FAA AT RISK: YEAR 2000 IMPACT ON THE AIR TRAFFIC CONTROL SYSTEM

JOINT HEARING

BEFORE THE

SUBCOMMITTEE ON GOVERNMENT MANAGEMENT, INFORMATION, AND TECHNOLOGY

OF THE

COMMITTEE ON GOVERNMENT REFORM AND OVERSIGHT

AND THE

SUBCOMMITTEE ON TECHNOLOGY

OF THE

COMMITTEE ON SCIENCE

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FAA AT RISK: YEAR 2000 IMPACT ON THE AIR TRAFFIC CONTROL SYSTEM

WEDNESDAY, FEBRUARY 4, 1998

HOUSE OF REPRESENTATIVES, SUBCOMMITTEE ON GOVERNMENT MANAGEMENT, INFORMATION, AND TECHNOLOGY, COMMITTEE ON GOVERNMENT REFORM AND OVERSIGHT, JOINT WITH SUBCOMMITTEE ON TECHNOLOGY, COMMITTEE ON SCIENCE

Washington, DC.

The subcommittees met, pursuant to notice, in room 311, Cannon House Office Building, Hon. Stephen Horn (chairman of the Subcommittee on Government Management, Information, and Technology) and Hon. Constance A. Morella (chairwoman of the Subcommittee on Technology) presiding.

Present: Representatives Horn, Morella, Sessions, Davis of Virginia, Gutknecht, Maloney, Gordon, and Stabenow.

Subcommittee on Government Management, Information, and Technology staff present: J. Russell George, staff director and chief counsel; John Hynes and Bob Alloway, professional staff members; Matthew Ebert, clerk; and Mark Stevenson, minority professional staff member.

Subcommittee on Technology staff present: Richard Russell, staff director; Michael Bell, staff assistant; Jeff Grove and Ben Wu, professional staff members; and Mike Quear and Jim Wilson, minority professional staff members.

Mr. HORN [presiding]. A quorum being present, the joint hearing of the Subcommittee on Government Management, Information, and Technology and the Subcommittee on Technology will come to order.

Our subcommittee began hearings on the year 2000 computer problem in April 1996. We have continued to raise the issue in hearing after hearing, a series of press conferences, progress report cards from A to F, and grades for each Cabinet agency, and even letters and personal conversations with the President by the ranking Democrat on the committee, as well as myself.

We have repeatedly called on the White House and the President to establish a high-profile, governmentwide leader to coordinate the Federal year 2000 effort. We now have word from the President's office that this is finally going to happen. A task force called the President's Council on the Year 2000 Conversion will be headed by John Koskinen. Mr. Koskinen is the former Deputy Director for Management at the Office of Management and Budget, and very respected by Members on both sides of the aisle and on this subcommittee. We're delighted that the President has recognized the

importance of this issue, and we eagerly welcome Mr. Koskinen to the effort.

When he arrives on the job, he will find some good news and some bad news. The good news, to use that trite expression, is that progress is being made. Some agencies, such as the Social Security Administration, will probably be ready in time. After all, Social Security began its conversion in 1989. The bad news is that other agencies, such as the Federal Aviation Administration, will probably not be year 2000 compliant before the immovable deadline now less than 23 months, just 695 days away.

We are here today to encourage the FAA to work harder. We must insist that the FAA meet its publicly announced schedules. We will help in any way we can to improve the productivity of the FAA in fixing and testing its year 2000 problems. Only executive leadership in the Government, in Transportation, and in the Federal Aviation Administration can provide the necessary organization, management, and leadership to solve the problem before us.

The General Accounting Office has pointed out in its report that the FAA has not met the administration's schedule for several milestones. Each agency was expected to complete a full assessment of its computer systems by July 1997. The FAA reportedly finished this assessment just 3 days ago. This degree of schedule slippage is of grave concern. I want to learn why it has occurred in the past to be convinced that it will not occur in the future. I'm skeptical about tigers that change their stripes. How can I believe today's FAA schedules when previous FAA schedules have been so far off?

The numbers here are very large. As of February 2, according to the FAA's own account, there are 430 mission-critical systems, and 305 of them are in need of repair. So far, only 22 systems, or 7 percent of the total, have been fixed, tested, and implemented—leaving the other 93 percent still undone.

Is the FAA schedule for fixing these systems realistic? Are the skilled people available? How much will this cost? I know these are difficult questions to answer because the FAA only finished its assessment 3 days ago, but they must be answered.

Systems testing is always a problem because you can never be sure that you've found all the bugs—only 99 percent of them. The FAA has an especially difficult testing problem. How do you thoroughly test a nationwide system as large and as complex as the air traffic control system while it is still running every day with thousands of flights coming and going?

I know the FAA considers safety the No. 1 issue. In fact, I think safety is the No. 1, No. 2, and No. 3 issue at FAA. I believe that the pilots, airlines, air traffic controllers, and the FAA will keep flights grounded unless they are absolutely sure it is safe. I'm told that the mantra in the airline industry is, quote, "when in doubt, ground it." And as a frequent flyer, every other week, from Los Angeles to Washington and then back to Los Angeles, I strongly agree with that policy, even if it means that I sit on the ground occasionally. That never bothers me.

However, I want to know what capacity the FAA can sustain without its sophisticated computer systems. If the FAA has to run portions of the air traffic manually; if the FAA does not finish fix-

ing all of its 430 mission-critical systems; what percentage of capacity can the FAA support? For 1 month? For 3 months? What contingency plans has the FAA developed for manual operation? What percentage of capacity can the FAA sustain, and for how long?

I look forward to the testimony of today's experts and FAA officials to help Congress answer these critical questions. This afternoon, as a common panel, we will hear from Joel Willemssen, the Director of the Accounting and Information Management Division, General Accounting Office, Congress' audit and program audit arm; Ken Mead, Inspector General, Department of Transportation; and Jane Garvey, Administrator, Federal Aviation Administration. She is accompanied by Richard Boe, Acting Manager of the FAA Year 2000 Program Office; and, finally, an outside consultant, Stanley Graham, a senior management consultant, vice president, Tech-Beamers Inc.

I now yield to the ranking minority member, Mrs. Maloney of New York.

Mrs. MALONEY. Thank you, Mr. Chairman. I'd like to thank you and the chairlady for calling this joint hearing.

The image of planes falling out of the skies because we've been unable to solve a simple computer problem is one that none of us wants to entertain. I am pleased that we will be receiving assurances today that planes will not be falling out of the skies. However, thousands of Americans may be inconvenienced for days or weeks or months if the air traffic control system cannot handle the load, and that is unacceptable.

This week President Clinton announced that John Koskinen is returning to Government as a Special Assistant to the President. He will be leading the administration's effort to make sure that critical systems governmentwide are repaired before the year 2000 arrives. I have worked with Mr. Koskinen before in the past. He is an excellent administrator, and I thank the President for bringing in a person of his calibre for this assignment.

I might note that Chairman Horn and I called upon the President, through Executive order, to create a czar to oversee the year 2000 problem, and he has responded with disappointment. It is also my understanding that Sally Katzen will be working with Mr. Koskinen on this project. That, too, is excellent news. Ms. Katzen, who served as Administrator of the Office of Information and Regulatory Affairs, is known for her ability to get things done, and I am sure that her involvement in this project will be a positive force change in getting it done. I only hope that they will put the FAA on the top of their list of agencies that need help and they need to get on the right schedule.

The General Accounting Office report and the testimony from the Inspector General are extremely disturbing. Both indicate that things are seriously behind schedule at the FAA. I am, however, pleased that the IG is pushing for a June 1999 completion date. That seems to me is a much safer target than the November 1999 date in FAA's original plans. All of you experts who have testified before us have said that you should allow 6 months for thorough and complete testing.

The year 2000 problem at the FAA is a symptom of a much deeper problem throughout the Government: the inability of agencies to modernize their computer systems. Computer modernization in the FAA has been a problem for some time now, and they are not alone. The IRS has failed repeatedly their attempts to upgrade its systems, and this morning we read in the papers that the latest architect of computer modernization at the IRS has resigned. I hope that Mr. Koskinen will turn his attention to this fundamental problem. If we cannot upgrade the computers at the FAA, the IRS, and Social Security, and the Health Care Financing Administration, which runs Medicare, we face extremely serious consequences, even more so than the year 2000 problem ever posed.

Again, I thank the chairman for calling this hearing, and this is one, I might add, of a series of hearings that Mr. Horn has called, and he has kept a scorecard on agency response. Unfortunately, most of the agencies have failed in their ability to get modernized, and we are glad that he is focusing today on the FAA.

Thank you.

Mr. HORN. I thank the gentlewoman, and now am delighted to yield to a very distinguished colleague, who is the chair of the Subcommittee on Technology of the House Committee on Science. Mrs. Morella is co-chairman of this hearing, and she and her staff are to be commended for their cooperation and work with our staff.

So the gentlewoman from Maryland.

Mrs. MORELLA. Thank you. Thank you, Mr. Chairman.

Good afternoon, and welcome to the sixth in a series of hearings that the Technology Subcommittee has held on the year 2000 computer problem, and this is the fourth time that we've had the pleasure of working cooperatively with our colleagues from the Government Reform and Oversight Committee's Subcommittee on Government Management, Information, and Technology, led by Chairman Steve Horn, and the ranking member, Carolyn Maloney.

Today's hearing focuses on the efforts of the Federal Aviation Administration to address the effects of the year 2000 problem on its computer and information systems. We have all read recent newspaper accounts describing the catastrophic potential of the year 2000 problem on passenger and cargo air transport. While these disastrous possibilities may hold true unless immediate corrective action is undertaken, I think it's very important to underscore that I believe it is a capacity issue and not a safety issue. The flying public should be assured that the year 2000 problem will not endanger the safety of passengers in the air.

If the mission-critical components of our Nation's aviation are not year 2000-compliant, aircraft will simply not be authorized to leave the ground. I'm confident that the FAA and the industry will not take any risks that could jeopardize aviation safety. While safety may not be an issue, the economic of an FAA Y2K failure could be significant.

As we'll soon hear from the General Accounting Office and the Department of Transportation Inspector General, the FAA's response to the year 2000 problem has been fragmented and slow. While I'm encouraged by recent efforts, it is clear that this problem only now is receiving the urgent priority it deserves from the highest levels in the agency.

As a result, the FAA is just discovering the full extent of the year 2000 problem by completing an assessment of their systems, a step that the Office of Management and Budget suggested should have been completed over 8 months ago. I regret to say that historically the FAA's track record for completing large computer and software-intensive projects has been very poor.

The year 2000 project, however, is one project that must not fall behind schedule. With less than 23 months to go until the relenting deadline of January 1, 2000, the FAA is quickly running out of time. It's absolutely critical that the agency proceed expeditiously to complete critical renovation, validation, and implementation activities on schedule. At the same time, we must also face the serious possibility that the FAA will not meet its new ambitious schedule. For this reason, the FAA must also develop plans for this contingency.

Yesterday the House considered H.R. 1271, the FAA Research Engineering and Development Act of 1997, and included in the legislation was a provision from my subcommittee regarding a sense of Congress urging the FAA to give high priority to correcting the year 2000 problem in all of its computer systems, and to develop a plan and budget to correct that problem. The legislation also requires the agency to develop contingency plans in the event that certain systems are unable to be corrected in time. I'm pleased to inform everyone that that bill has cleared both the House and the Senate, and is right now on the President's desk for his signature.

Now while the FAA, as well as the rest of the Federal Government, scrambled to assess and fix the year 2000 problem, the lack of leadership and coordination on this issue from our Nation's Chief Executive has been keenly felt. I can't help but wonder if the FAA would not currently be in their difficult position if they originally had the benefit of the President's direction and oversight.

My good friend from California, Congressman Horn, and I, and our ranking members, have been holding hearings on this important issue now for over 2 years. We've insistently and consistently called for the establishment of a senior-level official to coordinate the Federal Government efforts and for an Executive order vesting that official with the power to hold agencies accountable, and to make correcting the problem a top agency priority. Despite these warnings and pleas from Congress, the President and the administration neglected to take action on this important issue.

Now in the past few days, we've seen signs from the White House that our recommendations may not have fallen completely on deaf ears. Although a formal announcement has yet to be made, we understand the White House will soon be officially designating the year 2000 czar to direct national efforts to address this problem. I understand it will be, as has been mentioned, John Koskinen, whom we all have a great deal of respect for. I also understand the President will be issuing that Executive order in the very near future. We welcome these actions by the President. We know that they're necessary to substantially enhance our Nation's ability to correct the year 2000 problem in a timely and effective manner.

This afternoon at this hearing we're going to examine the FAA's year 2000 strategy and plan, the progress the FAA has made in ad-

dressing the problem, the time table and schedule for completing corrective actions. We're also going to seek to identify exactly who within the organization is responsible for directing and managing the agency's year 2000 efforts. And, finally, we're going to explore the contingency plans being developed in the Draconian event that repair or replacement efforts are not completed for all systems by the year 2000.

I am pleased that we have with us, as has been mentioned, a very strong panel of committed witnesses concerning the FAA's ability to address the year 2000 problem. The fact that the administrator of the FAA is before our subcommittees suggests that the year 2000 problem will receive a higher agency priority in the future. I wish to thank her, the other members of our distinguished, for joining us here today.

