

The State Treasurer application system group is too small to have an independent quality assurance function. However, it can implement more formal quality assurance and control functions within its development group.

State Treasurer should implement a set of standards against which to design and develop systems and programs. To ensure that these standards are adhered to, State Treasurer should implement a formal structured walk-through process for both maintenance and new system development efforts. Formal test plans should be developed for all major new system development and maintenance modification efforts. Final testing of all changes to a system should be performed by an independent programmer/analyst.

Finding 100 - State Treasurer's information systems policies, procedures, and standards are significantly out of date.

The performance audit reviewed a number of documents pertaining to IRM policies, procedures, and standards. One binder was called Information Processing Policies and Procedures Manual. Its latest dated entry was November 1985 and most items were dated January 1985. This was obviously the old SIPS Policies, Procedures, and Guidelines document. It also contained a PC/microcomputer policies and guidelines memo prepared by State Treasurer.

A second binder called Internal Procedures addressed the following topics:

- **Organization chart** - The charts provided were significantly out of date

- **General Programming Standards** - These addressed primarily very general standards (e.g., access to public libraries)
- **Management of Information Systems** - This document is a Life Cycle Management approach
- **Documentation Standards** - This volume addressed the procedures and forms for the following:

Job requests

Systems documentation - referring to the project management procedures

Problem records

Analyst/programmer time accounting

File maintenance

- **Hardware/Software** - addressed an IBM 4331 that had been State Treasurer's old machine
- **Application Schedule** - contains the production cycles for the major systems
- **Security**
- **Disaster Recovery Plan**, dated March 1984 - obviously out of date and appears not to have been updated since 1984

A standards document provided was the same as the above Internal Procedures Document with a few minor exceptions.

Recommendation - Initiate the development of current IRM policies, procedures, and standards.

This task is essential. The documentation found in State Treasurer is old, is not being followed, and is not in a form that is usable or conducive to managing a data processing operation.

Finding 101 - Access to the State Treasurer's computer center is not adequately restricted.

The data center is not set up as a closed shop. This means that anyone in information systems has the ability to enter the computer room. This constitutes an unnecessary

security exposure. There is no reason for application programmers and data entry personnel, for example, to enter a well planned and constructed computer room.

Recommendation - Institute a closed-shop policy for the computer room.

The data center should be operated as a closed shop. This means that only the computer operators and the data center manager should be allowed normal access to the data center. Programmers, the tape librarian, end users, and data entry clerks should not be allowed access to the computer room unless allowed in by the operations staff. Access to the computer room should be restricted to only those activities that must be performed in the computer room. Computer output should be immediately removed from the computer room and reviewed in the office environment.

Finding 102 - State Treasurer does not have well-documented operational procedures and run books.

State Treasurer has no run books to provide the computer operators with instructions on how to process the job streams and which programmer to call to solve problems when they occur. No check point restarts are used.

Recommendation - Formalize production operations documentation.

State Treasurer should take action to formalize the production run process by preparing run books for all production jobs and documenting the process for running and recovering from most abnormal job terminations. State Treasurer should also investigate the use of check point restart procedures for production runs that consist of a large number of job steps.

Finding 103 - State Treasurer delays moving its back-up tapes off site.

Back-up is performed every Friday, but that tape is not sent off-site until the following Thursday--for almost a week the tape stays in the tape library at the computer center. Although this provides a convenient way of recovering from data integrity errors and minor disasters, it places the site in jeopardy in the case of a major disaster. In a major disaster the back-up tapes maintained at the data center could also be destroyed. If this were to occur, State Treasurer's latest back-up tape at the archives could be up to two weeks old.

Three generations of back-up are maintained at the archive location and the courier brings back the oldest set of tapes.

Recommendation - Move back-up tapes to off-site storage immediately.

State Treasurer should move the back-up tapes off site immediately after their creation. If State Treasurer feels it still requires back-up files at the data center, then a second set of back-up tapes should be generated for that purpose.

Finding 104 - State Treasurer has an inadequate disaster recovery plan.

