



OFFICE OF EMERGENCY MANAGEMENT AND RESPONSE

# **COPING WITH Y2K: ORGANIZATIONAL ADAPTATION AND CHANGE AT THE US DEPARTMENT OF TRANSPORTATION**



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**June 2000**



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**EXECUTIVE SUMMARY**

**BACKGROUND AND STUDY DESCRIPTION**

The Year 2000 (Y2K) computer problem constituted an unprecedented threat for governments, the private sector, and members of the public worldwide. Y2K presented a special challenge for the US Department of Transportation (DOT), given DOT's major responsibilities in the areas of national and international travel and transport, safety and security, continuity of operations planning, and disaster preparedness and response. To meet that challenge, the Department took extraordinary steps to ensure that its own systems remained operational into the new millennium, and it also played a major role in overall Federal readiness efforts and in stimulating private-sector Y2K preparedness.

This study, which was undertaken by the University of Delaware's Disaster Research Center and the George Washington University Institute for Crisis, Disaster and Risk Management, sought to (1) document the strategies DOT used to achieve internal readiness, coordinate with other Federal agencies, and support private-sector stakeholders in their remediation and preparedness efforts; (2) obtain information on which strategies worked well and why; (3) document the short-term and potential longer-term impacts of the Y2K readiness effort; and (4) review lessons learned and identify aspects of DOT's Y2K-related efforts that can be transferred and institutionalized in ways that increase organizational effectiveness. To prepare this after-action report, the study team reviewed a wide range of documentary materials, engaged in systematic observation and conducted informal interviews at the Office of Emergency Transportation's Crisis Management Center during the New Year rollover period, and conducted confidential in-depth interviews with 25 key DOT officials.

**OVERVIEW OF DOT'S Y2K RESPONSE**

Y2K was virtually unique in its scope and complexity, and DOT responded to the threat through continually reframing the Y2K problem, redefining its organizational responsibilities, and developing strategies to overcome barriers to Y2K readiness. Originally perceived as primarily an information technology problem, Y2K was reframed as an organizational and management problem, and later redefined again as a threat requiring extensive industry outreach and emergency operations and rollover planning. DOT initially had difficulty appreciating the scope and implications of the problem, and some modal administrations were slow to act. Efforts to deal with the problem were hampered by the sheer size of the Department, its highly differentiated bureaucratic structure, the

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fact that it has always been better integrated vertically (that is, within modes) than horizontally, and, relatedly, the fact that its modal administrations have different cultures, responsibilities, authorities, and resource levels. Recent ONE DOT initiatives have sought to overcome these well-recognized centrifugal tendencies within the Department. In the case of Y2K, the situation was further complicated by the fact that DOT lacked a thorough understanding and inventory of its own information technology assets.

DOT was able to respond to the Y2K challenge very effectively because of a unique combination of external pressures and internal departmental initiatives. The fact that December 31 presented an immovable deadline was clearly an important factor that drove readiness activities. Organizations often have problems balancing competing priorities and meeting deadlines, but in the case of Y2K there was little room for ambiguity. As it prepared for Y2K, DOT was also subject to extensive scrutiny by Congress, the Office of Management and Budget, the media, and other external entities. The creation of the President's Council on Y2K Conversion and the large-scale Federal initiative that was undertaken to prepare for the rollover gave greater urgency to departmental readiness efforts.

The close attention and involvement of upper-level management was perhaps the most important factor stimulating departmental Y2K activities. The senior DOT leadership, beginning with the Secretary and the Deputy Secretary, communicated with key officials in the various DOT modes in ways that made priorities clear and that ensured their accountability. Top administrators in key operating administrations also recognized the significance of the Y2K threat and approached the problem very aggressively.

Upper-management attention and leadership set in motion strategies that enabled DOT to better manage complex Y2K problems. An Outreach Action Team (OAT) helped achieve cross-modal coordination and established an extensive network of ties with business and industry. Small in size and flexible in its operations, the OAT achieved a great deal in part because it was able to operate outside normal bureaucratic constraints. In a strategy designed to enhance departmental accountability, DOT used its own Inspector General's office to track and check the veracity of the information that was being provided to Congress, OMB, and other entities outside the Department.

Y2K readiness efforts were helped considerably by the fact that significant resources were made available to DOT to deal with the problem. While funds alone would not have ensured adequate Y2K readiness in the absence of senior management commitment and leadership, lack of funds would have made readiness impossible to achieve. The influx of funds into the Department also made it possible to hire consultants, who often teamed up with detailees who were reassigned specifically to work on Y2K issues.

## **STUDY FINDINGS**

DOT remediation, preparedness, and response activities were effective. Moreover, they produced tangible outcomes and improvements that have applicability well beyond the computer problem they were originally developed to address. Significant improvements took place in the following areas: department-wide technology awareness; identification of mission-critical systems; continuity of operations planning; internal information-sharing, relations with industry and the general public;

leadership in the identification of Y2K best practices; and emergency management capability.

- **Technology awareness:** Y2K required DOT to inventory and systematically review its technology assets, and then to follow up with large-scale replacement and remediation programs. It also forced the Department and its modal administrations to confront major issues of system and process incompatibilities. The Y2K planning effort also gave DOT personnel a greater appreciation for the benefits that are associated with the use of information technologies in daily work activities.
- **Mission-Critical Systems and Business Continuity Planning:** Modal administrations within DOT were required to identify and assess their mission critical systems in order to undertake Y2K remediation and preparedness efforts. The Department also engaged in extensive business continuity planning both internally (within DOT modes) and externally (with industry partners). For perhaps the first time, DOT considered in a systematic way how continuity of departmental operations would be ensured if a Y2K-related event caused disruption at its own headquarters or the facilities of one of its major operating administrations. This planning effort was distinctive in its focus on core business activities and mission critical systems, its high degree of detail, its emphasis on how different business processes relate to one another, and the open exchanges of information that accompanied the planning process. The lessons learned will prove useful for other types of emergencies.
- **Internal Information-Sharing:** Y2K planning facilitated extensive intermodal contacts and information-sharing throughout the Department. The Y2K effort encouraged knowledge transfer and helped overcome the Department's tendency toward overspecialization and compartmentalization.
- **Improved Relations with Industry and the Public:** Y2K outreach efforts brought many units of DOT into more intensive contact with industry partners and strengthened already existing ties. As DOT became a focal point for the collection of worldwide data on the Y2K status of all transportation modes, the Department and its key operating administrations came to be seen by the public as a critical source of information on transportation system readiness. This helped counter widely-circulated rumors and misinformation, and it also increased public confidence in government's ability to manage the Year 2000 problem.
- **Leadership in the Promotion of Best Practices:** As a consequence of its aggressive efforts to enhance industry and national capacity to cope with Y2K, the Department earned a position of recognized worldwide leadership in Y2K readiness. This was particularly true with respect to the Coast Guard and the FAA.
- **Enhanced Crisis Management Capacity:** DOT built upon and extended its crisis management capability in order to cope with the very special circumstances surrounding Y2K. The Department collected baseline data on the nature and frequency of transportation system disruptions during normal operations. DOT's Office of Emergency Transportation also took the initiative to develop computer software that would be capable of providing real-time information on the status of the transportation infrastructure during the Y2K rollover. OET

also took the lead in developing emergency plans for Y2K, providing very extensive training, and conducting a series of emergency exercises, including three special executive level exercises. Positive outcomes resulting from these efforts include improved readiness for major natural disasters and other potential threats; improved ability to respond to Presidential and other directives focusing on critical infrastructure protection; software that enables the Department to monitor the status of the transportation system during normal times and in crisis situations; greater visibility for DOT's role in the management of major national emergencies; and greater awareness on the part of upper- and middle-level management of the importance of emergency preparedness and effective crisis management.

## **RECOMMENDATIONS**

The study team found that unless decisive steps are taken to preserve and institutionalize practices, products, knowledge, and organizational strategies that were initiated in response to the Y2K problem, both DOT and the Nation risk losing those benefits. Disasters (or, in this case, a potential disaster) often provide organizations with "windows of opportunity" in which to implement changes, but those windows typically close quickly. Changes initiated in response to threats tend to be short-lived unless organizations act decisively to incorporate change. Many of the positive consequences of Y2K readiness activities have already begun to fade. To capitalize on what was learned as a result of its Y2K-related efforts, the Department should concentrate on institutionalizing gains in two key policy and programmatic areas: information technology management and investment; and department-wide emergency management activities.

With respect to information technology management and investment, as a result of Y2K, DOT's modal administrations have upgraded computer systems, eliminated outdated hardware and software, and achieved a level of consistency in computing and communications that had not existed previously. DOT now recognizes the importance of IT for its overall operations, and many parts of the organization that had lagged technologically brought their systems up to date with funding that was allocated because of Y2K. However, without a strategic plan, budget strategy, and adequate funding to maintain those systems, DOT and its modal administrations risk losing those gains. Policy and budgetary initiatives are needed to ensure that the Department is able to maintain those systems and build on technology advances that came about in the course of its efforts to manage the Year 2000 problem.

Efforts to cope with Y2K resulted in significant department-wide advances in the area of emergency management, including extensive and intensive contingency planning efforts; emergency training and exercises for both operational and executive-level personnel; the development of the AIM software system; and more intensive departmental involvement in Federal emergency preparedness and response activities. Y2K readiness activities increased the visibility of the emergency management function within the Department. Those activities were also an excellent example of the ONE DOT concept in action.

To sustain the positive momentum created by these efforts, DOT needs to address at least four emergency management policy issues. The first concerns the role and appropriate organizational location of the Office of Emergency Transportation. OET can continue to function within RSPA, but this organizational arrangement could leave the Office with insufficient authority to perform

department-wide emergency management coordinating duties. Alternative organizational arrangements include relocating OET to the Office of the Secretary, or reconfiguring the Office as a joint program office bridging multiple transportation modes. Regardless of what option is chosen, OET will need both additional resources to carry out its mission and the full support of the Secretary's Office.

A second emergency management policy issue that emerged in the aftermath of Y2K concerns the need to clarify boundaries and coordination requirements between OET and DOT's Office of Intelligence and Security (S-60). A third issue involves the documentation and retention of emergency management "best practices" within DOT. The Department and its modal administrations were accorded wide recognition for their leadership during the Y2K crisis, and this leadership position should be maintained. Finally, in undertaking its readiness efforts, DOT developed an important software system, the AIM system, that can be used both for monitoring the status of the transportation infrastructure system during normal times and as an information-gathering and decision support tool during emergencies. Without support, the value of this software tool will be lost.

In conclusion, DOT reaped significant benefits as a consequence of coping with Y2K. These benefits are far-reaching, encompassing improvements to DOT's technological infrastructure, increased cross-modal communication and coordination, a better understanding of the interconnectedness of the Nation's transportation systems, heightened awareness of infrastructural risks, improved continuity of operations planning, stronger relationships with private-sector industry partners, and an enhanced capacity to manage future crises. The next step is to act rapidly in order to continue to realize these benefits.

## **COPING WITH Y2K:**

### **ORGANIZATIONAL ADAPTATION AND CHANGE *AT THE US DEPARTMENT OF TRANSPORTATION***

#### **Background**

The Year 2000 computer problem (Y2K) constituted an unprecedented challenge for governments, the private sector and members of the public throughout the world. Never in history had the attention of so many people and organizations been focused simultaneously on the potential problems associated with one single threat. Y2K was a challenge of immense complexity, for many different reasons. First and foremost, Y2K constituted a hazard with which the entire world was unfamiliar. While entities that are charged with planning for natural and technological disasters often have problems envisioning the consequences of those events, there is typically some experiential basis for making loss projections and developing plans. This was not the case with Y2K.