I would like to now recognize the ranking member of the Technology Subcommittee, Mr. Bart Gordon, for any opening comments, and thank him for the work that he and the subcommittee have done on this problem.

Mr. GORDON. Thank you, and I want to add my welcome to everyone who's joined us for the hearing today.

Today, we will hear testimony about FAA's efforts to address the year 2000 problem. Because FAA is responsible for maintaining the national air safety system, this hearing isn't about FAA's progress in assessing, reviewing, and converting thousands of lines of computer code. For the FAA industry and the American public, the year 2000 problem is an issue of safety and economics.

In order to maintain the safety of our air traffic control system, there cannot be any unexpected air traffic control glitches at midnight January 31, 1999. It is imperative that the FAA and the airline industry identify all possible problems before the year 2000, and I have every confidence that they will identify every potential Y2K problem by then. I don't believe that the FAA or the airline industry will allow airplanes to fly, if there is a year 2000 problem that would compromise the public safety.

However, I feel less confident about the FAA's ability to renovate and test all of its systems before the year 2000 deadline. FAA's current schedule allows for no slippage. If FAA falls behind, we could find the national airspace capacity reduced until the computer systems were repaired and tested.

The economic impact would be tremendous. In 1996, more than 582 million flew on American carriers. Airlines carried more than 17 million metric tons of freight, and there were more than 22,500 daily departures. American airline carriers employ half a million Americans, and had a net profit of $2.8 billion a year. That's a snapshot in 1996.

Between now and 2000, FAA estimates that domestic departures will increase by 7 percent. Any reduction in capacity by the national airspace would have a dramatic impact on the U.S. economy. One only has to look back at the UPS strike to imagine just a few of the consequences.

Also, the year 2000 problem, as it affects air traffic and transportation, is not just a U.S. problem. This problem must be addressed and coordinated on a worldwide basis. It's my understanding that such coordination is only now just beginning, and that many coun-

tries have not even started addressing the year 2000 computer problem.

Currently, GAO is working on a request I made to have them report on international awareness, international meeting, and progress on addressing this problem. I would urge the FAA to take a more active and vigorous role in working with other countries.

During this hearing I want to focus on three questions. The first: FAA's track record is poor in producing or procuring new computer systems and software-intense programs online. What specific steps does the FAA need to take to meet the ambitious schedule for its year 2000 program.

Second, in order to meet the year 2000 challenge, the entire aviation industry must be involved and thousands of interfaces must be checked. What level and type of coordination must FAA do with private industry to ensure the smooth transition of fixing the Y2K problem, and what are the overall test strategies and plans that involve all these non-FAA stakeholders?

And, finally, what are the international implications of the year 2000 problem for air traffic? What specific actions need to be taken, and what contingency plans need to be drafted? I agree with the Inspector General's assessment, that it is not too late to fix the problem. However, FAA must have better and stronger management and must work with a sense of urgency. Given the public's reliance on air traffic, air travel, and the critical safety function of the air traffic control system, failure is unacceptable.

I want to thank the witnesses for appearing before the subcommittee today, and I look forward to listening to your comments.

Mr. HORN. I thank the gentleman, and I now wish to yield for an opening statement to the gentleman from Texas, Mr. Sessions, a very active member of the Subcommittee on Government Management, Information, and Technology. Mr. Sessions.

Mr. SESSIONS. Mr. Chairman, thank you. My comments will be very brief.

First of all, let me welcome the panel that is before us today. What you are hearing from us on this side is what I believe is serious and I think we're trying to treat the matter as such, and I believe that we're looking to you for the answers. We are all in receipt of the GAO's report. I believe we're all concerned.

I will tell you that I don't think in any way we can put ourselves in your shoes. We're looking for you to solve the matter, but what we're looking for today is for you to be forthright with us, and also to let us know about the things that are roadblocks to you implementing what you need. I hope that your testimony today—I know it will be truthful, but I hope that you will be candid with us also.

In particular, as chairman of the Results Caucus, I had two members of the Results Caucus who were working with the FAA, Representatives Jon Fox and Pat Danner, who are trying to work carefully with the FAA to implement their own computer problems that they have throughout the agency. I would like to say that they are intensively interested in what you're going to say today in addressing not only these Y2K problems, but also the other computer problems that beset the agency.

So, I come here today looking forward to hearing from you, and want you to know that the people on this side of the dais are in-

tensely interested in you being successful. We'll ask tough questions. That's our job, but we're also interested in knowing what we can do to be of benefit to you, so that the safety of our skies is apparent to all travelers and the American public.

Thank you, Mr. Chairman.

Mrs. MORELLA. I'd now like to recognize the vice chair of the Technology Subcommittee of the Science Committee, the gentleman from Minnesota, Mr. Gutknecht.

Mr. GUTKNECHT. Thank you, Madam Chairwoman, and I'll be brief as well. I certainly don't want to be redundant to what my colleagues have said, but I think we do need to underscore the importance of this hearing and the importance of this issue.

I also want to remind members, as well as the people who are here for this hearing today, that we have been having hearings on the year 2000 problem for several years, and at first I think it was difficult to get people to take this whole issue seriously. I feel a little bit like Will Rogers, and, you know, Will Rogers said, "All I know is what I read in the newspapers." And what I read in the newspapers today is not good.

Let me just read the first sentence of a story which appears in today's USA Today: "The Federal Aviation Administration is so far behind in its efforts to fix the year 2000 computer glitch that half the Nation's air fleet may have to be grounded during the earliest days, weeks, or months of the new millennium."

Now that's a pretty alarming statement, and as Will Rogers said, "All we know is what we read in the newspapers." I think we have to be honest with ourselves. We are looking down the barrel of a potential disaster, but unlike hurricanes and earthquakes, we know exactly when this disaster is going to arrive, and more importantly, that it can be averted.

And I would echo the statement of Mr. Sessions: We want to be constructive, but we also want to make it clear that, on behalf of the general public, the traveling public, we have to ask some tough questions, and we have to absolutely insist that real action is being taken by the FAA. As was said earlier, we have not always been very pleased with the speed, I guess I'd have to say, of the reforms that have been taking place at the FAA. We hope that we get good answers today, but I can guarantee you that, on behalf of the Science Committee, we're going to continue to press on this issue because we believe it's a very serious matter—as I say, a disaster that can be averted.

Thank you, Mr. Chairman.

Mr. HORN. I thank the gentleman.

If the witnesses will rise and raise their right hands, we will swear you in. Do we have all the witnesses there? Now those that accompany you, Administrator, are they going to speak at all? Because if they are, I'd just as soon swear them in.

Ms. GARVEY. They are available to answer questions.

Mr. HORN. Why don't we get them all at once? Come forward to the table, those that are going to speak.

[Witnesses sworn.]

Mr. HORN. You all have affirmed.

Now will the gentlemen behind you give us their names for the recording here, so we know who has been sworn in. We only have

two of you on the list, and that's Mr. Gray and Mr. Boe. So we assume they were there. Mr. Gray is which? And Mr. Boe?

Ms. GARVEY. Actually, they are not here. The FAA representatives are——

Mr. HORN. OK, let's just announce the names of who's sworn in, so we have it.

Mr. LONG. I'm Raymond Long.

Mr. HORN. OK. Can you get a microphone?

Mr. LONG. Surely. I'm Raymond Long with the FAA.

Mr. BELGER. And I'm Monte Belger with the FAA.

Mr. HORN. I'm sorry, I couldn't hear the last part.

Mr. BELGER. Monte Belger, B-E-L-G-E-R.

Mr. HORN. Yes, and there was the identification?

Mr. BELGER. With the Federal Aviation Administration.

Mr. HORN. OK. Who else?

Mr. DEGAETANO. Dennis Degaetano, also with the FAA.

Mr. HORN. OK. Anybody else?

Ms. LENG. Rebecca Leng with Office of the Inspector General.

Mr. HORN. OK. Anybody else?

Mr. RHODES. Keith Rhodes, General Accounting Office.

Mr. HORN. OK, those are the ones that will be permitted to testify, and we will now begin with one of our favorite witnesses, and that's Joel Willemssen, the Director of the Accounting and Information Management Division, the General Accounting Office. Mr. Willemssen.

STATEMENT OF JOEL WILLEMSSEN, DIRECTOR, ACCOUNTING AND INFORMATION MANAGEMENT DIVISION, GENERAL ACCOUNTING OFFICE

Mr. WILLEMSSEN. Thank you, Mr. Horn, Mr. Chairman, Chairwoman Morella, Ranking Member Maloney, Ranking Member Gordon. Thank you for inviting us to testify today on FAA's efforts to address the year 2000 computing crisis. As requested, I'll briefly summarize our statement.

The challenge before FAA in resolving its year 2000 problem is huge, given how critical information systems are to FAA operations. Unfortunately, FAA's progress in meeting this challenge and in making its systems ready for the year 2000 has been too slow. The agency has been severely behind schedule in completing basic awareness and assessment steps. Delays in completing awareness and assessment leave FAA with relatively little time for essential renovation, validation, and implementation activities—activities that we and others consider to be more difficult and time-consuming than awareness and assessment.

In particular, we believe it's imperative that FAA devote the necessary time and resources to test its fixes. As a report being released today points out, FAA's delays are cause for serious concern and can no longer continue. Such delays are further magnified by FAA's poor history in delivering promised system capabilities on time.

It's becoming increasingly clear that FAA's ability to ensure the continued operations of the National Airspace System could be compromised if systems are not changed. For example, FAA's organization responsible for air traffic control told us 2 days ago that

84 of the 209 mission-critical systems it initially assessed were likely to result in catastrophic failure if they were not renovated and tested. FAA assures that it plans to fix these systems.

As FAA completes its system assessments, it faces difficult decisions about to renovate or replace its systems. One significant example is the Host computer system, for which IBM has reported that it has no confidence in the ability of the micro-code to survive the date change, and therefore, has recommended that the FAA purchase new hardware.

FAA is now considering both assessing the micro-code and purchasing and implementing new hardware. While this may be a reasonable approach to help ensure success, the purchase of new hardware carries its own set of risks—risks that must be mitigated in a short period of time.

Overall, should FAA not succeed in making its systems year 2000-compliant, the domino effect on others could be far-reaching. At a recent meeting with FAA, airline representatives explained that flights could not even get off the ground on January 1, 2000, unless the FAA was substantially year 2000-compliant.

Given the many hurdles that FAA faces and the limited amount of time left, planning for contingencies and for operational continuity through the turn of the century becomes even more urgent. We plan to issue an exposure draft of a guide later this month to assist agencies in performing necessary contingency planning for the year 2000 crisis. Among other things, such planning lays out the specific steps and detailed actions required to re-establish capability for mission-critical operations in the event of prolonged disruption, failure, or disaster.

Despite the risks that FAA faces in reaching year 2000 compliance, we are encouraged by some recent events. For example, it's evident that the Administrator has now made year 2000 a top priority. Further, FAA has agreed to implement all of our recommendations. In addition, we're starting to see pockets of more aggressive action in some segments of FAA. Nevertheless, FAA's delays to date and the massive nature of the task at hand put the agency at great risk. Therefore, it's important that the Congress continue its oversight to help ensure that FAA makes it in time.

That concludes a summary of my statement. I'd be pleased to address any questions that you may have.

[The prepared statement of Mr. Willemssen follows:]

Ms. Chairwoman, Mr. Chairman, and Members of the Subcommittees:

We appreciate the opportunity to testify on the Federal Aviation Administration's (FAA) efforts to address the Year 2000 problem--a situation in which systems could malfunction or fail because the "00" in the year 2000 may be indistinguishable from the "00" in 1900 unless these systems are modified or replaced. With only 696 days remaining until January 1, 2000, federal agencies must act now to ensure that critical systems continue to operate. There may be no more urgent federal information systems priority.

Hundreds of critical FAA computer systems make its operations possible; without these specialized systems, FAA could not effectively control air traffic, target airlines for inspection, or provide up-to-date weather conditions to pilots and air traffic controllers. However, many of these systems could fail to perform as needed when using dates after 1999, unless proper date-related calculations can be assured. The implications of FAA's not meeting this immovable deadline are enormous and could affect hundreds of thousands of people through customer inconvenience, increased airline costs, grounded or delayed flights, or degraded levels of safety.

FAA's progress in making its systems ready for the year 2000 has been too slow. At its current pace, it will not make it in time. The agency has been severely behind schedule in completing basic awareness activities, including establishing a program manager with responsibility for its Year 2000 program and issuing a final, overall Year 2000 strategy. Further, FAA does not know the extent of its Year 2000 problem because it has not completed key assessment activities. Specifically, it has yet to analyze the impact of its

systems' not being Year 2000 compliant, inventory and assess all of its systems for date dependencies, make final its plans for addressing any identified date dependencies, or develop plans for continued operations in case systems are not corrected in time. Until these activities are completed, FAA cannot know the extent to which it can trust its systems to operate safely using dates beyond 1999.

Delays in completing awareness and assessment activities also leave FAA little time for critical renovation, validation, and implementation activities--the final three phases in an effective Year 2000 program.[1] With under 2 years left, FAA is quickly running out of time, making contingency planning even more critical.