The State Treasurer disaster recovery plan is outdated and does not reflect the current computer configuration. Furthermore, it does not identify a hot back-up site or detail procedures for recovering from disaster. State Treasurer indicated that the disaster recovery plan was going to be updated starting in May.

Recommendation - Develop an operational disaster recovery plan.

State Treasurer should update its Disaster Recovery Plan to reflect the current system configuration. It should also investigate the possibility of joining SIPS in the use of the IBM hot site facility in Tampa, Florida.

Finding 105 - State Treasurer manually manages its tape library.

The tape librarian uses a manual tape retention system to manage some 2,225 tapes. She recently obtained a PC and hopes to use it to manage the tapes.

Recommendation - Utilize an automated tape management system.

The retention and rotation of a library of over 2,000 tapes should be managed by an automated tape management system. State Treasurer should investigate the availability of automated tape management systems to manage the tape retention process.

Finding 106 - Many of the tapes in the State Treasurer's library are over 10 years old.

The librarian stated that most of the tapes in the State Treasurer's inventory went into production before 1981, over 10 years ago. She estimates that some 65 percent of the tapes in the library are this old.

State Treasurer has not been performing regular tape cleaning, and only recently borrowed an old tape cleaning device from SIPS.

There is a high risk that such old, unmaintained tapes may be successfully written, but may fail when the computer attempts to read them. According to the librarian, the operators have started to complain about the frequency of such tape errors.

Recommendation - Institute a tape maintenance and upgrade program.

State Treasurer should immediately initiate a program to retire the old tapes and replace them with new tapes. In addition, State Treasurer should permanently acquire the equipment to clean and test tapes and institute a regular program of maintaining its tapes.

Finding 107 - State Treasurer does not have a formalized Help Desk.

There is no formal Help Desk at the State Treasurer's data center. The division secretary has been taking all calls since April of this year and routes them to the appropriate individual.

There is also no automated problem tracking and reporting system, nor change management system within State Treasurer.

Recommendation - Formalize the Help Desk and problem reporting procedures.

State Treasurer should formalize the Help Desk function, staffing it with an IRM professional who can directly resolve a substantial portion of reported problems. The current situation of all calls being routed to individuals working on other assigned tasks magnifies the potential effect on productivity. If the Help Desk workload does not warrant its own position, the role should still be defined and should be supported by rotational assignments among current staff.

State Treasurer should also acquire and implement an automated problem tracking and reporting system. The Help Desk staff should act as dispatcher, receiving all help and problem related user calls and logging them into an automated problem tracking system. The Help Desk should then resolve the problem or route it to the appropriate individual in the telecommunication, operations, security, or application area.

The tracking system should be capable of recording such information as who initiated the call, when the call was received, type of problem encountered, who the problem was referred to for resolution, resolution arrived at, and the date the problem was closed.

Finding 108 - There is no formal sign-off procedure for turning processed checks over to accounting.

The check processing procedure at State Treasurer requires that the data processing group sign for the blank pre-numbered checks as they are turned over by the users. However, there is no comparable procedure when data processing returns the signed checks back to the users.

Recommendation - Implement controls over IRM group's disposition of signed checks.

State Treasurer should implement a procedure for the IRM group to sign over the processed/signed checks to the users, to include recording the check numbers and the signature of the user obtaining the processed checks. This will ensure the proper transfer of control from the data processing operation to the accounting office.

Finding 109 - The computer equipment at State Treasurer is not adequately protected against power surges and outages.

State Treasurer does not have an UPS system, but it does have a back-up generator. This means that if there is a power failure, the system will immediately go down, losing all processing on the system at the time of the failure. It will then take the IRM group some time to start the generator, restart the system, and recover from the failure.

An UPS system would immediately kick in if a power failure occurs, providing time for the back-up generator to start up and take over the power generation needed to keep the computer running without interruption. Having a back-up generator for the data center without also having an UPS serves no useful purpose.

Furthermore, there is no surge protection on the system since there is no UPS system. The UPS will typically protect the computer from voltage surges that could damage the hardware.