Relatedly, although there was widespread recognition that Y2K had the potential for causing very severe social and economic disruption, the size and parameters of the problem were not well understood. Moreover, since different nations, organizations, and sectors of the public came to recognize the problem at different times and since remediation was known to be taking place slowly and unevenly, even those that considered themselves well-prepared were nevertheless concerned about how other entities that constituted weak links in mitigation and preparedness could affect their own vulnerability. Further, a large proportion of the data that were available on Y2K remediation and preparedness were based on self-reports, raising questions about the confidence that could be placed in information on Y2K readiness. In short, the challenges associated with Y2K were even more complicated than the problems associated with most other “low-probability/high-consequence” crisis events. Even though there was a clear time window associated with the problem, an enormous amount of ambiguity existed about the magnitude and severity of the threat.

What was well-understood was that the Y2K problem had to be addressed on a number of fronts: making corrections in problematic computer codes; purchasing Y2K-ready equipment and components to replace those that were vulnerable to failure; and undertaking extensive testing to ensure that systems worked properly. Additionally, Y2K necessitated what was perhaps the most extensive and intensive public- and private-sector contingency planning and consequence management effort in peacetime history, as worldwide attention focused on the challenge of anticipating and then seeking to manage the entire panoply of failures and disruptions that were envisioned. Governmental entities at all levels engaged in remediation and preparedness efforts on a massive scale in order to ensure their continued ability to perform critical operational, regulatory, and public service functions into the millennium.

One aspect of the Y2K problem that greatly interests both researchers and policy makers is

that the challenges it posed required organizations to think in unaccustomed ways about their vulnerability. For example, most organizations--both public and private--tend to think primarily about internal preparedness for disasters and other crises, and they tend to plan in isolation from one another. They often have real difficulty conceptualizing preparedness in inter-organizational, as opposed to intra-organizational, terms. However, the potential implications of Y2K for supply-chain disruptions forced public and private sector entities to undertake inter-organizational planning efforts involving suppliers, customers, and other organizations on which their operations depended.

Additionally, in the era of globalization, public organizations and private firms were forced to concern themselves with worldwide Y2K vulnerabilities, because organizational and systems problems occurring elsewhere in the world could have a direct impact on their own operations. Therefore, organizations had to consider potential Y2K disruptions that might originate either within or outside U.S. boundaries.

### **The Department of Transportation and Y2K Readiness**

Among governmental agencies, the US Department of Transportation is virtually unique both in its scope of responsibilities and in the importance of its operations for public safety and the well-being of the Nation's economy. With more than 110,000 employees in ten federal regions, DOT has operational and regulatory responsibilities spanning the entire range of transportation systems and facilities, from air traffic and airports, to all modes of surface and marine transport and even underground pipelines. DOT's missions, which include responsibilities for both domestic and international travel, are assigned to twelve different agencies and administrations, including the Federal Aviation Administration, the US Coast Guard, the Federal Highway Administration, the Federal Railroad Administration, the Federal Transit Administration, and other major operational and regulatory entities. Given these responsibilities, Y2K readiness had been a central focus for the organization during the latter part of the decade of the 1990s.

Since the millennial rollover had the potential for disrupting key infrastructural systems and IT networks and for straining community resources, safety and security have also been important components of Y2K readiness for most organizations. In light of DOT's major responsibilities in the areas of international travel and transport, infrastructural and other vulnerabilities in countries worldwide, but particularly among major US trading partners, had to be a major concern. DOT needed to ensure the operational safety of US transportation systems anywhere in the world, while anticipating risks and disruptions that could originate from sources ranging from lone computer hackers to criminal conspiracies and terrorist organizations. Thus, while safety and security are always very important components of DOT's mission, the Y2K threat, by its very nature, heightened their significance.

For DOT, the unique challenges associated with Y2K readiness were compounded by the department's sheer size, its broad scope of responsibilities, its varied legal authorities, and its history of being better integrated vertically--that is, within transportation modes--than horizontally, or across modes. This vertical structure evolved because of the many types of transportation for which the Department has responsibility, the different legislative mandates under which it operates, and the wide variability of industries with which each modally-based agency and administration must interact. While this form of organization is in some respects functional for DOT in light of its

history and operating environment, and while internal differentiation typically has the potential for enhancing organizational effectiveness in many ways, there are also costs associated with high vertical integration. Those costs can include overspecialization, job compartmentalization, difficulties with intra-organizational communication, and problems with developing and maintaining a common organizational vision and culture. Recent initiatives emphasizing the ONE DOT concept represent attempts to overcome this tendency and enhance horizontal integration within the Department. Once again, since Y2K was recognized as the kind of problem that could only be addressed through a coordinated Department-wide effort, it was clear that DOT would have to take additional steps to foster horizontal integration. Thus, for DOT, meeting the Y2K challenge necessitated organizational adaptation in many areas, ranging from internal organization and strategy to organization-environment relations.

Now that the transition to the Year 2000 has been completed, DOT, like many organizations, is reviewing its Y2K remediation and preparedness activities in order to better understand what worked well and what did not and to identify ways in which those efforts can make its operations more effective. To meet these objectives, DOT has systematically collected information on lessons learned by requesting written feedback from staff members who were involved in Y2K remediation, preparedness, and emergency activities; holding meetings and discussion groups involving both Department personnel and representatives from a number of agencies in the transportation sector; and by preparing after-action reports. These efforts to better understand how the Department performed and what lessons were learned as a consequence of addressing the Y2K challenge have been undertaken both within the various operating administrations and on a Department-wide basis.

To assist with these efforts, DOT's Office of Emergency Transportation asked researchers from George Washington University's Institute for Crisis, Disaster, and Risk Management and from the University of Delaware's Disaster Research Center to conduct research to further explore the implications of Y2K readiness activities for future DOT operations. The remainder of this report discusses the objectives and research questions that study addressed, the types of data collection methods and informational materials that were used in the course of the study, and the investigators' key findings.

## **Study Objectives**

The study sought to obtain detailed information about the different adaptive strategies DOT used to prepare for and respond to the Y2K problem and to assess the ways in which Y2K-related mitigation, preparedness, and response efforts have affected organizational operations. Its more general goal was to better understand how the changes that Y2K necessitated can be institutionalized in the structure and culture of the organization. Specifically, the study attempted to:

1. *Document the strategies DOT used to* (1) achieve Y2K readiness in critical mission areas within the Department; (2) stimulate Y2K readiness among entities over which DOT has authority and responsibility; (3) coordinate with other federal preparedness efforts, including those that were international in scope; and (4) achieve higher levels of intra-departmental integration.
2. *Obtain information from key agency participants on which strategies worked well and were successful, and which did not succeed as well or were never completed, and why.* The project also

sought to identify major barriers that stood in the way of achieving higher levels of Y2K readiness and to understand how those barriers were overcome.

3. *Document the short-term and longer-term impacts Y2K readiness efforts have had on DOT.* Such changes could include the creation of new organizational and inter-organizational entities that have the potential for lasting beyond the period of preparation for Y2K, as well as more lasting changes in patterns of communication, coordination, information-sharing, and task performance within the organization.

4. *Identify aspects of Y2K readiness that can be transferred and institutionalized in ways that increase organizational effectiveness.*

## **Methodology and Research Questions**

The methods used in the conduct of the GWU/DRC study included documentary analysis, systematic observation, focus group discussions, and individual interviews. A very wide range of *documentary materials* were reviewed, including meeting notes, internal DOT memos, presentation materials, correspondence, records of Congressional testimony, and progress reports and after-action reports prepared by the various operating agencies.

Four staff members from the Disaster Research Center engaged in *systematic observation* of emergency operations in the DOT's Crisis Management Center during the Y2K rollover weekend. Observers were continuously present in the Center from 9 am on December 31, 1999 through 8 pm on January 1, 2000. Researchers also staffed the CMC on January 3, 2000, to document any potential Y2K-related problems on the first business day of the new year. Throughout that period, they conducted brief informal interviews with personnel who were staffing the center, attended briefings, and took notes on significant events as they occurred. Immediately after the activation, the observers prepared written synopses identifying significant issues and events they deemed significant.

GWU and DRC researchers also conducted two confidential *focus group discussions* with DOT personnel who had been closely involved with Y2K remediation and emergency activation activities. Each of those group discussions, which were held on January 28 and February 3, 2000, lasted approximately two hours. The discussions were taped and later transcribed.

Data were also collected through 27 confidential face-to-face *in-depth interviews* with 25 individuals who had assumed positions of responsibility in areas related to the study's main research questions.<sup>1</sup> Four interviews were conducted before the rollover, and the remainder took place in March and April, 2000. The interviews typically lasted between one and two hours. The majority of the interviews were tape recorded, and the tapes were transcribed to facilitate analysis.

Although most of the data for this study were collected by means of the methods outlined

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<sup>1</sup> Two individuals were formally interviewed both before and after December 31, 1999. Additionally, there were a number of other informal contacts (for example, at Y2K readiness-related meetings) that took place both prior to and after the rollover.

above, other kinds of information were also used. During fall, 1999 and winter, 2000, members of the research team were invited to a number of other meetings in which the Department's Y2K activities were reviewed and assessed. For example, a GWU researcher was present and took detailed notes at a large after-action assessment meeting in which DOT personnel and transportation sector representatives participated, which was held in January, 2000. Researchers were also given the opportunity to provide suggestions to the Department on how to develop its own internal Y2K evaluation strategy and were later given access to the reports produced by DOT staff.

In collecting and analyzing data, the study team was guided by the following very general questions:

- How did DOT define or conceptualize the Y2K problem initially, and how did those definitions evolve over time?
- What special challenges did Y2K present for DOT, and how did the Department deal with those challenges?
- What specific strategies did DOT employ to achieve Y2K readiness? Which strategies worked well and which were ineffective?
- What consequences--either positive or negative--did Y2K activities have for DOT?
- What were the most important lessons learned as a consequence of the Y2K readiness effort?
- Can these lessons have wider applicability to other aspects of DOT's mission and to other challenges the Nation faces? Was there a "value-added" component to Y2K-related efforts that could carry over into other problem areas?
- What would be needed to institutionalize positive outcomes of the Y2K readiness effort?

## **Study Team Findings**

In reviewing the findings presented here, readers should keep several points in mind. First, the project that was undertaken by the GWU/DRC team was qualitative, rather than quantitative. That is, rather than conducting a random-sample survey or analyzing data using quantitative techniques, the study team assembled large amounts of qualitative material. In analyzing the data, the team employed an approach that is termed *triangulation*, or relying upon different types of data (e.g., documents, interviews, observations) to answer particular research questions. The logic on which triangulation is based is that confidence in findings increases when multiple data sources and multiple informants all point to the same conclusions.

Second, in assembling findings for this report, the GWU/DRC team was permitted very broad access to people and information and wide latitude in forming judgments about what was read, observed, and heard over the course of the study. Although this research was funded by DOT, the investigators believe that they were perceived by interviewees and providers of information as

independent researchers undertaking legitimate social science research. Interviews were conducted according to strict confidentiality rules as outlined by government and university human subjects and informed consent requirements. Prior to each interview and focus group discussion, study participants were briefed on the confidential nature of the information they were being asked to give and were assured that they could speak frankly and openly with the study team.

At the same time, it should be noted that this study was relatively small in scale and that the time permitted for developing conclusions was short. Studies like these are no substitute for long-term, in-depth scholarly investigations. The authors of this report believe that much can and will be learned through detailed and long-range scientific study of both the technical and sociological aspects of the Year 2000 problem. This report should be viewed as a small and preliminary contribution to that effort.