As our report being released at this hearing today makes clear, FAA's delays to date are cause for serious concern.[2] Given the rapid approach of the millennium, such delays can no longer continue. My statement today will examine (1) FAA's reliance on information processing, (2) where the agency stands today, (3) what remains at risk, and (4) what we recommend must be done to increase the likelihood that FAA systems will be Year 2000 compliant by January 1 of that year.

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[1]Year 2000 Computing Crisis: An Assessment Guide (GAO/AIMD-10.1.14, September 1997).

[2]FAA Computer Systems: Limited Progress on Year 2000 Issue Increases Risk Dramatically (GAO/AIMD-98-45, Jan. 30, 1998).

FAA DEPENDS ON INFORMATION PROCESSING TO FULFILL ITS MISSION

In ensuring a safe, secure, and efficient airspace system that contributes to national security and the promotion of U.S. airspace, FAA administers a wide range of aviation-related programs, such as those to certify the airworthiness of new commercial aircraft designs, inspect airline operations, maintain airport security, and control commercial and general aviation flights.[3]

Integral to executing each of FAA's programs are extensive information processing and communications technologies. For example, each of FAA's 20 en route air traffic control facilities, which control aircraft at the higher altitudes between airports, depends on about 50 interrelated computer systems to safely guide and direct aircraft. Similarly, each of FAA's almost 100 flight standards offices, responsible for inspecting and certifying various sectors of the aviation industry, is supported by over 30 mission-related safety database and analysis systems. Because of the complexity of these systems supporting FAA's mission, many of them are unique to FAA, not off-the-shelf systems that could be readily maintained by vendors.

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[3]General aviation flights are any civil aircraft operations not involving commercial activities.

FAA also has numerous, complex information processing exchanges with various external organizations, including airlines, aircraft manufacturers, general aviation pilots, and other government agencies, such as the National Weather Service (NWS) and the Department of Defense. Over the years, these organizations and FAA have built vast networks of interrelated systems. For example, airlines' flight planning systems are linked to FAA's Enhanced Traffic Management System, which monitors flight plans nationwide, controls high-traffic situations, and alerts airlines and airports to bring in more staff during busy periods. As another example, FAA facilities rely on weather information from NWS ground sensors, radars, and satellites to control and route aircraft.

It is easy to see, then, that should FAA systems not be Year 2000 compliant, the domino effect would be far-reaching. In fact, representatives of major airlines are concerned that even if their own systems are ready for the millennium, they could not fly until FAA's systems were Year 2000 compliant.

FAA's YEAR 2000 AWARENESS, ASSESSMENT WORK INCOMPLETE; EXTENT OF PROBLEM UNKNOWN

To assist agencies in resolving the Year 2000 problem, we have prepared a guide that discusses the scope of the challenge and offers a structured, step-by-step approach for

reviewing and assessing an agency's readiness to handle this challenge.[4] The guide describes in detail five phases, each of which represents a major Year 2000 program activity or segment. The first phase, awareness, entails gaining executive-level support and sponsorship and ensuring that everyone in the organization is fully aware of the issue. During this phase a Year 2000 program team is also established, and an overall strategy developed. The second phase, assessment, entails assessing the likely Year 2000 impact on the enterprise, identifying core business areas, inventorying and analyzing the systems supporting those areas, and prioritizing their conversion or replacement. Contingency planning is also initiated, and the necessary resources identified and secured.

FAA recognizes that the upcoming change of century poses significant challenges. It began Year 2000 problem awareness activities in May 1996, and within 3 months had established a Year 2000 product team and designated it the focal point for Year 2000 within FAA. A Year 2000 steering committee was also established. Since then, the product team and steering committee have conducted various awareness activities and have briefed FAA management. In September 1996 the product team issued the FAA Guidance Document for Year 2000 Date Conversion.

Yet FAA was late in designating a Year 2000 program manager and its initial program manager recently retired. FAA has not yet selected a permanent replacement and needs

[4]GAO/AIMD-10.1.14, September 1997.

to fill this position as soon as possible. Further, its strategic plan--defining program management responsibilities and providing an approach to addressing the millennium challenge--has yet to be made final. A draft of this plan was provided to the Administrator on December 1, 1997, and we understand that it is now being revised. Until an official agencywide strategy is available, FAA's executive management will not have the approved road map they need for achieving Year 2000 compliance. The lack of a formal agencywide strategy also means that FAA's program manager position lacks the authority to enforce Year 2000 policies. As a result, each line of business within the agency will have to decide if, when, and how to address its Year 2000 conversion, irrespective of agency priorities and standards.

Additionally, FAA's inventory of all information systems and their components is still evolving. According to a Year 2000 program official, FAA's inventory of 741 systems was completed on December 29, 1997. However, we have found that the inventory changed on at least three occasions since then and, by January 23, 1998, had reached 769 systems.

Other crucial tasks include an assessment of the criticality of the systems in the inventory, and deciding whether they should be converted, replaced, retired, or left as is. On January 30, 1998, we were told by a Year 2000 program official that all outstanding systems assessments were to be received that day, but that review and validation of these assessments would continue during February. Assessing the likely severity of

systems failures is crucial as well, yet FAA only recently began to examine the likely impact of Year 2000-induced failures; this assessment is due to be presented to FAA management this month, February 1998.

Without the thorough definition of a program's scope and requirements that only such inventorying and assessment can provide, cost estimates are uncertain at best, as the agency acknowledges. FAA's current Year 2000 program cost estimate of $246 million will likely change once the agency more accurately identifies its inventory and determines how it will go about making its systems Year 2000 compliant.

On the basis of our discussions with FAA personnel, it is clear that FAA's ability to ensure the safety of the National Airspace System and to avoid the grounding of planes could be compromised if systems are not changed. FAA's organization responsible for air traffic control reported that 34 of the 100 mission-critical systems it initially assessed were likely to result in catastrophic failure if they were not renovated. FAA plans to renovate all of these systems. As of January 30, 1998, assessments of another 140 mission-critical air traffic control systems were continuing.

The Host Computer System: Critical Information Processing Link

As FAA completes its systems assessments, it faces difficult decisions about how to renovate, retire, or replace its date-dependent systems. One of the most significant

examples is FAA's Host Computer System--the centerpiece information processing system in FAA's en route centers--which runs on IBM mainframe computers. Key components of the Host include its operating system, application software, and microcode--low-level machine instructions used to service the main computer. While FAA officials expressed confidence that they have resolved any date dependencies in the Host's operating system and application software, IBM reported that it has no confidence in the ability of its microcode to survive the millennium date change because it no longer has the skills or tools to properly assess this code. IBM has therefore recommended that FAA purchase new hardware.

Given these concerns, FAA--in an attempt to help ensure success and minimize risk--is considering moving in two directions simultaneously: It is continuing its assessment of the microcode with a plan to resolve and test any identified date issues, while at the same time preparing to purchase and implement new hardware, called Interim Host, at each of its 20 en route centers before January 1, 2000. Yet the purchase of new hardware carries its own set of risks--risks that FAA must mitigate in a short period of time. These are at least fourfold.

- First, Lockheed Martin, currently the Host software support contractor, will be responsible for porting the existing Host operating system and application software to the new hardware. This software conversion requires extensive testing to ensure that air traffic control operations are not affected. Unexpected problems in testing

and certifying the new system for use in real-time operations may also become apparent.

- Second, the Interim Host will have to be deployed concurrently with FAA's new Display System Replacement (DSR), compounding the risk of delays and problems. When upgrading parts of a safety-critical system such as the Host and DSR, it is simpler and safer to upgrade one part at a time.
- Third, deploying the Interim Host to 20 en route centers in less than 2 years will be very difficult. As a point of reference, FAA's Display Channel Complex Rehost took almost 2 years to deploy to just five centers.
- Fourth, by moving quickly to purchase the Interim Host, FAA may not be purchasing a system that best meets its long-term needs. For example, alternative mainframe systems may provide more communications channels--something the Host currently depends on peripheral systems to provide.

External Organizations Also Concerned About FAA Year 2000 Compliance

External organizations are also concerned about the impact of FAA's Year 2000 status on their operations. FAA recently met with representatives of airlines, aircraft manufacturers, airports, fuel suppliers, telecommunications providers, and industry associations to discuss the Year 2000 issue. At this meeting participants raised the concern that their own Year 2000 compliance would be irrelevant if FAA were not

compliant because of the many system interdependencies. Airline representatives further explained that flights could not even get off the ground on January 1, 2000, unless FAA was substantially Year 2000 compliant--and that extended delays would be an economic disaster. Because of these types of concerns, FAA has now agreed to meet regularly with industry representatives to coordinate the safety and technical implications of shared data and interfaces.

LITTLE TIME REMAINS FOR CRITICAL RENOVATION, VALIDATION, AND IMPLEMENTATION ACTIVITIES, PLACING JANUARY 1, 2000, READINESS AT RISK

One result of delayed awareness and assessment activities is that the time remaining for renovation, validation, and implementation can become dangerously compressed. Renovation, validation, and implementation activities are the three critical final phases in correcting Year 2000 vulnerabilities. Renovation involves converting, replacing, or eliminating selected systems and applications. Validation entails testing, verifying, and validating all converted or replaced systems and applications, and ensuring that they perform as expected. Implementation involves deploying, operating, and maintaining Year 2000-compliant systems and components. Contingency plans are also implemented, if necessary.

FAA has started to renovate some of the systems it has already assessed. However, because of the agency's delays in completing its awareness and assessment activities, time is running out for FAA to renovate all of its systems, validate these conversions or replacements, and implement its converted or replaced alternatives.

FAA's delays are further magnified by the agency's poor history in delivering promised system capabilities on time and within budget, which we have reported on in the past.[5] FAA's weaknesses in managing software acquisition will also hamper its renovation, validation, and implementation efforts.[6]

Given the many hurdles that FAA faces and the limited amount of time left, planning for operational continuity through the turn of the century becomes ever more urgent. To ensure the ability to carry out core functions, such planning defines assumptions and risk scenarios, operational objectives, time frames, priorities, tasks, activities, procedures, resources, and responsibilities. Such planning also lays out the specific steps and detailed actions that would be required to reestablish functional capability for mission-critical operations in the event of prolonged disruption, failure, or disaster. We plan to

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[5]Advanced Automation System: Implications of Problems and Recent Changes (GAO/T-RCED-94-188, Apr. 13, 1994); High-Risk Series: An Overview (GAO/HR-95-1, February 1995); and High-Risk Series: Information Management and Technology (GAO/HR-97-9, February 1997).

[6]Air Traffic Control: Immature Software Acquisition Processes Increase FAA System Acquisition Risks (GAO/AIMD-97-47, Mar. 21, 1997).

issue a guide later this month, in exposure draft form, to assist agencies in ensuring business continuity by performing necessary contingency planning for the Year 2000 crisis.

STRUCTURED, RIGOROUS APPROACH CAN REDUCE LEVEL OF RISK, BUT URGENT ACTION ESSENTIAL

FAA's delays to date put the agency at great risk. The coming millennium cannot be postponed, and FAA will continue to be hamstrung until all inventorying and assessments have been completed. Once the degree of vulnerability has been determined, a structured, five-phase approach with rigorous program management--such as that outlined in our assessment guide[7]--can offer a road map to the effective use of available resources, both human and financial.

But time is short. Should the pace at which FAA addresses its Year 2000 issues not quicken, and critical FAA systems not be Year 2000 compliant and therefore not be ready for reliable operation on January 1 of that year, the agency's capability in several essential areas--including the monitoring and controlling of air traffic--could be severely compromised. This could result in the temporary grounding of flights until safe aircraft

[7]GAO/AIMD-10.1.14, September 1997.

control can be assured. Avoiding such emergency measures will require stronger, more active oversight than FAA has demonstrated in the past.

Our report being released today makes a number of specific recommendations to increase the likelihood that FAA systems will be Year 2000 compliant on January 1 of that year.[8] In summary, we recommend that the Secretary of Transportation direct that the Administrator, FAA, take whatever action is necessary to expedite overdue awareness and assessment activities. At a minimum, this would include

- issuing a final FAA Year 2000 plan providing the Year 2000 program manager with the authority to enforce Year 2000 policies and outlining FAA's strategy for addressing the date change;
- assessing how its major business lines and the aviation industry would be affected if the Year 2000 problem were not corrected in time and using these results to help rank the agency's Year 2000 activities;
- completing inventories of all information systems and their components, including data interfaces;
- completing assessments of all inventoried systems to determine criticality and whether the system will be converted, replaced, or retired;
- determining priorities for system conversion and replacement based on systems' mission-criticality;
- establishing plans for addressing identified date dependencies;

[8]GAO/AIMD-98-45, Jan. 30, 1998.

- developing plans for validating and testing all converted or replaced systems;
- crafting realistic contingency plans for all business lines to ensure the continuity of critical operations; and
- developing a reliable cost estimate based on a comprehensive inventory and completed assessments of the various systems' criticality, and how their needs for modification will be addressed.

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Officials of both FAA and the Department of Transportation generally agreed with our findings, conclusions, and recommendations. FAA's CIO stated that FAA recognizes the importance of addressing the Year 2000 problem and plans to implement our recommendations.