Recently a transformer on the power grid serving the State Treasurer's data center was hit by a vehicle. This caused interruptions to the area's power supply. Shortly after this incident, the State Treasurer started to experience multiple hardware component problems; the situation lasted for weeks. Ultimately IBM had to replace the power boards in nearly all hardware devices. Apparently the transformer failure created a surge that damaged the power boards in the computer. IBM's repair costs were over \$40,000. Though the equipment is under maintenance contract and this cost was not passed on to the State, the problems did significantly interrupt the processing of State Treasurer applications and absorbed hours of State Treasurer data processing personnel time. This problem would probably not have occurred had an UPS been attached to the computer. All other computers on the same grid (e.g., the General Assembly computer) have UPS systems and reported no problems.

Recommendation - State Treasurer should protect its data center equipment against power surges and outages.

State Treasurer should immediately procure an UPS system to protect its computer system.

Finding 110 - State Treasurer does not have a software library management package on its computer system.

There is no automated source code library management software package on the State Treasurer system. Furthermore, the programmers have only a production library to work with; there is no test library.

Recommendation - Acquire and implement a software library management product.

State Treasurer should immediately implement the concept of test and production libraries, with appropriate controls over access to the production libraries. State Treasurer should also procure a software library management package to help manage its test and production libraries.

DEPARTMENT OF STATE TRANSPORTATION

The mission of the Department of State Transportation (DOT) is to serve the public by providing a statewide transportation system for the convenient, economical, and safe movement of people and goods, and by regulating that system in accordance with the law. In order to manage the vast transportation system and provide better service to the public, while at the same time accounting to the public for associated expenditures, the department recognizes the need to develop, install, and maintain comprehensive information systems for most of its operations.

The Management Information Systems (MIS) Division is responsible for planning, developing and managing the information resources of the department. DOT uses the mainframe computer at SIPS as its primary processor. DOT also has an AS/400 at the Department of Motor Vehicle Headquarters.

The DOT portfolio of current major applications systems includes:

- Financial systems - over 2,000 programs
- Payroll/personnel systems - over 400 programs
- Department of Motor Vehicles (DMV) systems - over 2,000 programs
- Department of Highways (DOH) systems - over 2,000 programs

There is a total of over 100 systems with approximately 7,000 programs. The current portfolio of application systems is characterized as follows:

- Most systems are between 20 and 30 years old
- Most programs are written in Assembler Language Code (ALC) and macro level CICS
- Data files are packed, variable length records with imbedded bit strings manipulated by the programs
- Very few programmers and analysts remain at DOT who understand how the old systems were designed and how they perform their functions
- Production job streams require very intensive operator intervention
- Documentation is old and outdated

In summary, the present systems are antiquated and in need of significant improvement. They are difficult and costly to maintain and modify. To rectify the current system

deficiencies, the department has initiated a major modernization effort that involves a number of application system initiatives.

The major application system initiatives being undertaken by the MIS division include:

- **DOT Accounting System** (Priority 1 for replacement)

The current Accounting System is over 20 years old. Like most systems within DOT, it is programmed in ALC and macro level CICS, and it uses packed variable length records with bit level manipulation.

DOT investigated the D&B Accounting System that the State Controller had selected as the State Accounting system and found that for the core accounting functions (chart of accounts, general ledger, etc.) that the package was a fairly good fit. However, it only satisfied approximately 20 percent of the department's needs. DOT decided to implement its own version of the D&B Accounting System under DB/2, with heavy modification of the software to satisfy the department's unique needs. The basic software package has been installed. The first objective under this modernization effort is to implement the G/L and new chart of accounts using the Controller's G/L as a model.

- **Drivers' License System** (Priority 2)

The current Drivers' License System has the same obsolete technical characteristics as the DOT Accounting System. However, MIS does not have the same strong knowledge of the system's business functions and code as it does with the Accounting System. There are approximately 500 programs in the current system supporting 170 offices and 6 million records. The design of the new system, using Method/1, is planned to be completed in July of this year. Based on the availability of funds, MIS will release an RFP for development of the new system.