Third, the conclusions outlined in this report are policy-related and strategic, rather than tactical. That is, they focus broadly on the research questions outlined above and on organizational implications of Y2K remediation, readiness, and response activities for DOT, rather than on detailed aspects of those activities or on specific steps that may have been taken by individuals or operating administrations.

After a review of the materials to which the study team had access, the following points emerged as significant lessons learned.

### **Reframing and Redefining the Problem**

*The Year 2000 problem was virtually unique in its scope and complexity, as well as in the challenges it presented for the Department. DOT met those challenges through continual reframing of the Y2K problem, redefinition of its organizational responsibilities, and the development of strategies to overcome barriers to Y2K readiness.*

Over a period of approximately two years leading up to December 31, 1999, DOT personnel came to define Y2K as an extremely significant problem, both for the agency and for the Nation as a whole. Interviewees indicated that once the various dimensions of the problem had been fully defined, it was nearly impossible to envision a challenge that approached Y2K in terms of scope and complexity, short of a some other threat to the country's entire infrastructure. However, this definition of the Y2K problem and its importance evolved over time within DOT. In the mid-1990s, those who were aware of the problem--principally information technology personnel in the two major operating agencies, the Federal Aviation Administration and the Coast Guard--saw Y2K as primarily a deficiency in *information technology* that needed to be remediated. As late as 1997, there was little or no awareness of the broader implications of Y2K at senior levels in the various operating agencies, and thus little impetus to act. In some cases, this was due to a lack of understanding of the problem. In others, changes in leadership hampered remediation efforts.

Beginning in early- to- mid-1998, views on the problem and its scope began to broaden, and Y2K began to be seen as an *organizational or management* problem that demanded the attention of both information technology personnel and administrative personnel within the Department. Questions of overall organizational strategy and accountability began to emerge in the wake of the

poor assessments and unsatisfactory “report cards” DOT was given by Congressional representatives. In this next phase, DOT concentrated on assessing and improving its own internal remediation efforts. At this point, there was sufficient uncertainty about the progress that different entities within DOT were making that the Department expended most of its time and effort internally, mobilizing resources in areas where needs had been identified and setting up systems to direct Y2K efforts and track progress.

Starting in mid-1998, the Y2K problem was once again reframed, and this time the emphasis was on *outreach* activities that agencies needed to undertake in order to enhance Y2K readiness. As DOT officials began to explore the Year 2000 problem in more depth, it became evident that in addition to focusing on internal readiness, the Department should reach out to enhance the readiness of other outside entities. To achieve this objective, in late summer, 1998, a group called the Outreach Action Team (OAT) was formed. The OAT was headed by the Deputy Secretary of Transportation and directed on an ongoing basis by officials from the office of the Chief Information Officer and the Deputy Secretary. As the OAT continued to operate, outreach activities continued to expand. Over time, DOT established networks and formed partnerships with an extremely wide range of organizations, including regional offices of its own operating and regulatory administrations, other Federal agencies, states, organizations in industries over which the Department has responsibility (e.g., airlines, railroads), and, ultimately, with international partners, in particular those in the aviation and maritime industries. The OAT operated through a series of subgroups that focused on particular aspects of the Y2K problem, including: communications and coordination; compliance, enforcement, and liability; public affairs; liaison with other federal agencies; and (later) emergency response.

Beginning in early 1999, these efforts were accompanied by a growing awareness that *emergency operations and Y2K rollover planning* also needed more intense Department-wide attention. Paralleling remediation efforts, emergency operations planning began within DOT itself, but then quickly expanded to include DOT’s role in Federal government readiness and response planning and in monitoring the status of the Nation’s infrastructure during the period of transition to the Year 2000. From mid- to late 1999, efforts focused on an intensive series of training emergency exercises involving operational, administrative, and policy-level personnel.

Just as the Nation as a whole was slow to recognize Y2K as a societal problem, DOT also had difficulty appreciating the scope and implications of the problem until approximately two years before the Year 2000 deadline. Initial progress in dealing with the problem, even at the level of computer code, was slow in many cases. There were various reasons for this initial inability to manage the problem effectively. One was that prior to early 1998, senior career officials and political appointees in the various administrations comprising DOT had not made DOT readiness a priority. As one high official said of one key agency and its inability to manage the problem, “They said they were dealing with the issue, [but] it was quite clear they never would have got there. It would have been a disaster...Nobody was fully motivated enough to really grab ahold and say, ‘We are going to work this.’” In some cases, shifts in top leadership personnel within DOT administrations also contributed to the inability to focus on and prioritize Y2K issues.

Efforts to deal with Y2K-related problems were hampered by the fact that early on in the process and continuing until the last two years of the decade of the 1990s, there was still a tendency

to view Y2K narrowly, as the responsibility of the Department's information technology personnel, rather than in terms of broader department-wide concerns. As one interviewee who was involved in DOT efforts on a long-term basis put it:

...it seemed like it [Y2K] was a fairly contained issue, but we did think that it was probably important enough to bring out IT people together in the department and at least give a presentation on what we knew at the time, and frankly we didn't know much. I think we thought it was primarily a main-frame kind of an issue and on old software kind of an issue...I know I did not really at the time appreciate the magnitude of it.

Another interviewee recounted extensive efforts to educate management in one DOT agency:

We had to fight a cultural fight within our agency to persuade middle management what was being said in the press...that it was a management problem...those of us who were on staff, trying to interact with middle- to upper-middle management in our organization, still had to fight the fight to persuade them: "This concerns you, this is important to you, you need to pay attention to this."

DOT's own distinctive organizational characteristics constituted yet another barrier that needed to be overcome in order to achieve broader readiness objectives. The Department is often described as a "federation" consisting of very distinctive constituent modal organizations, each with its own unique history, culture, traditions, responsibilities, and networks of inter-organizational contacts. The two principal operating agencies, the Federal Aviation Administration and the U. S. Coast Guard, are very large entities that have historically operated with a great deal of autonomy. Entities such as FAA and the Coast Guard are justly proud of their records for excellence, and both have evolved unique organizational cultures. Differing greatly in size, resources, and internal organization, overseen by different Congressional committees, performing different functions, and interacting with different industrial partners, the various modal administrations that make up DOT have naturally come to view themselves as having little in common. They have also typically placed little emphasis on intermodal coordination, since for the most part their daily activities do not require it. Based on how modal administrations function on a daily basis, then, "everyone viewed their missions as pretty separate and not particularly interdependent." Clearly, attempting to change such deeply-held views and established operational practices was a major challenge.

Relatedly, the sheer size and the highly-differentiated bureaucratic structure of DOT and its major operating agencies also constituted barriers to achieving a broader Department-wide focus on Y2K-related issues. Key characteristics of the bureaucratic organizational form include a very specialized division of labor, a clear hierarchy of authority, and an emphasis on written rules and regulations. Bureaucracies are designed to enhance efficiency, handle large volumes of work, and harness the efforts of large numbers of people in the pursuit of organizational goals, and, by and large, they do a good job of achieving those objectives. Indeed, it is impossible to imagine how life in any modern industrialized society would be possible without bureaucracy. At the same time, bureaucratic forms of organization are susceptible to various kinds of problems, including: over-compartmentalization of organizational activities, accompanied by overspecialization on the part of

personnel; difficulties with ensuring individual accountability; ritualism, or blind adherence to rules for their own sake; and communication problems among various bureaucratic levels. Thus, although bureaucracies do many things well, over-adherence to bureaucratic rules can be bad for an organization. The term “stovepiping” has recently entered the public lexicon as a way of describing the high degree of vertical integration that characterizes many bureaucracies, as particular divisions or functional areas in an organization come to focus so much on their own internal operations and priorities that they may lose sight of overall organizational goals. Bureaucracies are also notoriously inflexible and slow to change, which is one reason why there has been so much emphasis in recent years on redesigning private sector organizations to be “lean and mean.” In sum, the paradox of bureaucracy is that the same features that make bureaucracies so efficient and effective can also be dysfunctional. This is particularly true when a highly bureaucratic organization faces unanticipated problems or has to deal with a rapidly changing environment.

This was the situation DOT faced with respect to Y2K. Ordinary features of bureaucratic life such as hierarchies, specialization, an emphasis on rules and procedures, the organization’s internal division of labor, and high workloads, combined with the regular shifts in priorities that take place in all organizations, constituted barriers that DOT had to overcome to begin analyzing and solving the Y2K problem in a holistic fashion. Doing so would require creative strategies for achieving department-wide coordination, dealing with problems created by too much stovepiping, and overcoming the natural caution and tendency to avoid taking decisive action that is a hallmark of bureaucracy.

Also complicating Y2K readiness efforts was the fact that prior to its initiation of Y2K-related projects, DOT itself lacked a thorough understanding and inventory of its own information technology (IT) assets. This situation was of course understandable. As noted earlier, constituent administrations had evolved independently from one another, and they had different IT needs and very different IT budgets. The Department performs numerous administrative and operational functions that require a vast array of IT solutions. The Department’s sheer size and complexity makes it difficult to keep track of IT developments, and hardware and software has been acquired and modified by different entities incrementally over the years. People in various parts of DOT have even had difficulty communicating with one another via e-mail.

Internal agency reports have highlighted the extent to which DOT lacked a comprehensive understanding of its IT infrastructure: that administrations within DOT lacked IT inventories, and also that they lacked program management skills and systems development methodologies to organize remediation efforts. Again, this was not a problem that was unique to DOT--in fact, these kinds of difficulties plague most large organizations, both in the public and the private sector--but it did make tackling Y2K especially challenging for the Department.

Finally, carrying out its Y2K mission was challenging for DOT because doing so required many entities within the organization to behave in ways to which they were not accustomed in an atmosphere that was very unlike the environment in which they typically operate. This was particularly true as DOT’s view of its mission began increasingly to expand beyond the narrower definition of Y2K as an IT problem, to encompass strategies for enhancing broader governmental, industry, and societal preparedness. For example, most DOT agencies typically operate in a reactive mode: based on their legal authorities, when an accident or mishap occurs, they become involved in

enforcement or investigative activities. However, the Y2K threat required agencies to think in terms of proactive mitigation of future problems, which in many cases had not been viewed as part of agency missions. As one informant indicated:

DOT is...it's "after-the-fact" enforcement...The culture and the way the regulations are set up is, we go in after the fact, so it was kind of a whole new construct to think about how we would use, if we could, our regulatory powers in a more positive, proactive fashion.

Many units within DOT had to alter their relationships with private-sector entities to a very significant degree in the interest of promoting Y2K readiness. For example, because of its regulatory and enforcement functions, DOT can be said to operate in at least a semi-adversarial fashion with the industries over which it has jurisdiction. In certain circumstances, DOT agencies have the power to compel entities in regulated industries to provide various kinds of information. In contrast with these normal functions and activities, the Y2K readiness effort required DOT to work with industries on a more collaborative basis and to persuade them to share information and work cooperatively, both with agencies and with one another. The emphasis shifted from what the Department *could* do legally to what it *needed* to do in order to exercise its broader leadership role.

As plans for the transition to Y2K proceeded, it was also evident that activating on a twenty-four hour basis over a holiday weekend was also something for which most entities within DOT were not prepared. While FAA and the Coast Guard are operational around the clock, this is not the case across the entire Department.