This concludes my statement, and I would be pleased to respond to any questions that you or other Members of the Subcommittees may have at this time.

(511442)

Joel C. Willemssen

Mr. Willemssen is Director, Civil Agencies Information Systems, within GAO's Accounting and Information Management Division. In this position he is responsible for GAO's reviews of information technology management at many of the federal government's major departments and agencies, including the Departments of Agriculture, Education, Energy, Health and Human Services, HUD, Interior, Labor, Transportation, Veterans Affairs; and EPA and SSA.

Mr. Willemssen joined GAO in 1979, and since that time has participated in and led numerous computer systems reviews in a wide array of federal agencies. His evaluation experience is predominantly in assessing major modernization efforts, telecommunications, software management, performance evaluation, requirements management, acquisition approaches, systems maintenance, and business process reengineering.

Mr. Willemssen has received many awards throughout his career, including GAO's Meritorious Service Award. He received bachelor's and master's degrees in business administration from the University of Iowa, and has completed the executive level program in information systems at UCLA.

Mr. HORN. I thank the gentleman, and we will now move to the Inspector General of the Department of Transportation, Mr. Ken Mead. Welcome again.

STATEMENT OF KEN MEAD, INSPECTOR GENERAL, DEPARTMENT OF TRANSPORTATION

Mr. MEAD. Thank you, sir. Members of the subcommittees, let me summarize my statement.

We've been reviewing the Department's year 2000 progress since May 1997, and we've issued two reports. FAA has about 70 percent of the mission-critical systems in the Department of Transportation. About 90 percent of the year 2000 repair and renovation costs will be allocable to the FAA.

I don't think there are too many ways of saying this, but FAA got a very late start on fixing the year 2000 computer problem. In fact, it was not until about 6 months ago that FAA began addressing the year 2000 issue with a sense of urgency. I should hasten to point out that that is about the time Administrator Garvey took office.

FAA is way behind schedule on assessing which of its systems have year 2000 problems, determining what needs to be fixed, and testing and implementing solutions. The good news is that it is not too late. Strong central management and a continuing sense of urgency are absolutely the keys to success.

The assessment work identifying systems with the problems and diagnosing those problems is about finished, although it is 7 months after the target date specified by the Office of Management and Budget. Much of the assessment work on the air traffic control system was, in fact, completed this past week under intensive central management and a firm requirement established by the administration that the assessment work be finished by January 31.

I'd like to refer to a set of charts. You each have them in front of you, I believe. They're on page 6 and 7, respectively, of my prepared statement as well.

This first chart compares FAA's target dates with OMB target dates for addressing the year 2000 problem. I'd like to focus on the first one: the assessment.

The assessment date established by OMB was 6/97. FAA's target date was 1/98. They met it.

Moving to the bottom milestone, implementation, that refers to the date after which all problems have been identified, fixed, tested, fixed again, tested, and implemented. OMB's target date for the Government in general today is March 1999. FAA's date is November 1999.

I've been following this agency for nearly 12 years, and it's out of observations about their computer systems, their progress, and meeting milestones, that I would say that 11/99 is too close a call, and that it should be accelerated, if at all possible, to June 1999.

I'd like to refer to the next two charts. You can see that a large number of assessments were completed in just the last week. They're shown in red.

[The information referred to follows:]

YEAR-2000 PHASES AND TASKS	OMB TARGET	DOT TARGET	FAA TARGET	DOT COST (Includes FAA)	FAA COST
Assessment--Determine the Scope of Year-2000 Problems	6/97	8/97	1/98	$10M	$8M
Renovation--Fix Year-2000 Problems	9/98	9/98	12/98	$99M	$90M
Validation--Test the Fix	1/99	1/99	7/99	(Included Below)	(Included Below)
Implementation--Implement Year-2000 Compliant Systems	3/99	3/99	11/99	$74M --- $183M	$64M --- $162M

FAA's Status as of January 23, 1998

Organization	Mission-critical	Assessed	Approved by Quality Assurance	Year-2000 Compliant
Air Traffic Services	234	100*	86	86
Administrative	107	93	N/A	0
Acquisition & Research	48	26	N/A	0
Others	15	12	N/A	0
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Total - All FAA	404	231	86	86

* Estimated since actual statistics were not available.

FAA's Status as of February 2, 1998

Organization	Mission-critical	Assessed	Approved by Quality Assurance	Year-2000 Compliant
Air Traffic Services	209	209	171	125
Administrative	122	122	N/A	0
Acquisition & Research	84	80	N/A	0
Others	15	14	N/A	0
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Total - All FAA	430	425	171	125

Mr. MEAD. Between January 23 and February 2, the number of assessed systems by air traffic increased from 100 to 209. The number of assessments approved by the Quality Assurance Review Team increased from 86 to 171. Since FAA completed and approved a significant portion of those assessment and quality assurance reviews just in the past week, we haven't substantiated the accuracy of that, and our confidence in the results will be much greater when all the quality assurance reviews are done and we've had a chance to validate it.

But, as of February 2nd, FAA data shows that 125 systems were year 2000-compliant. Our review shows that these were the easy ones to fix or they had no date processing function. But that means that 84 systems remain to be fixed.

The truth is that FAA's most difficult challenges lie ahead: fixing the problems, including the Host computer, which is really the heart and soul, and route centers which direct traffic at the higher altitudes. FAA also is buying new systems that are scheduled to be deployed before the year 2000. Twenty-three newly purchased but not deployed systems, each costing over $100 million, has not been determined by FAA to be year 2000-compliant yet. So that needs to be a priority item, too.

So with less than 2 years to go, the FAA's use of remaining time is critical. FAA must get the fixes done this year and begin testing as soon as possible. Funding requirements must also be determined. The current estimate is about $162 million, without replacing the Host computer; it's about $322 million if it's replaced.

But I should really stress, while money is important, the real issue facing all of us is the time one. The year 2000 problem is not just a major challenge for Government; it's the entire aviation industry, including manufacturer of airlines and airports. And the challenge to FAA is especially great because of its track record in installing computer hardware and software, and I don't mean to be redundant on the point, but I think that persuasively argues for accelerating the implementation target date.

At the end of our prepared statement there's a set of eight action items that I won't belabor here. The Administrator and I have discussed these. FAA is going to move to implement them. They are all directed, though, toward three things: accelerating the year 2000 completion and compliance date; establishing central leadership and maintaining a constant sense of urgency; and, finally, reporting to Congress more regularly, so that you are kept abreast of FAA progress.

Thank you.

[The prepared statement of Mr. Mead follows:]

Madam Chairwoman, Mr. Chairman, and Members of the Subcommittees:

We appreciate the opportunity to testify today. With all the recent publicity, most people know that many computer systems and software applications had been programmed with a two-digit year field. Computer systems programmed in this way will not be able to differentiate between the year 2000 and 1900, since both would have the same two-digit representation of "00." If the computer systems, including those used by air traffic controllers, are "confused" by an "00" year field, they could shut down or provide inaccurate information. Because of its critical safety function and the public reliance on air travel, any failure in the Air Traffic Control System is unacceptable.

We have been reviewing the Department's Year-2000 progress since May 1997, and have issued two reports.[1] The General Accounting Office also has been reviewing FAA as part of its Governmentwide oversight of Year-2000 problems. FAA has about 70 percent of the mission-critical systems in the Department, as shown in exhibit A. Our testimony today will address four areas:

- The importance of Year-2000 problems in the Air Traffic Control System,
- The status of actions to fix the FAA Year-2000 problems,
- Challenges ahead for FAA on Year-2000 work, and
- Actions FAA should undertake to solve its Year-2000 computer problems.

Before addressing these areas in detail, I will summarize our overall message and findings.

FAA got a very late start on fixing Year-2000 computer problems. It was not until about 6 months ago that FAA began addressing the Year-2000 issue with a sense of urgency. Consequently, FAA is behind schedule on assessing which of its systems have Year-2000 problems, determining what needs to be fixed, and testing and implementing solutions. The good news is that it is not too late. Strong central management and a continuing sense of urgency are the keys to success.

Every piece of computer software and hardware must be assessed for problems, fixed as needed, and tested for Year-2000 compliance. The assessment work--identifying systems with Year-2000 problems--is almost finished, although it is 7 months after the target date specified by the Office of Management and Budget (OMB). Much of the assessment work on the Air Traffic Control System

[1] Management Advisory on Year 2000 Computer Problems, FAA, Report Number FE-1998-027, November 26, 1997, and Assessing the Year 2000 Computer Problem, DOT, Report Number FE-1998-053, December 18, 1997.

was completed last week under intensive central management and a firm requirement that the assessment work be finished by January 31.

FAA's most difficult challenges lie ahead--fixing the problems, including the Host computer which is used in the En-route Centers to direct high altitude traffic, testing systems to make sure these fixes work, and putting Year-2000 compliant systems online. FAA also has new systems scheduled to be operational before the Year 2000, including major systems like the Standard Terminal Automation Replacement System (STARS), a primary air traffic control system that will replace an obsolete system, and the Wide Area Augmentation System (WAAS), a system that will use satellites for communication, navigation, and surveillance between air traffic controllers and pilots. Twenty-three newly purchased but not deployed systems, each costing more than $100 million, had not been determined by FAA to be Year-2000 compliant as of February 2. FAA must determine very soon actions needed, if any, to make them compliant. All tasks must be done, must be done well, and completed well before January 1, 2000. Failure of mission-critical systems is not a viable option.

With less than 2 years to go, use of the limited remaining time is critical. FAA must strive to get the fixes done this year, and begin testing as soon as possible. Funding requirements must also be determined by FAA. The current funding estimate is at least $162 million without interim replacement of the Host computer and $322 million with its replacement. These estimates are likely to change as the magnitude of the problem and the cost of the fixes become clearer. Congress must be told what the plan of attack is, and what it will cost to make all mission-critical systems Year-2000 compliant, including new systems under development. **While money is important, the real issue is time.**

The Year-2000 problem is not just a major challenge for Government. The entire aviation industry, including aircraft manufacturers, airlines, and airports must be involved. The challenge to FAA is great because its on-time track record for completing computer and software intensive programs has been poor. FAA's scheduled November 1999 date to have the Year-2000 problem fixed brings us much too close to the "millennium bomb," a term recently used to describe the Year-2000 problem by the Government Executive Magazine. This time there is no room for schedule slippage; the due date is fixed. We urge FAA to move up the implementation date to have all systems Year-2000 compliant, tested, and operational no later than June 1999.

Our testimony today will identify actions FAA must take to effectively solve the Year-2000 problem. They include the need to (1) take prompt action to make necessary fixes to newly acquired but not yet operational systems,

(2) expeditiously appoint a person with strong technical leadership and authority to manage the Year-2000 program, (3) make a prompt decision on the Host computer fixes, (4) develop a suitable contingency plan for the Host computer in case the planned efforts fail, (5) have an independent review of plans to fix and certify the existing Host computer, (6) develop a master schedule for fixing and testing all mission-critical systems, (7) promptly identify and secure resources needed to get the job done, and (8) report monthly to the Secretary and Congress on the progress made toward fixing Year-2000 problems.

We are working closely with the FAA Administrator and her senior staff. We will continue to monitor this issue, and advise the FAA Administrator, the Secretary, and the Congress of problems and recommended solutions.

Background

OMB established a five-phase approach for addressing Year-2000 computer problems. According to the OMB schedule, agencies should have finished the second phase, which is to analyze existing systems for the scope of Year-2000 problems, by June 1997. In the next phase, agencies will fix Year-2000 problems by repairing existing software code or acquiring replacement systems. The OMB target for completion of this phase is September 1998. Then, the fix has to be tested to ensure it works as intended, including interfaces with other systems. Testing should be completed by January 1999. After successful testing, agencies will implement Year-2000 compliant systems to support their operations. OMB's target date for full implementation is March 1999.

As of February 2, 1998, FAA has identified 430 mission-critical systems, of which 209 currently support the Air Traffic Control System. The remaining mission-critical systems primarily involve administrative services (122 systems) such as payroll, or systems that are in the acquisition and research process (84 systems) such as STARS. The 209 mission-critical systems are used by 17,000 air traffic controllers to direct and control over 40 million flights annually. The Air Traffic Control System contains thousands of inter-dependent radars, computers, special

display equipment, and telecommunication networks. Working together, the system software and hardware capture flight plans and the location of flying aircraft, transmit this information to a mainframe computer, display these locations on air traffic controller screens, and tag the locations with aircraft identification. Based on information displayed, controllers then provide instructions to the pilots through communication links.

The Year-2000 Problem is Important to the Air Traffic Control System

Every piece of software and hardware in the Air Traffic Control System has to be assessed for Year-2000 problems. When Year-2000 problems are found, either the software and hardware must be fixed, or the computers and software have to be replaced. The fix or replacement must then be tested to make sure the systems will properly interface with all components of the Air Traffic Control System. This is an enormous task; however, it has to be done, and must be done well. Otherwise, key components of the Air Traffic Control System could malfunction. If this happens, controllers might not be able to tell the exact altitude and speed of aircraft or the distance between aircraft, which could cause flights to be delayed or grounded.

Here are examples of three mission-critical systems for air traffic control that have been diagnosed with Year-2000 problems and must be fixed.