- **Image Processing of Drivers' Licenses** (Priority 3)

This is a new system that will digitize the driver's image or photo for storage and future use by law enforcement, and potentially for license renewals by mail. It is primarily a hardware project to acquire the image processing work station equipment that will be linked to the AS/400 at DMV headquarters.

- **Highway Safety Management System** (Priority 4)

This is a new system development effort that is to take accident statistics and compare and correlate them against the conditions of the roads where these accidents occurred.

■ **Registration System (Priority 5)**

The current system has the same generally obsolete characteristics as the Drivers' License System, but this system is much larger. It is comprised of some 750 programs that support 10 million records and 200 offices. MIS has almost no knowledge of how this system functions from either a business or technical perspective.

■ **Management Support System (Executive Information System) (Priority 6)**

This system has been designed by a contractor and is awaiting funding for implementation.

The above modernization efforts would replace all the old systems. MIS estimates that it could take 8 to 10 years and cost as much as \$100 million. MIS plans to use a combination of contractor and in-house staff at an initial ratio of 60 percent to 40 percent.

The major findings and recommendations concerning information technology and telecommunications within DOT follow.

Finding 111 - DOT historically has not allocated sufficient funds to maintain and modernize its aging and inefficient systems.

DOT's application systems are at such a state that the mission of the department is at risk. The data processing operation is extremely inefficient, and few people are available who understand how to make changes to the systems. Because of the programming languages used and the condition of the code, changes to the current system are difficult and time consuming, as well as prone to error. These problems are the result of 20 years of ignoring and neglecting the mission critical application systems of the department.

All funds for DOT operations come from the Highway Fund. DOT has not allocated sufficient amounts of these funds in the past to upgrade its aging systems. Now all systems within DOT need to be replaced over a relatively short time frame, instead of being replaced gradually over a greater number of years.

Recommendation - Allocate sufficient funds to address the critical situation.

The systems problem in DOT will require substantial resources and concerted effort to solve.

DOT should allocate a standard percentage of the Highway Fund each year to the maintenance of its information systems. This should include enough funding to address the modernization of the old obsolete systems. This funding approach will prevent the new systems that are now being developed from becoming obsolete in the future as the old systems have in the past.

Finding 112 - DOT has not developed the level of planning necessary to support its new application systems and modernization efforts.

DOT's Automated Information Systems (AIS) Plan submitted to SIPS last fall/winter was a copy of the previous year's plan submission forms with hand written updates and cross-outs of outdated sections. There was no detailed planning for the major system initiatives outlined in the AIS Plan submission.

MIS has identified more than six major new system initiatives to be addressed over the next several years. It has requested \$10 million in funds this year, but the full modernization of all DOT systems has been estimated to cost as much as \$100 million. Expenditures of that magnitude warrant very thorough plans.

Recommendation - Develop plans commensurate with the size and importance of the new systems.

DOT should develop a comprehensive modernization strategy and detail plans for the development of its next generation of systems. If funding is uncertain, alternative planning scenarios should be prepared based upon the most likely funding, the most pessimistic, and the most optimistic.

New system development efforts of this magnitude that directly impact the mission of the department require significant planning and evaluation of alternative approaches to ensure that the best approach is taken. Each of the modernization efforts identified in the DOT AIS Plan is of sufficient size and importance to warrant a detail plan of its own.

Finding 113 - DOT's modernization plan calls for the development of automated systems that other states are now completing.

DOT indicated that it had contacted several states a couple of years ago to see if they had systems that could be acquired to replace either the Drivers' License or Registration systems. DOT found that most systems in other states at that time were either old or still under development (e.g., Virginia was developing a new Drivers' License system, but was not yet finished). Furthermore, MIS stated that North Carolina's requirements are unique in many ways.

Recommendation - Identify potential drivers' license and registration systems from other states that could replace DOT's old systems.