The continual expansion of the expectations placed on DOT also constituted a formidable challenge. As noted earlier in this report, the Y2K problem underwent a process of continual redefinition and expansion, first being seen in rather narrow IT terms and ultimately expanding to include issues of global Y2K readiness. Because of its critical role in national preparedness, the Department had to maintain a very close working relationship with other agencies that were spearheading the national Y2K effort, such as the President's Council on Y2K Conversion and the Federal Emergency Management Agency. Agencies like the Coast Guard and the FAA were ultimately called upon to assume leadership roles in worldwide Y2K preparedness. As potential problems associated with cyber-terrorism and other types of terrorist attacks began to be considered, DOT had to emphasize increasingly not only the operability but also the security of the Nation's entire transportation infrastructure. In short, DOT personnel had to cope with the fact that as they made progress on certain aspects of Y2K, new significant problems and challenges continually presented themselves. At the same time, they began to appreciate the fact that this "mission creep" was necessary in light of the magnitude of the Year 2000 problem.

### **Factors Influencing DOT's Response to Y2K**

*DOT was able to respond very effectively to the challenges posed by Y2K because of a unique combination of external pressures and internal departmental and agency initiatives.*

Although DOT regularly has to cope with hazards, accidents, and disasters of various kinds, Y2K was in many respects qualitatively different from the more typical crises DOT faces. The

potential for major disruptions cutting across all modes of transportation and the entire national and even international transportation infrastructure was unprecedented. Even a major disaster of regional proportions, such as the 1993 Midwest floods, would have been small in scope compared to some of the Y2K problems the Department had to envision.

The fact that December 31 presented an immovable deadline by which DOT and its member agencies had to have their plans for managing the rollover in place was certainly an important factor driving readiness activities. As a number of interviewees pointed out to the study team, DOT regularly takes on very large projects, but deadlines for project completion can shift if other priorities present themselves, as they frequently do. Like all large bureaucracies, DOT agencies regularly experience difficulty reaching milestones and targets, and it is not unusual for even large initiatives to experience delays. Y2K, however, presented a *date certain*--a deadline that could not be avoided or amended.

***Key Factors Affecting DOT's Readiness Efforts:***

- *Immovable deadline*
- *Clear priority*
- *Extreme oversight*
- *Upper management leadership and direct involvement*
- *Creation of new internal teams*
- *Strategies to ensure accountability*
- *Sufficient resources to set the job done*

Similarly, in any large bureaucratic organization it is normal for ambiguity to develop about which priorities most need to be met and when different tasks must be completed. In large multi-level organizations, it is also quite typical for information to get distorted as it is passed among different levels; “signals” about what the organization needs to accomplish and when often get lost among the various forms of “noise” that permeate the system. In the case of Y2K, however, while different parts of the Department might have had different ideas on how to go about addressing the Year 2000 problem, or about when phases like remediation and testing could reasonably expect to be completed, December 31, 1999 represented an unambiguous and non-negotiable deadline for DOT as a whole. Everyone who was working on Y2K issues recognized that if mission critical systems were not ready for the rollover by then, any progress that had been made on intermediary steps would be moot. This degree of clarity and consensus on goals and deadlines is atypical for large organizations both in the public and in the private sector and is generally very hard to achieve.

The large amount of external scrutiny and pressure to which DOT was subject during the time it was working to prepare for the rollover was also unprecedented. Once Y2K began to be defined by entities outside the Department as a problem of major concern for the entire society, oversight and pressure became more intense, and it was clear that DOT had to act in a responsive fashion. The high degree of Congressional involvement with the problem and the continuing requests for information from various Congressional representatives and committees had a very significant influence on DOT activities. Some interviewees cited Congressman Horn's early activism on the issue as providing an important impetus. In 1996 and 1997, Congressional criticisms that called attention to a lack of readiness on the part of key agencies such as FAA, as well as the well-publicized low “grades” on Y2K readiness that were given by Congress, resulted in significant media scrutiny and raised societal concern. Although in many cases the low ratings that were given to the Department or its constituent agencies were the result of incomplete reporting, failure to take requests for information seriously, and the manner in which some members of Congress chose to interpret the information that was provided, a consensus did begin to develop among senior officials

that Y2K was an issue that needed to be assigned a very high priority. Over time, this stepped-up Congressional concern was accompanied by much more intense media coverage and, ultimately, by increased public curiosity and worry, particularly over issues such as airline safety. When quarterly reports began being required by the Office of Management and Budget, yet another layer of external oversight was added. By 1998, DOT understood that Y2K was an issue of intense interest on which regular Congressional hearings would be held and regular official reports would be required. In this context, it became virtually impossible not to make Y2K readiness a major Department-wide concern.

When the President's Council on Y2K conversion was established in early 1998, yet another set of external pressures and requirements emerged. As Y2K was given even greater importance as a society-wide crisis requiring extraordinary federal efforts, DOT was drawn into an ever-widening net of federal preparatory efforts. Recognition grew that DOT was among a very small group of agencies whose readiness was critical for the Nation as a whole. Not only did DOT have responsibility for the performance and safety of the transportation infrastructure, but by virtue of its role in the Federal Response Plan, it also had a key role to play in any federal response activities that would have to be carried out in the event of Y2K-related failures. Most notably, DOT is the designated organization for Federal Response Plan Emergency Support Function #1, which focuses on transportation. There was, in other words, absolutely no ambiguity about the pivotal role the Department would need to play in the federal government's activities with respect to Y2K. As federal-level planning around Year 2000 issues gained increasing momentum, DOT intensified its own efforts.

***High- level departmental leadership was critical for success:***

*"It's very clear that the highest level of leadership in the Department--and that's not only leadership with my agency, but the whole Department--took the job very seriously and gave a high level of attention on an ongoing basis."*

*"It could not have worked without the personal involvement of the Secretary and the Deputy Secretary. Period."*

Paralleling these increases in external scrutiny and pressure, DOT carried out a number of formal and informal internal measures that helped the Department rise to the Y2K challenge. Key to all these efforts was the activist role assumed by upper-level management. Indeed, sources used in the compilation of this report have consistently pointed to high management commitment to ensuring the safety and continuity of the Nation's transportation infrastructure as the most crucial determinant of DOT's high level of Y2K readiness. The senior departmental leadership, beginning with Secretary Slater and Deputy Secretary Downey, communicated with key officials in the various DOT administrations in ways that made priorities clear and that ensured their accountability, emphasizing that administrators were going to be held personally responsible for meeting Y2K targets and deadlines. For example, during the eighteen months prior to the rollover, the Deputy Secretary met monthly with modal administrators and asked them to report on the progress their agencies were making. Those reporting to high-ranking officials like the Deputy Secretary were expected to exercise leadership, know what was being done within their administrations, and provide accurate, valid data on the progress that was being made. Two officials described the process and its impact in this way:

So it was very effective, and they [the agency administrators] knew that every time

they met with the Deputy Secretary, Y2K was going to be on the agenda in a significant way...and we were answering to the Deputy Secretary and so we had to be careful. We could not put him out on a limb, either, when he went to the public and made speeches about these things. There had to be truth behind what he was saying.

It's very clear that the highest level of leadership in the Department--and that's not only leadership with my agency, but the whole Department--took the job very seriously and gave a high level of attention on an ongoing basis. Example: when [head of interviewee's agency] had a monthly performance agreement meeting with the Deputy Secretary, it [Y2K] was on the agenda and always on the agenda. And we always had to prepare [the agency head] for the latest progress report we would give to the Deputy Secretary. That's got to be effective, because it keeps it in the forefront.

The Department was also well-served by the fact that the heads of key operating administrations, notably the FAA and the Coast Guard, recognized the significance of the Year 2000 problem and approached the problem very aggressively, putting skilled management personnel in charge and giving them the authority to act. While early on the FAA in particular had been roundly criticized for delays, incomplete reporting, and failure to make Y2K a priority, those problems were addressed and corrected by the current administrator. Ultimately, both FAA and the Coast Guard not only achieved high levels of internal readiness, but also assumed leadership positions in the international Y2K readiness effort. Speaking of early problems with managing Y2K in some administrations and the manner in which good leadership remedied that situation, one interviewee noted that in one key agency:

...the two Y2K program directors over there, what those folks did was just amazing and the team that worked for them was just...I mean, they were incredible managers. And you know I hate to use a sports analogy, but I mean they were--it's like a team that's down ten touchdowns or fifty points in basketball, and then coming back.

There was a clear consensus among those who were consulted for this report that this high level of involvement on the part of departmental leadership was a critical ingredient in DOT's ability to meet its goals. As interviewees stated:

They made it very clear that they were involved, so therefore the administrators were obliged to put the resources in. It could not have worked without the personal involvement of the Secretary and the Deputy Secretary. Period.

It's very clear that the highest level of leadership in the Department, and that's not only leadership with my agency, but the whole Department, took the job very seriously and gave a high level of attention on an ongoing basis. The most important thing was that the Secretary said "We're going to do it." That was the Secretary and the Deputy Secretary.

To his credit, Deputy Secretary Downey understood [the nature of the Y2K problem] way early, and he began driving that home, you know, that, "This is a management issue. You have to be involved. This is not something that you are just going to throw over the fence to the IT guys."

This high degree of upper-management attention and leadership set in motion various processes and strategies that enabled DOT to manage the complex problems Y2K presented. Key among these was the creation of the OAT, which, as noted earlier, took responsibility for initiating and maintaining contacts with a range of entities in the transportation industry. Besides serving as a vehicle for outreach to entities outside DOT, the OAT also achieved significant coordination among representatives of the various transportation modes within the Department itself. OAT activities helped break down long-existing boundaries among the various administrations that make up DOT, creating a Department-wide focus on Y2K, while at the same time giving OAT participants broad access to information on activities being carried out in the operating administrations. The OAT thus served as a focal point for Y2K-related activities. As one interviewee put it:

The effective part of it [the OAT] was, I think, on a couple of levels. One was the intelligence-gathering aspect of it. It allowed us to get a more realistic picture of what the likelihood was of failures in other modes. But it also allowed other modes to see what we were doing, so it was sharing those practices, and it just helped us along in our assessment...I just remember picking up again and again little tidbits of things that would be good ideas for us to do in [name of agency]...We got an awful lot of our tasking that was department-level tasking through that committee.

The OAT's direction and organization were well-suited to the tasks it had to perform. With leadership in the Deputy Secretary's office and in the Office of the Chief Information Officer, and with Deputy Secretary Downey acting as chair, there was again no ambiguity about the OAT's authority or the importance of its mission. With respect to the team's size, one interviewee described the OAT as being large enough to achieve broad representation across modes, but not so large as to become unwieldy.

The OAT's style of operation also helped the group achieve its objectives. Team members and other key actors associated with the team were given considerable flexibility and latitude to act. Faced with a task of enormous magnitude, combined with very severe time pressures, the Department and the OAT "de-bureaucratized" in a number of ways. Some kinds of memos and letters were vetted less exhaustively than they normally would be, for example, as participants in the Y2K effort were given more autonomy than they typically had in their routine performance of their duties. Reports that might normally have taken weeks to receive authorization were approved with very short turn-around times. E-mail and listservs were used extensively as a means of disseminating information widely and coordinating activities across modal boundaries. Individuals took initiative, rather than waiting to be asked (or officially authorized) to perform certain tasks. People who wanted to take more responsibility could do so more easily than during non-crisis times. Official duties and established areas of specialization were viewed as less important than they usually are in an organization like DOT. As one interviewee noted:

...a lot of times people would jump into the middle of something that they had no experience in but they were willing to take it on, figure out how to make it happen, and because it was more of a management and a common-sense kind of thing or an energy kind of thing, to make sure something kept moving forward.