- The systems used in the En-route Centers consist of 4,000 pieces of hardware and software, including the Host mainframe computers, that allow air traffic controllers to manage aircraft flying at high altitude.

- The Offshore Flight Data Processing System is used to communicate and display positioning and flight plan information for aircraft over the oceans.

- The Terminal Doppler Weather Radar System is used to detect microbursts, gust fronts, wind shifts, and precipitation. This system alerts aircraft of hazardous weather conditions around airports and provides advanced notice of changing weather conditions.

The Year-2000 Problem also is Important to the Airline Industry

Airlines and the aviation industry also will be affected by the Year-2000 problems since many of their operations are date sensitive. For example, airline reservation systems and fleet maintenance systems operate based on dates, and calculations using dates, and aircraft have sophisticated on-board computerized avionics equipment that must be Year-2000 compliant.

At a recent event sponsored by FAA, members of the airline industry raised concerns about how ready FAA, and the industry itself, would be for the Year 2000. In general, airlines were not very confident that the Air Traffic Control System would work correctly. Regional airlines thought the awareness level--the first step in addressing Year-2000 problems--among its members was not good. Airport representatives generally agreed that airports were not as aware of Year-2000 issues as they need to be.

The industry suggested FAA assume more of a leadership role in directing the industry's Year-2000 work. In December 1997, the Air Transport Association established a Year-2000 program office to coordinate and interface with FAA. FAA plans to hold another meeting with industry leaders later this month. The

increased interactions on this issue between FAA and all parts of the industry is one step in the right direction.

FAA's Assessment Work is Well Behind OMB's Established Targets

FAA got a very late start on the Year-2000 problems. About 6 months ago, FAA began addressing these issues with a sense of urgency. Consequently, FAA is behind schedule on assessing its systems for Year-2000 problems, determining what needs to be fixed, and deciding how to solve these problems. The following chart shows the target dates established by OMB, the Department, and FAA for completing Year-2000 tasks. It also shows the cost estimates for the Department and FAA, excluding the cost to replace the interim Host computer.

YEAR-2000 PHASES AND TASKS	OMB TARGET	DOT TARGET	FAA TARGET	DOT COST (Includes FAA)	FAA COST
Assessment--Determine the Scope of Year-2000 Problems	6/97	8/97	1/98	$10M	$8M
Renovation--Fix Year-2000 Problems	9/98	9/98	12/98	$99M	$90M
Validation--Test the Fix	1/99	1/99	7/99	(Included Below)	(Included Below)
Implementation--Implement Year-2000 Compliant Systems	3/99	3/99	11/99	$74M --------- $183M ===	$64M --------- $162M ===

Recently FAA has been working very hard to complete its assessment work. To its credit, FAA implemented a two-step approach for Air Traffic Control Systems that has been effective. First, the assessment is done by system owners in the

field. Then, an internal quality assurance review (QAR) team, assisted by the consulting firm Coopers & Lybrand, reviews the assessment results for adequacy.

As shown in the following two charts, a large number of assessments of Air Traffic computer systems was completed last week. Between January 23 and February 2, the number of assessed systems by Air Traffic Services increased by 109, from 100 to 209. Furthermore, the number of air traffic mission-critical systems also decreased by 25, from 234 to 209.

FAA's Status as of January 23, 1998

Organization	Mission-critical	Assessed	Approved by Quality Assurance	Year-2000 Compliant
Air Traffic Services	234	100*	86	86
Administrative	107	93	N/A	0
Acquisition & Research	48	26	N/A	0
Others	15	12	N/A	0
	---	---	---	---
Total - All FAA	404	231	86	86

* Estimated since actual statistics were not available.

FAA's Status as of February 2, 1998

Organization	Mission-critical	Assessed	Approved by Quality Assurance	Year-2000 Compliant
Air Traffic Services	209	209	171	125
Administrative	122	122	N/A	0
Acquisition & Research	84	80	N/A	0
Others	15	14	N/A	0
	---	---	---	---
Total - All FAA	430	425	171	125

The number of assessments approved by the QAR team increased by 85, from 86 to 171. FAA must still run 38 mission-critical air traffic systems through its quality assurance process. Since FAA completed and approved a significant portion of its assessments and quality assurance reviews in the last week, we have not substantiated the accuracy of its reported numbers. Our confidence in the results will be much greater when all quality assurance reviews are completed and we have had the opportunity to validate these numbers. According to FAA management, all QARs should be completed by mid-February 1998. We are encouraged by the sense of urgency FAA is now applying to this process.

As of February 2, FAA data shows that 125 of the 171 systems subjected to quality assurance reviews were Year-2000 compliant. Our review of these systems showed they were easy ones that had no date processing function, or could be fixed quickly. Much of the hard work for FAA is still ahead.

Projects under Development had not been determined to be Year-2000 Compliant

An additional concern is that FAA has not yet concluded that any of its Air Traffic Control Systems currently in the acquisition and research phase are Year-2000 compliant. There are 23 major projects under development, each costing more than $100 million. These projects are listed in exhibit B. We plan to do more work in this area during our ongoing audit.

On January 30, we reviewed contracts for WAAS and STARS, two major development projects. Although these systems have not been determined by FAA to be Year-2000 compliant, we were advised that the contractors have warranted that these systems will comply. We are in the process of making sure this is the

case. FAA needs to validate for itself that there are no Year-2000 problems with these systems, and initiate corrective actions if problems are found.

Significant Challenges Lie Ahead for FAA on Year-2000 Work.

While FAA still needs to determine the resources needed to fix Year-2000 problems, the critical issue today is time. Being behind with less than 2 years to go, FAA has to commit to the Year-2000 project with an absolute sense of urgency. From what we have observed recently, FAA is now doing so. The most difficult challenges lie ahead--fixing the problems, testing systems to make sure these fixes work, and putting Year-2000 compliant systems into operation.

o Prompt decision needed on strategy for addressing the Year-2000 problem in the aging Host computer

The Host computer is a key part of the system that enables air traffic controllers to direct high altitude air traffic from the En-route Centers. There are two issues concerning continued service of the Host computer beyond Year 2000: Can FAA make it Year-2000 compliant, and can FAA find replacement parts, which are already scarce?

International Business Machines (IBM), the manufacturer, recommended FAA replace the existing hardware because replacement parts are getting harder to find, and because IBM lacks the talents and tools to assess the Year-2000 problems in the Host computer. However, FAA maintains the Host computer can be fixed, and is considering a parallel effort to both repair the existing computer and replace it with an interim Host before Year 2000. FAA estimates

it will cost about $2 million for the repair job, and about $160 million for an interim replacement.

FAA and IBM are at odds regarding the difficulties in evaluating and fixing Year-2000 problems in the Host computer. IBM has claimed the Host Year-2000 problems could not be properly assessed. In a letter dated October 2, 1997, IBM stated "Analysis of 3083 microcode (a machine language) involves reviewing hundreds of thousands of lines of microcode written in several different protocols. . . . IBM does not have the skills employed today that understand the microcode implemented in the 3083 well enough to conduct an appropriate Year-2000 assessment. In addition, the tools required to properly analyze the microcode do not exist."

FAA has done limited testing on the Host computer microcode. To date, FAA has identified a Year-2000 problem with the computer's cooling system. FAA still must complete an analysis of the microcode, but, at this point, the FAA program office is maintaining that the microcode can be fixed. FAA hired one technical expert to work on the microcode assessment, and is searching for other technical experts. Within the next 90 days, FAA plans to make a decision on whether the Host can be repaired. If it can, FAA plans to self-certify the Host with the help of technical experts.

Replacement of the Host requires "rehosting" the mainframe computer. This involves taking the software from the existing computer and installing it into the replacement machine. This sounds simple, however, the reality is that rehosting a highly sophisticated and customized system like the Air Traffic Control System is a complex undertaking. The last time FAA rehosted these mainframe computers, the process took about 3 years. Another key concern is

that both the replacement and repair efforts will demand the attention of the same FAA employees who are responsible for rolling out other new equipment. FAA must try to fix the Host and promptly make a decision on its replacement. Regardless of the decision, FAA must work toward repair of the existing Host because FAA's track record for replacing systems is poor, and rehosting in less than 2 years at all centers is extremely optimistic.

It should be recognized that even if FAA decides to adopt a parallel approach to the Host problem--i.e., fix and replace concurrently, there are risks. In order to mitigate the risk, FAA needs to have a contingency plan. FAA's current contingency plan for the Host computer is another system--the Direct Access Radar Channel system (DARC). If the Host computer cannot function, DARC, assuming it is Year-2000 compliant, will enable the Air Traffic Control System to continue displaying aircraft location on the controller's screen. However, controllers will not be able to tag the aircraft with flight identification and will have to space aircraft further apart. This would slow air traffic. This is not the best solution, but it needs to be available in the event that the existing Host cannot be made Year-2000 compliant, and rehosting cannot be accomplished in sufficient time to be fully operational prior to January 1, 2000. FAA needs to ensure that DARC is Year-2000 compliant and that the operational procedures for its use are current.

o <u>FAA has not established central leadership for Year-2000 work.</u>

The Host computer issue illustrates an underlying problem with FAA's Year-2000 program: a lack of strong leadership. While OMB guidance required agencies to establish Year-2000 program offices by December 1996, FAA did not take action until June 1997. Then, FAA established two program offices--an Air Traffic Services program office (responsible for the Air Traffic

Control System), and an FAA-wide program office. The FAA-wide program office reports to the FAA's Chief Information Officer (CIO). However, the CIO is three levels down from the FAA Administrator, and has not provided effective FAA-wide leadership.

The FAA Administrator is aware of the need for strong CIO leadership and is addressing the issue with her senior staff. The Department also is looking for candidates to head the Departmentwide CIO Office. Meanwhile, FAA's Year-2000 responsibility is divided. The Associate Administrator for Air Traffic Services continues to be responsible for the Air Traffic Control System, but not for Air Traffic Control Systems that are not yet operational. The remaining Year-2000 responsibility recently was elevated from the CIO Office to the Deputy Associate Administrator for Research and Acquisitions.

Developing central leadership for FAA's Year-2000 program is critical because of the close relationship between its two groups. Also, central leadership is critical for prioritizing and determining how time and resources should be spent for fixing Year-2000 problems in FAA's mission-critical systems.

o <u>Fixing and testing Year-2000 problems are time consuming.</u>

FAA started its Year-2000 work in mid-1996, and is about to finish its assessment work. However, the hard and time-consuming work lies ahead. Fixing non-compliant software code, testing the fix, and implementing compliant systems require more work, as demonstrated by FAA's cost estimates. FAA has spent $8 million on assessing Year-2000 problems. Excluding the Host, cost estimates for fixing software code and

testing/implementing Year-2000 compliant systems are $90 and $64 million for FY 1998 and FY 1999, respectively.

The Air Traffic Control System is a complex and inter-dependent system. FAA has to analyze millions of lines of code and thousands of pieces of hardware for their individual Year-2000 problems, but also must ensure the systems will continue working together after Year-2000 fixes. FAA's recent experience with the Enhanced Traffic Management System (ETMS) illustrates the complexity of the Air Traffic Control System and highlights the importance of comprehensive testing. ETMS displays the location of aircraft on a national and local scale to alert controllers when traffic exceeds certain limits. About 2 years ago, FAA found it had to upgrade ETMS software because the operating system software was unable to process times and dates after November 2, 1997. FAA developed a fix to the operating system software and successfully tested the fixes. However, just 1 month before the November 2 deadline, FAA found the fix did not work with the application system software. As a result, FAA had to initiate an emergency task to make the last-minute change.

The testing of all Year-2000 fixes and recommissioning the entire Air Traffic Control System is something FAA has never undertaken. FAA's plan is to construct an integrated test environment to perform end-to-end (i.e., from radar to the air traffic control screen) testing of the Year-2000 fixes for the Air Traffic Control System. We fully support this endeavor. To effectively manage this process, a master schedule (for repairing, testing, and implementing Year-2000 fixes for all mission-critical systems) is needed to ensure coordination among inter-dependent systems and to facilitate management, including early detection of schedule slippage.

- FAA's target date for implementing Year-2000 fixes should be accelerated to minimize risk.

Even with a well structured integrated test environment, FAA has no assurance all Year-2000 fixes will work as intended because field conditions are different from a test environment. The task is further complicated by the fact that local software changes have been made to the Air Traffic Control System. FAA has over 8,000 employees maintaining the Air Traffic Control System. The software developed or changed by local maintenance teams could result in different conditions from site to site. As a result, Year-2000 fixes working in a test environment may not work properly when implemented in the field.

FAA's November 1999 target completion date for implementing all Year-2000 fixes for all mission-critical systems leaves little cushion for schedule slippage or corrective actions to solve problems unique to individual sites. FAA's track record for solving hardware and software problems does not instill a high confidence level that the fixes can be made on schedule. To avoid a crisis situation in November 1999, we recommend the FAA Administrator move the date by which all systems have been fixed, tested and operational, to no later than June 1999. FAA has informed us they will look for opportunities to move up implementation dates after the assessment and quality assurance work is completed.

- Year-2000 cost estimates are still evolving.