DOT is under tremendous cost pressure based on the estimated cost to replace these systems. DOT is also under enormous time pressure because of the extremely poor condition of the current systems and the extensive breadth of systems to be replaced.

If a recently developed State Drivers' License or Registration system can be found with a suitable fit to North Carolina's requirements, it is very likely that it could be modified to meet the additional requirements at a fraction of the cost and time it will take to develop a new system from scratch.

DOT should make every effort to find another state's system to use as a baseline upon which to build its own new system. Systems that were under development a few years ago may now be at the point where they can be acquired. Even if not totally completed today, these systems are years ahead of DOT in the life cycle development process and might be worth waiting for.

Finding 114 - DOT lacks the necessary MIS policies, procedures, and standards to support its major new application development efforts.

A year and a half ago, when the new Director of MIS took over, there were no standards, policies, or procedures in the MIS division. Recognizing that this was a problem, MIS purchased an off-the-shelf set of standards from Corporate Enterprise System Consultants.

For the past year, MIS has focused more on its life cycle management methodology (Method/1), CASE tools (FOUNDATION), and hiring new staff than on developing its policies, procedures, and standards. Regarding the latter, MIS has only completed the following:

- Development of a new standards manual outline
- Development of a limited number of new standards (which have not been integrated into the purchased standards and procedures manual):

- DB/2
- LAN
- Request system
- Change control
- CSP
- Training

The development of new standards and procedures is critical since DOT has a number of major system redesign/modernization efforts either in process or planned. It is important to have these new standards in place so that there is a target against which the new systems can be designed and developed. This is especially critical because the largest of these systems is being designed and implemented by contractors, and DOT will pick up responsibility for maintenance of the completed system.

Recommendation - Develop a comprehensive new standards and procedures manual.

Additional resources and priority should be given to this effort to allow this important document to be completed in a timely manner.

If DOT plans on using the purchased policies, procedures, and standards manual as its standard until it has time and resources to develop the new DOT tailored manual, then:

- DOT should remove and update those sections that are superseded by the recently developed standards.
- DOT should review the current manual to ensure that all standards are applicable, and should either flag or remove those sections that are not applicable.

Finding 115 - MIS has not fully implemented its quality assurance function.

MIS has one person assigned to the quality assurance function. The QA function responsibilities include:

- Institutionalization of the FOUNDATION tools
- Reviewing work plans
- Establishing standards
- Customizing methodologies
- Participating in quality reviews

According to MIS management, the QA process has not yet been fully defined. There are no quality reviews being performed today, and there are no standards to serve as a basis for evaluation.

Recommendation - Define and develop the QA function.

It is important to have the QA function in place and fully operational as quickly as possible so that it can participate in the reviews of the new systems being designed and developed today. This is especially critical since a large number of major, critical systems are being designed and implemented over the next several years.

Finding 116 - MIS staff does not have adequate training to support its new system development efforts.

MIS management stated that it is now aggressively implementing Method/1 and FOUNDATION CASE tools as part of its modernization effort. MIS is also implementing a LAN to support software design and development.

All application programmers have had 30 days of training in the CASE tools, and project managers have undergone project management training from North Carolina State University.

However, less than 50 percent of the staff have been trained in structured techniques (i.e., structured analysis, design, and programming), which the CASE tools automate. Also training is required in the standards to be used during the design and development efforts.

Recommendation - Continue training staff in the new development techniques.

All staff who will be using the CASE tools should be trained in standardized structured analysis, design, and programming techniques prior to their attempting to develop their first systems using these tools. This training should also include training in the department's standards that will be used to design and implement the new systems.

Finding 117 - MIS has inadequate change management practices and procedures.

The change management function at DOT is a new function that has been staffed for only a short time. It is responsible for:

- Processing system change requests
- Managing the document library
- Managing the change management system
- System library management

MIS does not currently have separate production and test libraries for existing production systems. MIS management stated that separate production libraries will be used for all future systems put into production.

Recommendation - Immediately implement production and test libraries.

Some of the current systems may remain in production for six to eight years while the new replacement systems are being developed. MIS cannot afford to continue to follow