Or as a representative of another modal administration said, "...we were making this up as we

went, we were inventing a new existence for [name of agency], we were reaching out and being active in areas that were unfamiliar terrain for us.”

On the whole, problems were addressed by entities like the OAT in a much more fluid and flexible way than in the typical bureaucratic organization. This is consistent with what has been observed in organizations facing other types of crises, notably natural and technological disasters. Under time and task pressure, and as more and more decisions are required of an organization, decision making tends to become more decentralized, and informal organizational “work-arounds” develop to overcome formal organizational barriers. People work longer and harder, often outside their formally-designated areas of expertise. Of course, this is not to say that DOT ceased to be a bureaucracy because it had to face the Y2K challenge. Rather, the organization kept the aspects of bureaucratic organization that worked best while at the same time adapting structurally and procedurally to encourage flexibility, initiative, and innovation.

DOT and its constituent agencies also increased their flexibility through extensive use of detailees who were reassigned to work on particular aspects of the Y2K problem. Through this recirculation of staff and expertise, the Department took advantage of the skills of a wide range of agency personnel. Besides helping achieve particular Y2K-related goals in a more timely fashion, the use of detailees also facilitated information flow and the transfer of know-how across operating agencies and helped break down intra-organizational barriers.

Other organizational strategies were instituted specifically to enhance accountability. In a strategy designed to ensure the reliability and validity of its information, DOT used its own Inspector General’s office to track and check the veracity of progress reports that were being provided to Congress, OMB, the President’s Council, other agencies, and the general public, DOT used its own Inspector General’s office to track and check the veracity of the information that was being provided by various entities within the Department. These validity checks were crucial for ensuring that when DOT went on record as having met particular Y2K milestones, the Department could say with considerable confidence that those targets had in fact been met, because actions had been independently documented by the Inspector General’s staff. As one interviewee noted approvingly:

...when we talked with an operating administrator about where they were, our IG came in right behind them and said “OK, here is what we found. We did not find that you tested this, or if you had, that you documented the test.” ...when we got our quarterly reports, we could always say to the Deputy Secretary, “Here are our findings”, as agreed to by the IG. They even sent what he called a “comfort letter” every quarter to him, telling him what their concerns were. No other agency did that.

Y2K readiness efforts were helped considerably by the fact that, as outside scrutiny and public concern increased and as the magnitude of the problem began to be more widely recognized, significant resources were made available to DOT to deal with the problem. Once Congress and the Executive Branch decided to make transportation readiness a key priority, DOT and its major operating administrations were well-positioned to request additional funding to fulfill their missions.

Rather than having to find funds within its existing budget to cover Y2K-related expenditures, the Department was able to take advantage of special funding opportunities that became more abundant as public and Congressional concern continued to rise. While the bulk of the funds were used for

Y2K remediation, key response-related expenditures, such as the purchase of an emergency generator for the Crisis Management Center at DOT headquarters, which had not been authorized in the past for other types of emergencies, were approved as part of Y2K preparedness efforts. As one modal administration after-action report noted:

The Department's Y2K activities were well funded and staffed. Congress's emergency appropriation for Y2K provided us with the additional necessary funds to ensure that we could meet our aggressive remediation schedules, test our work, and plan for contingencies. Without this augmentation of existing budgets, our remediation work would have been jeopardized; testing greatly curtailed; and contingency planning limited.

While funds alone would not have ensured adequate Y2K readiness in the absence of senior management commitment and leadership, lack of funds would have made readiness impossible to achieve. An influx of funds into the Department also made it possible to hire consultants specifically to work on Y2K-related problems. Consultants often teamed up with detailees from around the Department who had been reassigned to Y2K readiness tasks, which again added to the overall knowledge and skill base.

***Resources were also crucial:***

*While funds alone would not have ensured adequate Y2K readiness in the absence of senior management commitment and leadership, lack of funds would have made readiness impossible to achieve.*

In addition to providing emergency supplemental funds to meet Y2K-related needs, Congress also passed the Year 2000 Information and Readiness Disclosure Act. The Act was considered by some interviewees to be problematic along some lines because of the perception that it might hamper enforcement efforts. However, having such legislation in place did help DOT outreach efforts by removing liability issues surrounding the sharing of Y2K readiness information among private sector entities.

### **Changes and Improvements Resulting from Readiness Efforts**

*DOT remediation, preparedness, and response activities were effective. Moreover, they produced tangible outcomes and improvements that have applicability well beyond the computer problem they were originally developed to address.*

Because of the very extensive and intensive efforts that were made to remediate internal systems in the years and months leading up to December 31, 1999, DOT and its various administrative agencies at both the federal and sub-federal levels were successful in mitigating potential Y2K-related systems problems. Through its extensive efforts to prepare for whatever disruptions might occur during the New Year rollover period and at other critical dates, the Department was also poised to respond to any difficulties that might have developed with the transportation infrastructure, including both hardware and software problems and disruptions caused by natural disasters, cyber-terrorism, and other threats. Particularly during that last year, DOT teams had undertaken a large-scale effort to ensure that the Department would be able to monitor the status of the various modes that comprise the transportation system, respond effectively to disruptions, and play its role in whatever federal response activities would need to be undertaken. That effort involved developing formal intra- and inter-organizational plans, working out elaborate "wiring

diagrams” in order to enhance communication and coordination, and conducting a series of intensive drills, exercises, and planning sessions that included hundreds of participants. Additionally, DOT’s outreach efforts to the transportation sector had a significant positive impact on the Nation’s overall level of readiness. Recent estimates indicate that as many as 14,000 employees took part in some aspect of the Department’s remediation and preparedness efforts.

Those efforts proved to be highly successful. There were no significant difficulties experienced in the mission-critical systems for which DOT is responsible, and the transition to the year 2000 was smooth and relatively uneventful. Additionally, on the whole the American public appears to have been satisfied with the manner in which DOT and other federal agencies approached the Y2K challenge, as evidenced by survey data that suggested declining levels of public concern with the Year 2000 problem as 1999 drew to a close. The high level of public confidence in the performance of the transportation infrastructure was a very important outcome of Y2K readiness efforts.

Social scientists have long recognized that, like other social activities, organizational procedures and practices can have a wide range of outcomes, including consequences that were never intended and never desired. For this reason, researchers often make a distinction between the *manifest* and the *latent* functions that a particular activity serves. In this context, the term manifest function is used to refer to the *planned or intended* outcomes of social activities or policies, while the latter term, latent function, refers to *unintended or unanticipated* consequences of those same activities. Latent functions may be positive or negative; indeed, it may be the case that the unintended or latent consequences of a set of activities may actually undermine its manifest goals. For example, a governmental program may encourage behaviors among its intended beneficiaries that actually undermine program objectives. Latent consequences may, in other words, be *dysfunctional* for the program as a whole.

In this particular case, DOT’s Y2K readiness efforts have led to a number of positive consequences, many of which were intended and some of which were probably not originally foreseen by those who took part. What follows is a discussion of some of the more important manifest and latent functions the Y2K readiness effort served. The discussion is based both on the interviews and focus group sessions that were conducted with DOT personnel and on detailed after-action reports that sought to identify what the agencies that comprise DOT learned as a result of its readiness activities. The key outcomes highlighted include: changes in the areas of technology awareness; identification of mission-critical systems; continuity of operations planning; internal information-sharing; relations with industry and the general public; recognition of leadership in the identification of best practices; and enhanced emergency management capability.

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| <p><b><i>Tangible Outcomes and Improvements</i></b></p> <ul style="list-style-type: none"><li>• <i>Department-wide technology awareness</i></li><li>• <i>Mission-critical systems and business continuity plans</i></li><li>• <i>Information-sharing</i></li><li>• <i>Improved relations with industry and the public</i></li><li>• <i>Recognition for developing best practices</i></li><li>• <i>Enhanced crisis management capacity</i></li></ul> |
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### **Department-wide Technology Awareness**

A number of interviewees noted that through its efforts to get ready for Y2K DOT gained a better understanding of its own technology infrastructure, and likely enhanced its ability to use technology constructively in the future. As noted earlier, the modal administrations within DOT differ considerably in the size of their technology budgets, the age of their systems, the kinds of technological resources they control, and how they manage technology, with the Federal Aviation Administration and the Coast Guard accounting for by far the largest share of DOT's technological resources. Y2K required DOT to inventory and systematically review its technology assets, and then to follow up with large-scale replacement and remediation programs. It also forced the Department and its agencies to confront major issues of system and process incompatibilities, both within and across operating administrations. As one DOT staffer put it, "there was really no definite idea of where or how compatible we were technologically among agencies and departments before this." When attention was focused on those problems, it became clear that there was tremendous variation, both in terms of reliance on technology and in terms of the hardware and software that were being used. It also became clear that existing and new technologies had not been used to the extent that they could have been by many entities within the Department.

Having a better grasp of technology, how it was being used, and how it could be used both elevated the importance of technology within operating agencies and raised awareness about risks and vulnerabilities associated with technology. As one interviewee noted:

...the management of IT has been pushed into the front office of the organization, so to speak. It's viewed no longer as strictly the techies, the computers. It's the key to responsibility for the highest level of management, highest level of leadership...we have a much better handle now on what the full range of our technology is. As a corollary to that, what the risks are to our organizations...I think after Y2K we're going to be still better at the whole range of configuration management. I think that will improve still further.

In a related vein, Y2K readiness efforts gave DOT personnel an even greater appreciation for the benefits associated with the use of more advanced technologies in daily work activities. As agency personnel stepped up their readiness efforts, they relied extensively on technological aids such as e-mail to communicate, coordinate, and disseminate information. Indeed, given the time constraints and the number of people who were involved in Y2K planning, it would arguably have been impossible to achieve coordination without such tools. And as we discuss in more detail below, as a consequence of the Y2K threat, the Department and many of its modal administrations relied more than ever before on the World Wide Web as a mechanism for communicating with the public. Many of those who participated in remediation, planning, and response activities came out of the experience with a new appreciation for technology and how it can help agency performance on a daily basis. As one interviewee noted, the emphasis on technology that was a part of Y2K readiness efforts highlighted ways in which technology can be used to help the DOT perform its missions in other areas:

....better use of the World Wide Web to do our business, to improve service to the American public and to also improve internally how we communicate using the web and e-mail...there's a lot of stuff that you can do on the web and Internet, and we've got all that stuff, but we have not exploited it the way we really should as a

technology-oriented organization...[we need] to figure out what is it that is demanded in terms of what the employees of this department want, what kind of content do we need to have out there, who is going to update that content and make it interesting and current, who is going to invest in the various components of the infrastructure, so all of that is going to demand an inter-modal team to work together to figure out how to make this department much more web-based, web-centric, as opposed to paper-centric like we are right now.

An after-action report prepared by one of the modal administrations noted that as a consequence of Y2K:

*Our hardware and software platforms are the most current technology they have ever been. With these tools, the staff has improved its productivity, discovered new ways of doing business with others and upgraded its skills. We have also expanded our agency contacts.*

### **Mission-Critical Systems and Business Continuity Planning**

Like many other organizations in both public and private sectors, the agencies and administrations within DOT were required to identify and assess their mission critical systems in order to undertake Y2K remediation and preparedness efforts. And like many other organizations, as a result of that activity, they learned a great deal about their own operations and how those operations should be prioritized. For example, in one of its after-action reports, one key operating agency noted that as a result of Y2K “[for] the first time [the agency] has a centralized inventory of all systems, and a published prioritization as to their criticality to operation and management of the organization.”