Until all assessment work is approved, the cost estimates to fix Year-2000 computer problems remain uncertain. FAA's current cost estimate of $162 million does not include $160 million for the interim Host computer

replacement. FAA's estimate does not provide sufficiant coverage for hardware replacement cost, so there is the potential for additional funding requirements. Also, the cost to make major projects currently under development Year-2000 compliant, and the cost to accelerate FAA's implementation schedule by at least 5 months, are unknown.

If unexpected problems are identified during testing or implementation, FAA has to repeat much of the entire exercise--changing program code, retesting, and implementing new fixes. The closer it gets to Year 2000, the more it will cost to fix additional problems identified and to repeat such exercises. FAA should reassess its Year-2000 cost estimates after considering all of these factors, and inform the Secretary and Congress of its requirements.

Actions FAA Should Undertake to Solve Its Year-2000 Computer Problem.

The FAA Administrator is aware of the need to make sure Air Traffic Control System computers are fixed and operational well before January 1, 2000. A sense of urgency has been established, but there are risks even if the work is tightly controlled and managed. To minimize these risks, we offer the following recommendations:

- Assign a high priority to complete the assessment work, including the quality assurance reviews, on existing systems. Also, determine whether or not systems currently being purchased are Year-2000 compliant and take appropriate action to fix those that are not. Amend contracts if necessary.

- Appoint, by the end of February, a central Year-2000 program manager with sufficient technical background and authority to direct remaining work, who reports directly to the Administrator.

- Promptly decide on the strategy for addressing Year-2000 problems in the aging Host computer. If the parallel repair/replacement option is selected, milestones should be established for repair and replacement work at each En-route Center. The Secretary and Congress should be advised of the impact this will have on the implementation schedule for other systems FAA is acquiring.

- Develop a suitable contingency plan for directing high altitude aircraft in case both the Host repair and replacement efforts are not completed by Year 2000.

- Have an independent review of plans to fix and certify the existing Host computer. The staff involved with this must have a sufficiant expertise of IBM 3083 system architecture.

- Develop, by the end of March 1998, the master schedule for fixing all mission-critical systems. The plan should contain a goal to have all mission-critical systems fixed, tested, and fully operational no later than June 1999.

- Determine, by mid-March 1998, the resources needed for repairs, replacements, comprehensive testing, and for an earlier Year-2000 implementation date; and notify the Secretary and Congress of the resource requirements.

- Continue reporting to the Secretary on the progress made toward fixing Year-2000 problems, and provide the same information to Congress on a monthly basis.

Madam Chairwoman and Mr. Chairman, this concludes our statement. I would be pleased to answer questions.

EXHIBIT A

Total number of mission-critical systems

(As of February 2, 1998)

Operating Administrations	Total Number of Mission-critical	Number Already Compliant
BTS	1	0
FAA	430	125
FHWA	9	0
FRA	8	4
FTA	2	0
MARAD	14	0
NHTSA	27	0
RSPA	27	0
SLSDC	10	4
USCG	78	25
OIG	1	0
OST	4	0
STB	2	1
TASC	4	0
Totals	617	159

EXHIBIT B

FAA MAJOR DEVELOPMENT PROJECTS

Acronym	Development Project Description	Program Costs
VSCS	Voice Switching and Control System	$1,453M
DSR	Display System Replacement	1,055M
STARS	Standard Terminal Automation Replacement System	940M
ASR-9	Airport Surveillance Radar Model 9	832M
TFM	Traffic Flow Management	795M
MODE-S	Mode Select-discrete addressable secondary radar system with data-link	454M
LRR	ARSR-4 Long Range Radar Replacement	409M
TDWR	Terminal Doppler Weather Radar System	384M
NIMS	NAS Infrastructure Management System	379M
WAAS	Wide Area Augmentation System	261M
ITWS	Integrated Terminal Weather System	276M
OSDS	Oceanic System Development and Support	264M
ASOS	Automated Surface Observing System	252M
RCE	Radio Control Equipment	248M
ASDE-3	Airport Surface Detection Equipment	243M
COMMON ARTS	Automated Radar Terminal System	196M
OASIS	Operational & Supportability Implementation System	175M
PRM	Precision Runway Monitor	128M
WARP	Weather and Radar Processor	126M
TVSR/ETVS	Enhanced Terminal Voice Switch/Terminal Voice Switch Replacement	112M
NEXRAD*	Next Generation Radar	285M
ADLS*	Aeronautical Data Link System	279M
ALSIP*	Approach Lighting System Improvement Program	133M

*Not found in FAA's Year-2000 System Inventory Listing as of January 23, 1998

Office of Inspector General

Audit Report

Assessing the Year 2000 Computer Problem

Department of Transportation

Report Number: FE-1998-053
Date Issued: December 18, 1997

Memorandum

U.S. Department of Transportation
Office of the Secretary of Transportation
Office of Inspector General

Subject: ACTION: Report on Assessing the Year 2000 Computer Problem, DOT Report Number: FE-1998-053

Date: December 18, 1997

Reply To Attn Of:

From: Lawrence H. Weintrob
Assistant Inspector General for Auditing

To: Michael P. Huerta
Acting Chief Information Officer

BACKGROUND AND OBJECTIVE

This report is the first in a series of reports on the Department of Transportation (DOT) efforts to address the Year 2000 (Y2K) Computer Problem. Our objective was to evaluate Departmentwide strategy, and Operating Administration (OA) plans, for ensuring automated information systems and applications are Y2K compliant by the end of calendar year 1999.

Until recently, most computer systems and applications were designed to use two digits to designate the year. As the year 2000 approaches, these systems and applications may not be able to operate properly because they cannot differentiate between the year 2000 and 1900, since both would have the same two digit representation "00." Consequently, some systems may abort or provide erroneous data.

The Office of Management and Budget (OMB) and the Department's Acting Chief Information Officer (CIO) established milestones for completing the Y2K project. For reporting purposes, OMB recognizes five Y2K phases: (i) awareness, (ii) assessment, (iii) renovation, (iv) validation, and (v) implementation. Awareness of Y2K issues is an ongoing process in the Department. This report addresses the assessment phase.

In the assessment phase, agencies are required to determine the vulnerability of computer systems and applications to Y2K problems, and develop plans for correcting deficiencies. Requirements of the assessment phase include completing a systems inventory, evaluating the hardware and software environment,

identifying interfaces among systems, estimating cost, and developing renovation and contingency plans. The OMB milestone for completion of assessments was June 1997. The Department's milestone for completing assessments was August 1997 for all OAs, and December 1997 for the air traffic control systems in the Federal Aviation Administration (FAA). OMB did not issue waivers to extend the assessment milestone. OMB also initiated quarterly reporting requirements. The Department had submitted three quarterly progress reports to OMB; May 15, August 15, and November 14, 1997.

Audit work on the Department's Y2K assessments was performed between May and November, 1997. Our scope initially did not include FAA because the General Accounting Office (GAO) was reviewing FAA as part of its Governmentwide Y2K oversight. GAO completed its work and had an exit conference with FAA on October 2, 1997. On October 17, 1997, we expanded the audit scope to include FAA. In performing the audit, we used guidelines developed by the CIO Council Subcommittee on Year 2000. The audit was conducted in accordance with Government Auditing Standards prescribed by the Comptroller General of the United States.

RESULTS-IN-BRIEF

We validated information in the Department's May submission to OMB, and the data provided by the OAs to the Department's CIO office for the August and November reports. We identified six areas which were brought to management's attention before the August and November reports were finalized. Overall, we found the Department had not accurately reported its Y2K status to OMB on May 15, and may have continued to do so if the data reported by the OAs to the Department had not been audited independently. As issues identified by the audit were brought to management's attention, the Secretary, Deputy Secretary, and the Department's Acting CIO initiated corrective actions promptly, and proposed reports to OMB were adjusted.

Departmental Strategy

Formal guidance establishing the Department's strategic plan for dealing with Y2K matters was issued by the Department's Acting CIO, but not until September 19, 1997. At the Department level, the Y2K coordinator's office was a one-person operation, without support staff proficient in technical and operational issues concerning Y2K. Departmental guidance was limited and untimely. For example, the Department had not defined what constituted mission-critical systems or what to include in total inventory (systems, equipment, and electronics). This was addressed in the guidance on September 19, 1997. The Department's Y2K

office served primarily as the collection point for reporting progress to OMB and Congress, but was not verifying data reported by the OAs as of November 14, 1997.

Systems Inventories

Identifying all systems is the first, and key, step for assessing the scope of Y2K work and estimating resource needs. At the start of our audit work, the Department's Y2K inventory included 717 systems. To determine the accuracy of this data, we compared the OA systems in their Y2K inventories (717) with other systems inventories, such as the Information Resource Management 5-Year Plan. We identified 306 systems that were not included in the Y2K inventory. Of these, 232 were in FAA and the remaining 74 were in the other OAs.

As of October 31, 1997, the OAs included 55 of the 306 OIG-identified systems in their inventory. Fourteen of the fifty-five systems were determined by the OAs to be mission-critical. The remaining 251 OIG-identified systems were being reviewed for possible inclusion in the Y2K inventory.

We also found the OAs were not fully assessing electronic equipment for Y2K implications. We identified at least 10,000 electronic equipment items that were not fully evaluated for Y2K problems with embedded micro-chips. Embedded micro-chips, which are used in electronic devices, such as communication or navigation systems, could be programmed with time and date mechanisms which could potentially create Y2K failures. The OAs were researching these items for Y2K implications.

Completed Assessments

The Department's reported percentage of complete assessments was overstated in its May 15 report to OMB, and in its proposed reports for August and November. The August and November reports to OMB included adjustments based on our results. For example, the Bureau of Transportation Statistics (BTS) reported its Office of Airline Information as being 100 percent assessed. We found little documentation or evidence supporting completion of assessment efforts. BTS had not prepared adequate renovation or contingency plans, and had no documentation supporting cost estimates. As a result, the Department reported the BTS percentage of completion as zero in the November 14 report to OMB.

In its August report, the Coast Guard reported assessment work was 100 percent complete, although it had not yet determined whether 27 of its mission-critical systems had Y2K problems. We reviewed seven mission-critical systems reported

by Coast Guard as fully assessed as of October 28, 1997, and found none was fully assessed in accordance with Departmental criteria. At least one of the seven mission-critical systems will not be fully assessed until July 1998. In computing the assessment completion percentage for the November 14 report to OMB, the Department included 100 percent of the Coast Guard systems as fully assessed. However, the Department noted those systems were being revisited, and the updated status would be included in the quarterly report to OMB in February, 1998.

As of October 28, 1997, FAA was reporting 47 percent of its mission-critical systems were fully assessed. We found FAA included systems in the Y2K assessment percentage that it deemed already compliant or having no Y2K implications, which is contrary to OMB guidelines. For assessment purposes, OMB requires reporting only on mission-critical systems that need repair. Based on our inquiries, GAO guidance, and an FAA reassessment, 150 systems were reclassified as mission-critical and were included in the November 14 report to OMB for the first time.

On November 14, 1997, the Department reported to OMB that FAA was 38 percent complete on its assessments. This was based on 12 of 32 systems being repaired. However, as noted in the November 14 report, FAA had 329 mission-critical systems which needed to be assessed. Accordingly, the 38 percent was significantly overstated when considering FAA's entire universe of mission-critical systems.

Compliant Systems

On May 15, 1997, the Department reported 18 systems were Y2K compliant. We reviewed eight of these systems, and as of August 13, 1997, found no evidence that these systems were properly assessed, tested, and certified as being Y2K compliant. Based on our findings, the Department reported, in its August 15 report to OMB, that none of its systems was Y2K compliant because they did not meet the departmental criteria for compliance. Subsequently, at least one mission-critical system, included in our sample and reported as Y2K compliant, was found to be noncompliant. The OAs were researching the other 17 systems for Y2K implications.

As of October 31, 1997, the OAs reported to the Department that 98 of 368 systems were Y2K compliant for reporting to OMB on November 15. We again tested for evidence of compliance on 79 systems and found 43 systems, deemed Y2K compliant by the OAs, did not have proper evidence of being evaluated and certified as being compliant. Based on our results and certifications provided by

the OAs, the Department reported 36 systems to OMB as compliant in its November 14 report. We agree the 36 systems were Y2K compliant.

Estimated Cost for Y2K Fixes

The $92 million estimate in the May 15 report to OMB for fixing Y2K problems was unsupported. We found cost estimates did not include all mission-critical systems, and many estimates for non-mission-critical systems were based on unsupported estimates. Based on our work and ongoing Departmental initiatives, the estimated cost to fix Y2K problems had increased to $265 million in the August 15 report and $266 million in the November 14 report.

As of November 14, 1997, the OAs were still developing their systems inventories, and FAA was still assessing the Y2K implications for 265 of its mission-critical systems. For example, the current Y2K cost estimate to fix the "host" computers for the air traffic control system was $783,000 (this Y2K project is separate from the ongoing "host" replacement project to be completed by the year 2005). However, the En Route Integrated Products Team Leader told us the total Y2K cost may be an additional $40 million if the computers have to be replaced because of Y2K problems. Based on the magnitude of ongoing work, the estimated cost to fix Y2K problems is not reliable.