This was also true with respect to the continuity of operations and business continuity planning that was required for Y2K. These detailed analyses of how operations would be maintained in the event of Y2K-related disruptions and the plans that were developed for those situations went far beyond any previous Department efforts. Business continuity planning activities were undertaken both internally--within DOT’s modes--and externally, with industry partners. That is, in addition to undertaking efforts to ensure its own continued operations, DOT also engaged in extensive outreach to regulated industries, pressuring and cajoling those industries to put more effort into their own planning. As a staff member in one DOT branch observed:

We came in with the BCCP for Y2K and all of a sudden we knew what our core business functions were...Not only that, we said now what risks do these things face, technology-wise or whatever, power or whatever? What would we do to mitigate those risks?... What do I have to do that I can’t live without?...And if there is a failure, how am I going to operate? They had never done that before.

For perhaps the first time, DOT needed to consider in a systematic way how continuity of operations would be ensured if a Y2K-related event caused disruption at its own headquarters or at the facilities of one of its major operating agencies. And DOT officials recognized that the planning that was undertaken for Y2K could well prove useful for other types of emergencies, including

security threats ranging from cyber-terrorism to garden-variety hacking.

This is not meant to imply that business continuity and contingency planning had never been undertaken prior to the Department's recognition of the Y2K problem. Such planning was extensive, particularly in agencies such as the FAA and the Coast Guard and in the aviation and maritime industries more generally. What made the Y2K planning effort so distinctive was its focus on core business practices and mission-critical systems, its high degree of detail, its emphasis on how different activities and processes related to one another, and the more open exchanges of information that accompanied the BCCP process. As one interviewee observed with respect to FAA and the aviation industry:

Every group, to some extent, especially the operation people, have contingency plans for their facilities...They've got a lot of contingency plans. They keep them to themselves, they're not public, and nobody knows anything about them...What we tried to do was to build on that foundation and create contingency plans at the business process level...We got people from each of the lines of business together, people who actually do the processes, and facilitated them creating risk matrices at a higher level. If this entire process fails, what do we do to get information out to other people? How do we process payroll checks at a higher level?...Several products came out of it, such as an inventory of systems, an inventory of interfaces between systems.

### **Information-Sharing**

As the interview quote immediately above suggests, sharing knowledge and information is an ongoing challenge in DOT, just as it is in any large bureaucratic organization. DOT is both extremely large and highly differentiated internally, and when the Department, its constituent agencies, and its organizational clients--which number in the thousands--are considered, it is easy to see why a great deal of useful information remains compartmentalized, rather than widely disseminated. The nature of ongoing operations is such that people have few opportunities--and often no real reason--to gain a broader understanding of knowledge and practices developed in other parts of the Department. Y2K planning facilitated extensive intermodal contacts and information sharing, both through OAT and through other activities, such as the extensive emergency preparedness initiative that was carried out as part of the readiness effort.

Speaking specifically about the OAT, for example, one interviewee observed that:

How it [the OAT] functioned was it brought the modes together so that the FAA and the Coast Guard and Highway and all those folks could hear what others were doing. And the effective part of it was, I think, on a number of levels. One was the intelligence-gathering aspect of it...But it also allowed other modes to see what we were doing, so it was sharing those practices and it just helped us along in our assessment...I just remember picking up again and again little tidbits of things that would be good ideas for us to do in [name of administration], but came from other players.

## **Improved Relations With Industry and the Public**

To a very significant degree, DOT acted as a catalyst for change and took a leadership role in promoting Y2K readiness among the industries with which it has contact. Y2K outreach efforts brought many units of DOT into more intensive contact with industry partners, and they also strengthened already-existing ties. As part of its efforts to stimulate readiness among all transportation modes, the Department brought together industry stakeholders of all types, including major trade associations and unions, for meetings, conferences, and Y2K strategy sessions. With respect to airlines and airports, for example, one interviewee noted:

We got them together, talked about the issues that were important to them. Right out, we asked what we can do to help. They asked for examples of contingency planning. We approve their contingency plans, but they wanted to know 'How do we update our contingency plans for Year 2000?' ...And so I gave some presentations there. It seemed to increase their confidence and gave them a voice. We did good facilitating at both meetings, wrote down all the issues, tried to address them and get back to the trades with answers.

Similar activities took place in the other modes. For example, among its various outreach activities, the Federal Railroad Administration convened three special Y2K workshops in 1998 and 1999. These workshops were attended by participants representing numerous stakeholders, including representatives from the Association of American Railroads and Class I Railroads, Amtrak, the American Short Line and Regional Railroad Administration and several of its members, the American Public Transit Association, the Railway Progress Institute, commuter rail lines, unions, various other branches of DOT, and other Federal agencies. Ongoing contacts were maintained with a very large number of organizations in both the passenger and freight rail system through site visits, regional conferences, and other outreach activities, and information on Y2K-related activities was disseminated to industry and the public via the World Wide Web.

These kinds of contacts, which helped to cement relationships between DOT and the private sector, were often very different from typical agency-industry relationships, which sometimes tend to be distant or strained, particularly when issues like regulatory compliance and safety are involved.

As Y2K came to be seen as a common enemy that DOT and the private sector were confronting together, this sense of common mission contributed to a broadening and improvement in public-private sector relations.

Similarly, although the entire citizenry indirectly benefits from DOT's work on a daily basis, the Department has a tendency to remain somewhat distant from the general public. As DOT was required to disclose ever greater amounts of information about its own readiness, and in particular as DOT became a focal point for the collection of worldwide data on the Y2K status of all transportation modes, the Department and its constituent agencies also came to be seen by the public as a key source of information on transportation readiness. Ordinarily content to stay in the background, DOT began increasingly to "go public" with what it knew about Y2K remediation and preparations, not only through its regular reports to Congress, but also through press conferences and other mechanisms for disseminating information to the mass media, as well as through web-based strategies, such as the "FLY2K" web site. That site, which was widely publicized when it was

launched, became a major source of information for the public, and the existence of the site also motivated air transportation-related entities around the world to update their own Y2K readiness information.

Rumors and exaggerated concern about threats typically grow when the public lacks accurate information. By improving its relationships with industry and the general public and by serving as a conduit for Y2K readiness information, DOT helped counter rumors and distorted information that were circulating as December 31 drew near. Its information dissemination efforts also helped strengthen public confidence in government's ability to manage the Y2K problem.

### **Recognition for Leadership With Respect to Best Practices**

In a similar vein, the Department's aggressive efforts to enhance industry and national capacity to cope with Y2K led it to assume a position of recognized worldwide leadership in Y2K readiness. This was particularly true for DOT's largest operating agencies, FAA and the Coast Guard. Both agencies are now recognized for the large impact they had on worldwide efforts to manage the Year 2000 problem. For example, the Coast Guard convened conferences involving all elements in the maritime transport mode, including ports and national and international shipping organizations. It also organized a major international meeting in London that involved a number of key entities in the international maritime industry, and it developed a standard of "best practices" for Y2K readiness that was adopted very rapidly by the International Maritime Organization as a worldwide standard. Indeed, one interviewee described the speed with which the IMO responded to the leadership on Y2K demonstrated by the Coast Guard as "unprecedented." The FAA achieved a comparable level of recognition throughout the aviation industry for the development of its "Green Book," which provided detailed guidance on Y2K remediation, as well as for taking a leadership role in encouraging the worldwide air transportation industry to make Y2K planning a major priority.

### **Enhanced DOT Crisis Management Capacity**

Starting in late 1998 and early 1999, DOT, like many other public and private-sector agencies, began stepping up its efforts for the Y2K rollover. This effort to strengthen DOT's crisis management capability took place both within key operating administrations, such as the Coast Guard and the FAA, as well as at the Department-wide level within the Office of Emergency Transportation (OET). DOT is, of course, no stranger to crisis, emergency, and disaster preparedness and response. The Coast Guard, the FAA, and other operating administrations undertake planning activities of various kinds to ensure their ability to respond to emergencies that affect the modes over which they have jurisdiction, and both the Coast Guard and the FAA maintain an around-the-clock state of crisis readiness. Prior to its involvement with Y2K, DOT already had very significant emergency and disaster management responsibilities, both in terms of agency response to natural and technological hazards affecting transportation systems and with respect to DOT's involvement in ESF #1 of the Federal Response Plan. OET's Crisis Management Center (CMC) had been activated to assist with the coordination of DOT response activities in several major disasters.

DOT built upon and extended this crisis management capability in order to cope with the very special circumstances surrounding Y2K. Those circumstances included the need to coordinate

with a broad group of federal agencies and with the Information Coordination Center that had been set up especially for the New Year's rollover; to monitor the status of numerous elements in the US and international transportation system; to be prepared to evaluate and respond to any emergencies that might develop; and to provide accurate and timely information to upper DOT management in the midst of unprecedented media and public scrutiny.

Working in concert with entities such as the OAT, with personnel from key operating administrations, and with consultants and detailees, OET took several steps to address these needs. First, a systematic effort was made to *collect baseline data* on the nature and frequency of transportation system disruptions during normal times. Ideally, the baseline assessment could serve as a point of comparison for failures and disruptions that could occur during the rollover period. For the first time, the Department gained a basic understanding of the kinds of difficulties the different transportation modes experienced during non-crisis periods, which could provide a context for assessing potential Y2K problems.

OET also took the initiative to engage consultants who could provide DOT with *computer software* that would be capable of providing real-time information on the status of transportation systems during the rollover period. The most important of these systems, the Activation Information Management (AIM) system, was a customized version of an emergency management software tool that had been developed by E-team, a crisis management consulting organization. While information on problems with transportation modes is routinely collected by the Department and its modal administrations, the new AIM software reporting system differed in several ways from non-Y2K reporting protocols. First, its scope was broad and multimodal, simultaneously encompassing literally thousands of different modal entities in a single reporting system. Second, the system was designed to collect not only data on problems and disruptions but also information on which elements in the transportation infrastructure were not experiencing difficulties. Third, it was designed to serve as a mechanism for the centralized collection of data that could be evaluated and then relayed to Department policymakers and to Federal coordinating organizations like the ICC. The operation of the AIM system required an intensive and ongoing effort to collect, record, and transmit data, including data indicating that activities were progressing normally. Within the system, the color codes "green," "yellow," and "red" were used to indicate the status of various modal elements.

As part of its efforts to prepare for the New Year rollover, OET took the lead in developing *emergency plans*, providing very extensive *training*, and conducting a series of *exercises*. The Y2K emergency plans that were developed included both documents pertaining to intra-departmental operations and plans focusing on DOT's role in Federal response management. As noted earlier, the plans that were developed were very detailed, incorporating both detailed instructions on roles, responsibilities, schedules, and complex "wiring diagrams" specifying how communication and coordination would proceed during the rollover period. The development of formal crisis-management plans was also accompanied by actions taken to ensure continued operation of the CMC in the event of Y2K-related problems in Washington, such as the acquisition of a generator that could provide backup power in the event of a loss of power to the facility housing the Center.

Nearly two dozen different exercises were undertaken in order to prepare departmental personnel for the responsibilities they were expected to carry out during the period of CMC

activation. Training and exercises covered various aspects of CMC crisis-period operations, including the use of the AIM software. Notably, among the exercises that were conducted were three *special “executive-level” exercises* in which modal administrators and members of the departmental leadership took part. A number of those contacted for this study emphasized the positive impact these efforts to involve high departmental management in emergency planning had on the overall success of Y2K readiness activities. Not only were modal administrators actively engaged in preparing for a major emergency--and for some, this was their first experience with crisis planning--but their involvement also signaled to others in the Department that Y2K was being assigned a very high priority by the Department’s top leadership.

*“We started creating an emergency response organization that’s more department-centered.”*

*“It was a good dress rehearsal and walk-through for what a major crisis would entail.”*

Both the interviews that were conducted and the various reports that were reviewed for this study point to longer-term benefits that could result from these very extensive planning activities. Included among those potential benefits are:

- improved readiness for major natural disasters, particularly disasters that are regional in scope and that simultaneously affect several different modes of transportation;
- improved readiness for other potential threats, including those posed by terrorism and bio-terrorism;
- overall improved ability to effectively respond to Presidential and other directives focusing on critical infrastructure protection;
- a status-monitoring software system that, although certainly not without flaws, does provide a basis for real-time assessments of transportation system problems and capabilities, both during normal times and in emergency situations;
- greater visibility for DOT’s role in the management of major crises affecting the Nation’s population and civil infrastructure
- greater awareness on the part of both high- and middle-level management of the overall importance of emergency preparedness and effective crisis management

Along these same lines, both Y2K preparations and the actual New Year’s weekend activation moved DOT further toward conceptualizing emergency preparedness and response as a Department-wide, as opposed to a modally-based responsibility, because they required the various entities within DOT to interact and coordinate with one another to a much greater degree than they typically do. As one interviewee noted:

We started creating an emergency response organization that’s more department-

centered...I think had things turned out more seriously, some of our tools and processes would have worked pretty well for us. But it was sort of new to interact with [other modes and DOT headquarters] in that way. It might be a value to pursue that and see where that might take us.

Similarly, after noting how preparing for Y2K enhanced the Department's appreciation of the crucial role of information technology in its operations, another official emphasized that:

The other area where we are getting long-term benefit and institutionalizing is in the emergency response world. Our execution of the actual transition wasn't by any means perfect...[but] it was a good dress rehearsal and walk-through for what a major crisis would entail, so we are using the lessons there to say we need to improve our capability...We are spinning off that to our long-term responsibilities for continuity of operations and the like. While I am not in any way looking forward to any crisis that might occur in the next period of time, we at least now know where to go and what to do and what some of the issues will be in making it work.

Of course, Y2K readiness and response activities were not an unalloyed triumph for all participating individuals and administrations. Committing enormous amounts of resources, time, and energy into a single initiative can clearly have a downside, and both interviews and reports have raised the possibility that, in addition to having many positive effects, the Y2K readiness process may also have had latent dysfunctional consequences. Clearly, the intense focus on Y2K meant that many other departmental and agency priorities had to be delayed. As was pointed out earlier, detailees and consultants were a critical element in helping DOT cope with Y2K, but most have subsequently departed or been reassigned, taking their knowledge and experience with them. Questions have been raised about whether the Department was excessive in its search for problems to solve and whether Y2K readiness efforts could have been less thorough and intensive and just as effective.

Study participants also noted that there were many things about departmental emergency operations during the rollover period that could have been improved. For example, while many found the AIM software valuable, others saw problems. As one agency after-action report noted, "AIM is an excellent tool in providing real-time incident information. However, operational rules such as reporting time should have been clear and consistent." Others worried about inconsistencies in operating administrations' understandings of reporting criteria, problems with formatting and the manner in which information was gathered, and other issues. Even though steps were taken to facilitate the free flow of information among the various modal entities within the Department, there were still barriers to information-sharing that created friction during the emergency activation period. Additionally, both interviewees and modal administration reports pointed to the need to physically modify and improve OET's Crisis Management Center. As one after-action report stated:

The CMC facility itself was quite inadequate for monitoring the Y2K rollover. The room was crowded and over-heated. The facility needs to be expanded significantly...The heading, ventilating, and air conditioning also needs a significant upgrading.

On the whole, however, the information sources consulted for this study concurred that the benefits that accrued from efforts to meet the Year 2000 challenge--both those that were intended and those that developed as unanticipated byproducts of readiness efforts--far outweighed any problems or dysfunctional consequences that resulted. More broadly, there was general agreement that Y2K readiness efforts made a major contribution to furthering the Department's ONE DOT vision. Indeed, many of those consulted for this report considered the Year 2000 planning and response initiative to be an outstanding example of the ONE DOT philosophy in action and a model that can be used again in the Department's efforts to address problems such as infrastructure security.

As we have noted throughout this report, DOT is an organization that is subject to numerous centrifugal forces. Rather than operating with very strong central direction, DOT has a federated structure in which responsibility for a large share of the Department's work resides within modal administrations. ONE DOT efforts have centered on overcoming these centrifugal tendencies, achieving a common sense of mission throughout the Department, and enhancing intermodal communication and coordination. Y2K readiness activities clearly contributed significantly to these efforts. However, despite all that was achieved, centrifugal forces remain extremely strong within the Department, and, as discussed in the section that follows, DOT needs to act rapidly in order to profit from and institutionalize the lessons it learned through managing the Y2K problem.

### **Building on Y2K Successes to Better Manage Future Threats**

*Unless decisive steps are taken to preserve and institutionalize practices, products, knowledge, and organizational strategies that were initiated in response to the Y2K problem, both DOT and the Nation risk losing those benefits.*

Previous sections of this report discussed how Y2K posed a unique threat to DOT (and other public and private sector organizations) because of its scope and complexity, described how various external political pressures and internal initiatives combined to enhance DOT's response to the challenge, and outlined numerous tangible benefits that the Department gained from its Y2K readiness activities. As described in previous sections, the Department's Y2K effort represented perhaps the largest and most sustained ONE DOT initiative to date. Because Y2K posed a potential threat to the entire transportation infrastructure, it highlighted the interconnectedness of the Nation's (and the world's) transportation systems, and made it abundantly clear that mitigation, preparedness, and response activities needed to be closely coordinated. As a result, DOT's Y2K readiness effort demanded extensive cross-modal communication and coordination coupled with close interaction and cooperation with industry partners. Despite the fact that various agencies within DOT have different missions, funding sources, publics, and cultures, the Department's handling of Y2K convincingly demonstrated the value of the ONE DOT approach to problem solving.

The next challenge DOT faces is developing ways to institutionalize the positive changes that resulted from its Y2K readiness effort in order to ensure that the Department and the Nation continue to benefit from those changes. Doing so will not be an easy task. Research suggests that disasters--or in this case a potential disaster--frequently provide organizations and communities with "windows of opportunity" to implement needed changes. However, research also shows that those windows

typically close quickly. As demonstrated by DOT's experience with Y2K, crisis situations require organizations to become flexible and adaptive in order to be capable of responding to an extremely uncertain, continually changing environment. DOT adapted to the Y2K challenge by altering its existing organizational structure and developing new structures when needed. In terms of the former, staff members took on new Y2K-related tasks--in many cases in addition to their regular activities--that brought them into contact with individuals from other modes with whom they do not ordinarily interact. In terms of the latter, the OAT was formed, which became a central and crucial component of the department's approach to Y2K. The dilemma for organizations is that changes made in response to a threat or crisis are often short-lived--that is, they are temporary alterations designed to meet specific needs at a particular time. In some instances, however, ephemeral, crisis-period changes can have longer-term implications for the organization. For example, an organization may decide to institutionalize certain changes that improve its operations or enhance its capacity to respond to future crises.

*The Department's handling of Y2K convincingly demonstrated the value of the ONE DOT approach.*

When they attempt to institutionalize temporary alterations to their structures and/or cultures, however, organizations like DOT face numerous challenges. Because stability, predictability, and continuity over time are defining characteristics of large, complex bureaucracies, major barriers must be overcome in order for temporary changes to become permanent features of an organization. In particular, organizations that have altered in some way to meet the demands of a crisis situation must confront the "normalcy bias" characteristic of the post-crisis time period. In the wake of a major crisis, there is a strong tendency for individuals, groups, and organizations to quickly return to pre-crisis patterns of interaction and functioning. While crisis-period changes may clarify goals and facilitate activities during that time period, organizations and individuals show a clear preference for structures and interactions that are familiar to them.

In both individual interviews and focus group discussions conducted for this study, DOT employees expressed major concerns about the organization's ability to institutionalize the numerous positive outcomes of the Y2K effort. For many of them, Y2K activities were added on to their regular responsibilities, and now that the event has passed they are focusing their efforts on bringing projects that had to be suspended up-to-date. With their tasks completed, detailees and consultants have also discontinued Y2K activities within DOT. And the OAT, which emerged to facilitate communication and coordination among the different modal administrations within DOT and between those agencies and industry partners, has disbanded.

With the threat of Y2K disruptions gone and the gradual fading of new structures and patterns of interaction within DOT, there will be a very strong tendency for the organization to resume functioning as it did prior to Y2K. As one of the agency after-action reports suggested, "Ultimately, without additional effort (and funding), behavior will return to 'normal'--life will go on in much the same manner it did before Y2K." The same report goes on to say that:

...by their nature large organizations react to problems, and now that Y2K has passed, the tendency will be for this experience to pass. Further, even if 'institutionalized,' such institutional structures tend to fossilize because the focus is on past issues, not future ones.

As one respondent indicated, in the absence of an issue like Y2K, “Unless there is a need for us to come together, we probably don’t and won’t.” A participant in one of the focus group discussions expressed similar concerns about DOT’s ability to institutionalize positive outcomes, saying, “Well, changing cultures is really tough...I don’t know how they do it.” Another respondent, concerned about the difficulties associated with making temporary alterations permanent, suggested that DOT’s Y2K activities may have represented “...a blip in the continuum of inertia that’s inherent in a bureaucracy.”

Some respondents were also concerned that because Y2K passed with no major transportation incidents the institutional memory of the organization will quickly fade and positive structural and cultural changes within DOT will give way to pre-Y2K patterns. As one respondent said, “Because Y2K was so successful, because there were no problems, it has immediately gone into the back part of people’s brains.” Similarly, a participant in one of the focus group discussions expressed doubt that Y2K will have lasting impacts on DOT operations because “...this was such a boring weekend and you know, why worry, we could probably handle almost anything because, well, look how well we did in Y2K.” That would, of course, be drawing precisely the wrong lesson from the Department’s efforts to manage the Year 2000 problem. The concern of these respondents and others is not just for the longevity of internal DOT changes; they are equally concerned that improved relations between DOT agencies and various industry partners will also be short-lived.

As discussed in previous sections of this report, Y2K was unique in its scope and complexity, its ability to focus the attention of virtually the entire world on a single threat, and its time-certain nature. Absent a similar event in the future, DOT faces the challenge of resisting the normalizing forces described above and developing new and innovative ways to sustain the momentum created by Y2K in moving toward ONE DOT. The interviews, focus group discussions, and documents reviewed for this study all concur that DOT’s Y2K readiness effort was a success due to strong leadership and guidance from OST, availability of adequate resources and funding to address the issue, and the immovable time frame for making necessary changes. While it is not likely that the Nation and DOT will confront another threat with the same characteristics as Y2K, there are things DOT can do to balance its strong tendency to adhere to routines and ensure that structural and cultural changes resulting from Y2K are institutionalized within the organization. Consistent with the ONE DOT approach, these initiatives should involve strong leadership, encourage team-building approaches to problem solving, and facilitate cross-modal interaction where possible. In the sections that follow, we discuss changes that need to be institutionalized in two main areas: information technology management and investment and emergency operations management.