Computer and Service Contracts

On January 2, 1997, the Federal Acquisition Regulation (FAR) interim rule on Y2K compliance was established to ensure Federal agencies procure products that were Y2K compliant. We judgmentally sampled contract documents from all OAs, and identified five OAs that were not consistently providing the appropriate Y2K language in their contracts despite the Y2K requirements. For example, the Coast Guard was purchasing helicopter roto-tuner test equipment without specifying this equipment must be Y2K compliant. Seventy-five roto-tuners previously purchased by Coast Guard were noncompliant, and require upgrades. Coast Guard had not yet determined the cost of upgrading the roto-tuners.

Actions Taken by the Department

To ensure accurate reporting to OMB on August 15 and November 14, we worked closely with the Department's CIO office. We also provided our interim results to the Department's CIO office on July 21 and August 13, 1997. We provided formal comments to the Deputy Secretary on August 1, 1997, and to the Department's Acting CIO on August 13, 1997. On November 12, we provided our

current results to the Department's CIO office and senior Y2K officials in each of the OAs.

The Department recognized the need to better manage its Y2K program. As a result, these key actions have been taken:

- On October 1, the Secretary issued a memorandum to Heads of the OAs requiring (i) appointment of a senior executive for Y2K, (ii) project management plans detailing schedules, priorities, costs, financing plans, and contingencies, (iii) the Department's CIO to immediately report on unfinished system assessments, and (iv) acceleration of the validation phase from December 31, 1999, to July 31, 1999.

- The Deputy Secretary developed a monthly tracking system which measures OA progress of assessments, renovation, validation, and implementation. The Deputy Secretary has made Y2K a high priority, and is requiring senior-level management accountability.

- The CIO office issued departmental criteria on mission-critical systems. On September 19, 1997, the Department's Acting CIO issued specific guidance on what constituted completion of each Y2K phase. For the assessment phase, the Acting CIO required a total inventory, an evaluation of Y2K for each inventory item, identification of all systems interfaces and data exchanges, estimated cost for fixing Y2K problems, a renovation plan, and a contingency plan for all systems. The Acting CIO also required OAs to ensure that all information technology procurement documents have the required FAR language requiring Y2K compliance.

- The proposed reports submitted by the OAs to the Department's CIO office were adjusted, based on the audit results, before finalizing the August 15 and November 14 reports to OMB.

Conclusion

The Department is behind schedule in completing its Y2K assessments. Since our memorandum to the Deputy Secretary on August 1, 1997, the Department has initiated a series of actions, with direction coming from the Secretary, Deputy Secretary, and Acting CIO. As a result of this high-level involvement, progress is being made, but much more needs to be done. As of November 14, 1997, total systems inventories were not developed and assessments for mission-critical inventory were not complete. Timely completion of assessment work by the OAs,

and increased oversight by the Department's CIO office, are essential to ensure the Department is ready to begin solving its Y2K problems.

RECOMMENDATION

We recommend the Department's Acting CIO, in addition to continuing the ongoing initiatives, obtain additional support staff to ensure the Department's Y2K program has the necessary resources to properly oversee the work remaining on this important project.

Management Comments

The Department's Acting CIO reviewed this report on December 9, 1997. He concurred with the recommendation and stated that implementation actions will be taken by March, 1998. No further response to this report is required.

We appreciate the cooperation and assistance provided during the audit. Please contact me on (202) 366-1992, or John Meche on (202) 366-1496, if you have questions concerning this report.

KENNETH M. MEAD

Inspector General
U.S. Department of Transportation

Mr. Mead was nominated by the President to be the Inspector General of the U.S. Department of Transportation (DOT), and was confirmed by the U.S. Senate on May 27, 1997. As the head of the Office of Inspector General, he is responsible for leading the program of audits, evaluations and investigations to prevent and detect fraud, waste, and abuse. He advises the Secretary of Transportation and the Congress on the best practices and deficiencies found, and recommends ways to strengthen the management of DOT's programs and operations. In establishing the goals for the oversight programs, Mr. Mead directed the highest priority be given to transportation safety, followed by improving the effectiveness and efficiency of DOT's operations.

Prior to becoming Inspector General, Mr. Mead served at the U.S. General Accounting Office (GAO) for 22 years. As the Deputy Assistant Comptroller General for Policy, he was responsible for providing policy guidance on GAO audits and evaluations, overseeing GAO's external peer review, quality control program, and performance measurement system. Prior to that, as Director of Transportation and Telecommunication Issues, he directed reviews that resulted in recognized improvements to the safety and efficiency of DOT's operation in numerous areas, involving aviation, surface, Coast Guard, rail, and shipping. Mr. Mead also served as an Associate and Assistant Director in the transportation area, Assistant Director for GAO's Office of Quality Assurance, and as Senior Attorney with GAO's Office of General Counsel.

Mr. Mead received his baccalaureate degree from Southern Connecticut University, and his Juris Doctor degree from the University of South Carolina. He is also an alumnus of the Federal Executive Institute's Executive Excellence Program, and of Harvard University's Senior Policy Fellows Program.

A veteran, Mr. Mead served in the U.S. Naval Submarine Service.

Among the awards he has received are GAO's Distinguished Service Award, the Meritorious Service Award, and the rank of Meritorious Executive in the Senior Executive Service. He is an active member of the District of Columbia Bar and the American Numismatic Association.

Mr. Mead resides in Alexandria, Virginia, with his wife, Elizabeth, and their daughters Jennifer and Hillary.

Mr. HORN. We thank you for that testimony.

We will now hear from the Administrator of the Federal Aviation Administration, Jane Garvey. Welcome.

STATEMENT OF JANE GARVEY, ADMINISTRATOR, FEDERAL AVIATION ADMINISTRATION

Ms. GARVEY. Thank you very much. Thank you, Chairwoman Morella. Thank you, Chairman Horn and members of the subcommittee. I'm very pleased to be here today before both subcommittees to discuss the challenges the Federal Aviation Administration faces as the countdown to January 1, 2000, continues.

The question on everyone's mind, and certainly the question on my mind when I arrived at the FAA last August is: Will the FAA make it? Can we ensure that the air traffic safety is not compromised in the slightest at 12:01 a.m., on January 1, 2000? The answer to that is, yes, airline safety will not be compromised. Ensuring that we meet this challenge is one of my top priorities.

Let me say that I have been meeting with managers and the key FAA personnel involved in the year 2000 compliance effort frequently since I became Administrator. I know from these meetings, and I know from the work that the Inspector General and GAO have done, that FAA needs to do a better job of managing this problem. We are behind, and that is unacceptable.

What I'd like to do is to tell you what actions I've taken to correct that. FAA is following the Office of Management and Budget and the General Accounting Office recommendations for a five-phased approach for identifying and fixing software date change issues. These five phases are: awareness, assessment, renovation, validation, and implementation.

Your concerns and mine, obviously center on mission-critical systems—those that are vital to the agency's successful achievement of its mission. Some of the most mission-critical equipment in the FAA includes the individual pieces and systems that make up the Nation's air traffic control infrastructure. And although the Y2K issue is broader than that, affecting, for example, the automation components of FAA's business management systems, I will focus my testimony on the status of our efforts to address the mission-critical systems in the National Airspace System—NAS—and then discuss the overall agency's Y2K efforts.

The components that make up that NAS architecture are comprised of more than 23 million lines of code, 50 computer languages, and more than 250 computer systems. The Y2K problem can affect NAS systems in a variety of ways. Software, hardware, or embedded code in NAS systems can be date sensitive.

For example, let's look at the Y2K problem we've identified with our en route surveillance radar. Each of our 20 air traffic control centers has an air-route surveillance radar equipment—or ARSR—that monitors en route traffic in the system. The ARSR has a cooling pump system that turns on automatically to prevent the system from overheating. The computer code that initiates the cooling system is date dependent, and therefore affected by Y2K. If the code is not Y2K compliant, the cooling system will not turn on on the correct day at the correct time and the ARSR could over-heat and could shut down. If this were to happen, air traffic controllers

would have to monitor and separate air traffic the old fashioned way—by altitude and time. This would slow down the system, as some of you have suggested, while air traffic is either re-routed or deliberately delayed to maintain safety. Obviously, our goal is to ensure that these problems—that the delays that could result—do not happen.

In order to meet that goal, last June, FAA's Office of Air Traffic Services, the line of business in the FAA responsible for the operation and maintenance of the NAS, established a centralized, specialized war room, if you will, staffed with technical experts from across the country who have been brought together to tackle the Y2K problem for our air traffic systems. The effort has been led by a senior manager whose been assigned to this challenge full-time. ATS also published Y2K project plan that details the specific steps required to implement the five-phase strategy for addressing the Y2K problem. In addition, we published a repair process and standard guidelines detailing the specific repairs that are to take place. Everyone working on this system, and they come from across the country, is being held strictly accountable for following the specific steps for following the timelines laid out in the published guidelines.

In addition to a clear plan for accessing and repairing the system, ATS has a comprehensive quality insurance process in place. And I want to mention that the quality assurance process is for every line, not just a random sampling, but for every one of the systems.

Our deadline, as the Inspector General said, for assessing the mission-critical systems was January 31. I am pleased to report that we've met that deadline. Of the 209 mission-critical systems, as the Inspector General said, 125 have been certified as Y2K compliant. We have completed the quality assurance reviews for 171 of these mission critical systems. We expect to complete the remaining 38 reviews by February 10, and we're working very closely with the IG and his staff to make sure that quality assurance is as it should be.

We do have, we believe, an accurate picture of what needs to be done to make the air traffic control system Y2K compliant. Renovation efforts are now underway. We expect this to go more quickly and we expect to be completed by December 31 of this year.

That's the air traffic portion of this picture. As for Y2K for the rest of the FAA: assessment of 216 of our 221 mission-critical systems is now completed. The chart that you see shows five remaining. But, I will tell that you as of last night, they are now completed.

As I stated earlier, the GAO and the IG have advised the FAA that we are not as far along as we should be, and that the core issues plaguing us are: a lack of an overall agencywide plan, and the lack of a strong centralized leadership on this issue. I agree, and I want to tell you the steps I've taken to address this concern.

We've identified a new agency lead to bring discipline, to bring consistency, and to bring management direction to the challenges presented. We've asked Ray Long, who for the past several months has been effectively dealing with the Y2K effort for air traffic systems, to be the program manager. He's got a proven track record

managing the air traffic control program. His experience, his knowledge of the problem are simply unparalleled, and it will allow the entire FAA to benefit from his leadership immediately.

We've also expanded the technical support provided by Coopers and Lybrand. They are our business partner in this effort and we're getting excellent technical advice from Coopers in this arena. And we want Coopers and Lybrand to be able to provide that same kind of support to the FAA as a whole so that all of us will benefit from the stringent, the disciplined approach developed for our air traffic systems.

In pulling together this new office, Ray will draw on the many technical talents of all elements of the FAA to ensure that we have a complete, a coordinated, a corporate approach to Y2K. And he will be also working directly with his counterparts in industry to make sure that industry and airports are fully informed and confident in the FAA's progress.

Mr. HORN. I'm going to have to suspend for a minute. We have a vote on the floor and the clock is ticking. So all Members, we're in recess for approximately 12 to 15 minutes. We will return relaxed. And after you finish your statement, Mr. Graham will be next, and then there will be questions of the whole panel. Thank you very much.

We're in recess.

[Recess.]

Mr. HORN [presiding]. The session is resumed. There might be another vote coming up shortly, so bear with us as we go through these.

We now will have the finishing part of the Administrator's statement, and then we'll move to Mr. Graham. Please proceed Ms. Garvey.

Ms. GARVEY. Thank you very much, Mr. Chairman, and I'll be very brief and just, again, to reiterate what I said previously, our new director of the program is Ray Long, and he's begun his new assignment. He reports directly to me. We just had an opportunity by satellite to make that announcement to all of the managers and all of the employees of the FAA, and I'm delighted that he's part of the team.

Next, we really must ensure that we've got sufficient funding in the rest of this fiscal year and in fiscal year 1999. To augment the $18 million Congress has appropriated for Y2K efforts this year, we have absorbed approximately $33.2 million of Y2K costs within the agency. Additionally, the administration is in the process of formally requesting a reprogramming of funds to assist us in these efforts. We hope to finalize this request and forward it to our authorizing and appropriating committees shortly.

Mr. Chairman, I have heard your wise counsel to me and to the FAA to stay on top of this issue and to ensure that the safety and the efficiency of air transportation is not compromised after midnight on December 31, 1999. I want very much for the FAA to succeed. I know you want us to succeed, and I appreciate your generous offer of help and support.

As I said at the beginning of my testimony, the question on everyone's mind is, can we make it? And my answer is, yes. It will take perseverance; it will take persistence; it will take vigilance

and a continuity of commitment, which I believe we will bring to this issue. And I want to say to all of you, as sincerely as I can, that I am dedicated to providing that commitment. I am dedicated to resolving the Y2K challenge.

That completes my prepared statement, and thank you once again for the opportunity to appear here before you today.

[The prepared statement of Ms. Garvey follows:]

STATEMENT OF THE HONORABLE JANE F. GARVEY, FEDERAL AVIATION ADMINISTRATOR, BEFORE THE COMMITTEE ON SCIENCE, SUBCOMMITTEE ON TECHNOLOGY, AND THE COMMITTEE ON GOVERNMENT REFORM AND OVERSIGHT, SUBCOMMITTEE ON MANAGEMENT, INFORMATION, AND TECHNOLOGY, CONCERNING THE TECHNOLOGY CHALLENGES PRESENTED BY THE YEAR 2000. FEBRUARY 4, 1998.