***To capitalize on Y2K, DOT should:***

- Continue to invest in information technology*
- Continue to strengthen DOT’s emergency management capabilities*

### **Information Technology Management and Investment**

DOT experienced marked improvements in its IT infrastructure as a result of its Y2K readiness activities. Agencies within the Department have upgraded computer systems, eliminated outdated hardware and software, and achieved consistency in computing and communications. However, without a strategic and budgeting plan to maintain those systems and without adequate funding, the Department and its modal administrations risk losing the gains they have made as new

technologies emerge to replace existing ones. As one respondent said of the technological gains in one DOT administration:

...we are current, but we would sure like to stay that way, whether it is the user or the IT community, because the technology is changing so fast and the applications are changing so fast or the approaches to the applications are changing so fast. We are fearful, I think, from strictly a user perspective that we are going to look in three years and be where we were again in '97 and '98.

Concerned that technological advances made by DOT in its Y2K readiness effort may quickly dissipate, another respondent emphasized that:

...we have to take some firm action. I mean, we have to put in place the mechanisms and we also need to sell the administrators the idea that, in fact, IT is critical to their business, as opposed to a back-room function. And, again, I think we've used the Y2K experience to remind them that this is what we found that IT is critical to their missions and their daily business.

Speaking about the need to sustain IT gains that have been made, a third interviewee cautioned that:

Several products came out of it, such as an inventory of systems, an inventory of interfaces between systems. That's the good news. The bad news is, unless you put in place a process for updating that list at the same time you create it, it disintegrates over time.

As this report and DOT after-action reports document, Y2K started as an IT problem and later evolved into a core management issue. During that process, the IT function within DOT underwent change in three significant ways. First, IT became much more visible to management personnel as a central component of DOT. As one interviewee observed, for example, the CIO finally got a place at the table and was able to influence the organization. Clearly, the acknowledgment of IT as a core business function resulted in a recognition of the value of IT managers as well as an awareness of how much IT actually contributes to Department productivity. Second, the IT managers within DOT coordinated and collaborated in an unprecedented manner. This level of interaction was required for Y2K success, but it also resulted in a general sharing of expertise in IT project management and planning. Finally, Y2K provided an opportunity for a significant investment in IT hardware and software. Agencies that lagged technologically brought many of their systems up to date under the umbrella of Y2K, providing a consistency of computing and communications capability across the Department that had not existed prior to the Y2K threat.

Despite these positive outcomes, DOT has not yet undertaken policy or budgetary initiatives that will institutionalize these gains. Y2K investment funds were provided outside of the normal agency budgetary process, and much of the IT technical project work was carried out by augmentees since the Y2K readiness effort did not result in the addition of permanent positions. The recognition of IT leadership and the coordination between agencies was necessary to achieve Y2K preparedness. Unless specifically addressed as policy, budgetary, and management issues, these gains could easily be lost.

## **Management of Emergency Operations**

Y2K furnished a powerful external force that moved the modal administrations that make up DOT toward the ONE DOT goal advocated by Secretary Slater and Deputy Secretary Downey. As stated in this report and in DOT after-action reports, Y2K was a date certain, external threat, and the resulting top management attention and resource availability contributed to a successful collaborative effort. Once the external force generated by Y2K was removed, however, the historical centrifugal tendencies of the DOT returned. As stated earlier, the agencies have different publics, different funding sources, different legislative authorities, different organizational cultures, and vastly different resources. Without management intervention, the ONE DOT gains obtained through Y2K will quickly dissipate.

An increased priority for emergency and crisis management is a potential counter to these centrifugal forces. If DOT takes continuity of operations planning, critical infrastructure protection, and its emergency support role under ESF #1 seriously, then collaborative planning, joint exercising, and information sharing should continue to be encouraged and supported. Other collaborative mechanisms may be the continuation of some of the ad hoc committee structures created by Y2K. The OAT, the emergency subcommittee of the OAT, and the DOT working group linking external stakeholders with modal emergency managers all are candidates for continuation in some form. All three groups provided benefits to DOT far beyond the information exchanged at their meetings. The relationships established in these groups, which were essential to DOT's response to the Y2K challenge, could be critical element to the evolution of a ONE DOT culture.

A major advance in DOT's emergency management operations that came from Y2K is the AIM system, which tremendously enhanced communication and information sharing across modes during the Y2K rollover. With its capacity to log near real-time information on the status of the Nation's entire transportation infrastructure, the AIM software should have utility far beyond the event for which it was adopted. Its monitoring capabilities could prove useful for the Department in preparing for and responding to a wide range of future events, including large-scale regional natural disasters, major protest events in cities across the country, disruptive terrorist incidents, and cyber-terrorist activities. Interviews, documents, and focus group discussions all show that the AIM system was perceived to be among the most important benefits of Y2K readiness and that it should be maintained and used in a wide variety of contexts. As one respondent said, "I think AIM, not AIM in and of itself but that technology, is crucial and they need to institutionalize that for all kinds of emergencies." According to another respondent:

I think the AIM database is a really good tool...It was very amazing to me to think that we would, at any one time, kind of have our finger on the pulse of the transportation infrastructure in this country. That's an amazing thing, and it would be a shame for it to all go away....It turned out we really didn't have a disaster, but had we had one, it would have been an extremely useful tool.

Emergency management operations are increasingly relying on computer technologies to identify and monitor hazards and respond to disasters. The AIM system enhances DOT's capacity to utilize new technologies in its own emergency management functions. If DOT continues to give priority to emergency management, the AIM software can be applied to and tested in a wide variety

of crisis situations.

To sustain the momentum toward a ONE DOT culture that Y2K generated, at least four policy issues will need to be addressed. The first issue concerns the role of OET as the departmental emergency coordinator. OET, currently located within RSPA, is the DOT link to FEMA, and it also coordinates DOT support of the Federal Response Plan under Emergency Support Function #1. OET's role in DOT naturally parallels FEMA's lead for Y2K consequence management under the FRP. The Office coordinated the acquisition of the AIM software, the development and supervision of management-level table top exercises, and the activation of the CMC during the Y2K rollover. It also represented the Department on key interagency preparedness and response coordinating groups.

Because OET was clearly operating with the full support of the Secretary and Deputy Secretary, other entities within DOT were cooperative and supportive. Under "normal" emergency operations, however, the major operational agencies are not coordinated by OET through the CMC, and they do not look to RSPA for leadership. The Coast Guard operates the National Response Center as the coordinating center both for its own operations and for all operations conducted under the National Response Plan. The FAA also operates a full time operations center. The location of the OET within RSPA places it at best in a peer relationship with these larger operational agencies. Without very high-level support, it is doubtful that the organizational attention paid to OET will continue as the Y2K focus fades. As a participant in one of the focus group discussions pointed out:

...OET is still run by RSPA. OET has got a response and recovery function [but] what OET becomes and who they work for, I think, would help make these changes more lasting. Working for a RSPA administrator is a lot different from working for a Deputy Secretary.

Crisis management is inherently a top management function. In its current organizational position and with its current staffing pattern, OET may well lack both the ability to speak authoritatively for the Secretary and the power to pull agencies together to focus on emergency management goals. Its situation is somewhat analogous to the circumstances in which state and local emergency management units find themselves when they are "nested" within other agencies, such as fire services or police departments, rather than being directly connected organizationally to the local or state executive office. Research supports the notion that emergency management works more effectively when those activities are accorded a higher degree of visibility and importance. For this to occur within DOT, the crisis and emergency management function must be closely coupled with and accountable to top Department management.

There appear to be several possible ways of achieving this objective. One would be to relocate OET and its readiness and response functions to the Office of the Secretary of Transportation. Another option would be to relocate and reconfigure OET as a joint program office bridging multiple crisis-relevant modal administrations, perhaps using the Intelligent Transportation Systems Joint Program Office as an organizational model. A third option would be to retain OET's current organizational position within RSPA. There may well be other approaches that would enhance OET's visibility and authority while building on existing organizational strengths, but regardless of which option is chosen, OET will need additional resources to carry out its mission effectively. Even more important, it will have to be made clear, as it was during Y2K, that the OET

is undertaking its disaster management roles and responsibilities with the full support and authority of the Office of the Secretary.

A second emergency preparedness policy issue that has emerged in the aftermath of Y2K centers on the need to clarify boundaries and coordination requirements between OET and the Office of Intelligence and Security (S-60) in the Secretary's office. OET is responsible for coordinating natural disaster planning under the FRP, as well as for continuity of operations and contingency planning, while S-60 is responsible for critical infrastructure protection and counter-terrorism planning. The overlaps are obvious: terrorism can clearly affect continuity of operations, natural disasters can cripple elements in the transportation infrastructure, and weapons of mass destruction cross all boundaries. During the Y2K planning process, the emergency management subcommittee of the OAT handled coordination very effectively. The personal and organizational relationships formed as a consequence of subcommittee activities served DOT well and should be nurtured.

A third important set of organizational issues involves the identification and retention of emergency management best practices within DOT. The Coast Guard has a well-deserved international reputation for its ability to coordinate the response to maritime disasters, its extensive experience in contingency planning, and its skills in formulating and carrying out emergency exercises. Similarly, the FAA has successfully managed the airspace response to major aviation disasters. Y2K provided an opportunity for OET to draw on this expertise, demonstrate its own planning and coordinating skills, and use the CMC to facilitate the development of these skills in all agencies. However, without the support of the Secretary, Deputy Secretary, and other members of upper DOT management, this process will not continue.

Finally, as a result of DOT's Y2K readiness activities, the Secretary was able to monitor the status of the Nation's entire transportation infrastructure. This capability may well prove invaluable in some future national crisis. However, like other Y2K-related advances, this capability requires ongoing support. As one study participant indicated:

One of the interesting phenomena that took place here during that whole New Year's weekend was that for the first and only time in the history of this Department there was in one place knowledge about how the transportation system was operating. I think that was good. I think that should be continued.

However, that same individual went on to observe, "I am not sure that others in the Department would agree. I am not sure that Congress would agree. I am not sure that industry would agree." As these comments suggest, while the Department vastly increased its information-gathering and analysis capabilities, a consensus has not yet developed on how those capabilities might be used--or even if they are actually needed. For example, modes have different regulatory and oversight authorities supporting the collection of different kinds of information from the private sector, and they view their infrastructural monitoring responsibilities differently. These responsibilities range from the FAA's real-time monitoring of the national air space to the Department's grant-giving agencies' focus on historical data rather than real-time information. Agencies collect and store information in different formats, and they have different thresholds for reporting. Y2K forced the creation of common information-gathering procedures and protocols within the Department, and the Information Disclosure Act provided the protection necessary for

private sector stakeholders to share information with the federal government.

Since historical data on system interruptions do not exist, the evaluation of deviations from normal operations required not only a detection of anomalies but also an understanding of the daily incidence of accidents and interruptions in the various transportation modes. The use of the AIM software in the CMC made this type of information available to the Secretary on a near-real-time basis. This capability (and the national capability established at the ICC) was phased out after Y2K.

However, DOT readiness for counter terrorism and critical infrastructure protection will undoubtedly require some permanent enhancements to its ability to monitor the status of the transportation infrastructure. The assignment of this responsibility and the source of permanent funding required to maintain that capability are open issues.

In conclusion, the data reviewed for this report clearly suggest that DOT reaped significant benefits as a consequence of its experience with Y2K. These benefits are far-reaching, encompassing improvements to the organization's technological infrastructure, increased cross-modal communication and collaboration, a deeper understanding of the interconnectedness of the Nation's transportation systems, heightened awareness of the various risks faced by the Department's modal administrations, improved continuity of operations planning, stronger relationships with the private sector, and wider recognition of the role of emergency management operations within the Department's structure. These changes, which stemmed directly from DOT's Y2K readiness efforts, are consistent with the ONE DOT approach advocated by the Secretary, and they demonstrate the value of that approach. DOT is now faced with making crucial decisions in order to sustain the positive outcomes generated by those efforts.