Chairwoman Morella, Chairman Horn, and Subcommittee Members:

I am pleased to be making my first appearance before both Subcommittees this afternoon to discuss the challenges the Federal Aviation Administration (FAA) faces as the countdown to January 1, 2000 continues.

The question on everyone's mind -- and certainly the question on my mind when I arrived at the FAA last August -- is: will the FAA make it? Can we ensure that air traffic safety is not compromised in the slightest at 12:01 a.m. on January 1, 2000? And the answer to that question is yes. Aviation safety will not be compromised. Ensuring that we meet this challenge is one of my top priorities.

I have been meeting with my managers and the key FAA personnel involved in the Year 2000 compliance effort frequently since I became Administrator. I know from these meetings, and from the work that the Inspector General and General Accounting Office have done, that FAA needs to do a better job of managing this problem. We are behind, and that is unacceptable. Let me tell you what actions I have underway to correct that.

FAA is following the Office of Management and Budget (OMB) and the General Accounting Office (GAO) recommended five-phase approach for identifying and fixing Y2K (shorthand for Year 2000) software date change issues. These five phases are awareness, assessment, renovation, validation, and implementation.

Your concerns, and mine, obviously center on "mission-critical" systems, those that are vital to the Agency's successful achievement of its mission. Some of the most mission-critical equipment in the FAA includes the individual pieces and systems that make up the Nation's air traffic control infrastructure, and although the Y2K issue is broader than that -- affecting, for example, the automation components of FAA's business management systems -- I will focus my testimony on the status of our efforts to address the mission-critical systems in the National Airspace System (NAS), and then discuss the overall Agency Y2K effort.

The components that make up the NAS architecture are comprised of more than 23 million lines of code, 50 computer languages, and more than 250 computer systems. The Y2K problem can affect NAS systems in a variety of ways. Software, hardware or embedded code in NAS systems can be date-sensitive.

For example, let's look at a Y2K problem we have identified with our en route surveillance radar. Each of our 20 air traffic control centers has en route surveillance radar equipment, or ARSR, that monitors en route traffic in the system. The ARSR has a

cooling pump system that turns on automatically to prevent the system from overheating. The computer code that initiates the cooling system is date-dependent and therefore affected by Y2K. If the code is not Y2K compliant, the cooling system will not turn on at the correct day and time, and the ARSR could overheat and shut down. If this were to happen, air traffic controllers would have to monitor and separate aircraft the old-fashioned way, by altitude and time. This would slow down the system while air traffic is either re-routed or deliberately delayed to maintain safety. Obviously, our goal is to ensure that these problems, and the delays that could result, do not happen.

In order to meet that goal, last June, FAA's Office of Air Traffic Services (ATS)--the line of business in the FAA responsible for the operation and maintenance of the NAS -- established a centralized, specialized "war room," staffed with technical experts from across the country who have been brought together to tackle the Y2K problem for our air traffic systems. This effort has been led by a senior manager who has been assigned to this challenge full time. ATS also published its Y2K project plan that details the specific steps required to implement GAO's five-phase strategy for addressing the Y2K problem. In addition, ATS published its Y2K repair process and standards guidelines, detailing the specific repairs that are to take place. Everyone working on the Y2K issue for ATS systems has been held strictly accountable for following the specific steps and timelines laid out in these published guidelines to ensure consistency and coordination of all repairs. In addition to a clear plan for assessing and repairing systems, ATS has a

comprehensive quality assurance process in place to ensure that every NAS system is Y2K compliant.

Our deadline for assessing all NAS mission-critical systems was January 31, 1998, and I am pleased to report that we have met this deadline. Of the 209 mission-critical systems in the NAS, 125 have been certified as Y2K compliant. ATS has completed the quality assurance reviews for 171 of their mission-critical systems, and expects to complete the remaining 38 reviews by February 10. We now have an accurate picture of what we need to do to make the air traffic control system Y2K compliant. Renovation efforts are now underway and we expect this to go more quickly because we conducted a comprehensive assessment.

That's the air traffic portion of the picture. As to the Y2K effort for the rest of the FAA, assessment of 216 of our 221 mission-critical systems is now completed, with 5 remaining to be completed.

As I stated earlier, the GAO and the IG have advised that the FAA is not as far along as it should be, and that the core issues plaguing the Agency are the lack of an overall Agency-wide Y2K plan, and the lack of strong, centralized leadership on this issue.

I agree, and I have taken the following steps to address this concern. I have identified a new Agency lead to bring discipline, consistency and management direction to the

challenges presented by Y2K for the entire Agency. I have asked Ray Long, who for the past several months has been effectively directing the Y2K efforts for the air traffic systems, to be the FAA Y2K program manager. Ray has a proven track record managing the ATS Y2K program. His experience and knowledge of the problem are simply unparalleled, and will allow the entire FAA to benefit from his leadership immediately. I have also expanded the technical support provided by Coopers and Lybrand, our business partner for the ATS Y2K program, so that the FAA as a whole will benefit from the stringent and disciplined approach developed for our air traffic systems. I have asked Ray to focus particularly on the contingency plans that are needed for our mission-critical systems.

In pulling together this new office, Ray will draw on the many technical talents of all elements of the FAA to ensure that we have a complete, coordinated, corporate approach to Y2K. He will also be working directly with his counterparts in the aviation industry so that the airlines and airports are fully informed and confident in FAA's progress. Ray has begun his new assignment and reports directly to me. I intend to remain personally involved in our progress on Y2K. I have made it clear to all FAA executives that we must, and we will, meet our obligations to the flying public.

Next, we must ensure we have sufficient funding in the rest of this fiscal year, and in FY 1999. To augment the $18 million Congress appropriated for Y2K efforts this year, we have absorbed approximately $33.2 million of Y2K costs within the Agency.

Additionally, the Administration is in the process of formally requesting a reprogramming of funds to assist us in these efforts. We hope to finalize this request and forward it to our authorizing and appropriating committees shortly.

Madame Chair, Mr. Chairman, I have heard your admonishments to FAA to stay on top of this issue and ensure that the safety and efficiency of air transportation is not compromised after midnight on December 31, 1999. I want the FAA to succeed. I am keeping a close eye on the management of this program to ensure we get the job done.

As I said at the beginning of my testimony, the question on everyone's mind is, can we make it? And my answer is yes. It will take perseverance, persistence, vigilance, and continuity of commitment, which Ray Long, the dedicated personnel working to resolve the Y2K problem, and I, as FAA Administrator, are committed to providing.

That completes my prepared statement. Thank you once again for the opportunity to appear before you, and I would be pleased to answer any questions you may have at this time.

U.S. Department
of Transportation
**Federal Aviation
Administration**

800 Independence Ave., S.W.
Washington, D.C. 20591

Jane F. Garvey
Administrator
Federal Aviation Administration

Jane F. Garvey, the 14th Administrator of the Federal Aviation Administration was sworn in August 4, 1997. She became the first Administrator confirmed by the Senate to serve a five-year term as opposed to serving at the pleasure of the President.

With an outstanding career in public service and extensive administrative experience, Garvey brings to the FAA a strong commitment to ensure the world's safest skies become even safer.

As Administrator, Garvey manages a 48,000-person agency with worldwide impact and presence in promoting aviation safety and security. The FAA regulates and oversees aviation safety and security, conducts cutting edge research and development, and operates the world's largest air traffic control system.

Prior to being named FAA Administrator, Garvey was Acting Administrator of the Federal Highway Administration (FHWA). She served as Deputy Administrator of FHWA from April 1993 until February 1997. FHWA, also an agency of the U.S. Department of Transportation, has an annual budget of $20 billion and works in partnership with the states to maintain the safety and efficiency of the Nation's roads and bridges.

A creative leader at FHWA, Garvey chaired FHWA's Innovative Financing Initiative, which resulted in more than $4 billion in transportation investment in more than 30 states—projects that in many cases would not have been otherwise built.

Prior to joining FHWA, Garvey served as director of Logan International Airport, one of the Nation's busiest aviation facilities. From 1988 to 1991, she was Commissioner of the Massachusetts Department of Public Works. Before that, Garvey was Associate Commissioner in the Department of Public Works, where she directed construction activities and developed environmental initiatives.

Garvey holds degrees from Mount Saint Mary College and Mount Holyoke College. She has participated in the Fellowship Program for Public Leaders at Harvard University.

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Mr. HORN. Well, we thank you.

And Mr. Graham, we're delighted to have you here as an outside consultant who has looked at this problem in a number of agencies. Stanley Graham is senior management consultant for Tech-Beamers, Inc. Mr. Graham.

STATEMENT OF STANLEY GRAHAM, SENIOR MANAGEMENT CONSULTANT, TECH-BEAMERS, INC.

Mr. GRAHAM. Thank you very much, Mr. Chairman.

I hope to be of help on FAA's year 2000 challenge. Based on information supplied by the GAO and your staff, I've concluded that many of the FAA's 414 critical applications, will not be year 2000 ready by the end of 1999.

I agree with the GAO that the problem at the FAA is indeed a project management one, however, with technical complication. Furthermore, it appears that the FAA does not have an objective methodology for planning and tracking their year 2000 project schedules.

My experience evaluating the schedule performance of several hundred projects has shown that the progress of large software projects tend to follow a family of curves known as beta curves. The percent complete is represented to the left of the curve and elapse time is represented to the bottom of the chart. The curve at the extreme left shows the progress that might be expected from the use of a highly automated migration aid. The curve at the extreme right illustrates pilot testing using manual renovation.

Most projects start off slowly. The FAA applications are no exception. In order to become year 2000 ready, the FAA must significantly accelerate their progress during the next few months. However, even when they do, experience shows that this higher rate will not be sustained. Finding the cause and fixing the last 10 percent of the problems can take 20 to 30 percent of the time. Furthermore, the use of these curves as a planning and schedule tracking tool over time is a highly reliable indicator of a project's schedule performance.

To give the FAA the benefit of the doubt, we selected the average beta curve. It shows equal time on the learning curve and on the completion segment. When we assess their progress against the curve using our code-track project management tool, the results were not encouraging. Even if the FAA stops slipping their schedule, they would miss their deadline by more than 7 months. If they continue to slip at the same rate, they would finish almost 9.5 years late. The FAA schedules are open, and therefore, not reliable. As a result, I believe there is little chance that the FAA's critical applications will be year 2000 ready.

According to the GAO report, the number of applications systems is large. More than 875 systems, 18,000 subsystems, and 65 million lines of code. Furthermore, through November 15, 1997, the Department of Transportation reported that the FAA's large, complex systems were only 3 percent through program renovation. Although this number should rise with later data, we will not have a reliable number until 65 million lines of code and their data have been analyzed and accounted for.

Furthermore, testing is projected to take 50 to 70 percent of a projects schedule. A strong testing discipline is required. One year 2000 project planning methodology suggests an approach that may be helpful to the FAA. In order to maximize overlap of the year 2000 renovation, we recommend that baseline testing begin prior to the renovation of programs. Given the current situation at the FAA, I recommend that base testing phases begin no later than June, but preferably sooner.

Integral to executing each of FAA's applications are extensive information processing and communication technologies. These systems depend on 80 interrelated computers just for the en route system to safely guide and direct aircraft.

What makes the FAA problem particularly serious is that the FAA is running computers that are almost 20 years old. What makes the situation even more difficult is the special instructions that have been added to the FAA computers. The agency also has it's own proprietary computer operating systems software that is used nowhere else in the world.

In order to reduce the risk of the integrity of the FAA flight control system, I recommend the establishment of a pilot project on a cluster of year 2000 time machines. The first step would be to replicate the FAA's current operating system on a computer such as the IBM R390, and to pilot test selected FAA systems operation on this year 2000-ready computer environment. We previously used such a system to replace similar computers that are central to the FAA's en route system.

The recommendations I propose are not a quick fix. Furthermore, there is no way to completely test applications as complex as air traffic control. The number of logical paths cannot be bounded. Therefore, no solution will come with 100 percent guarantee. However, what I propose could be helpful in your search for an inexpensive and practical short-term solution. It would help the FAA maintain their vital services.

Thank you for the opportunity to testify. I hope I have been helpful to the FAA and your subcommittee.

[The prepared statement of Mr. Graham follows:]

Presentation to Congress The Year 2000: At the FAA -The Time for Action is Now!

1/30/98

Thank you. Mr. Chairman, I hope to be of help to your committees on the FAA Year 2000 challenge. Based on information supplied by the GAO and your staff, I concluded that many of the FAA's 414 critical applications will not be "Year 2000 ready" by the end of 1999. I agree with the GAO that the problem at the FAA is indeed a project management one, however with technical complications. Furthermore, it appears that the FAA does not have an objective methodology for planning and tracking their Year 2000 project schedules.

My experience evaluating the schedule performance of several hundred projects has shown that the progress of large software projects tend to follow a family of curves known as Beta Curves. The percent completed is represented to the left of the curves and elapsed time is represented at the bottom of the chart. The curve at the extreme left shows the progress that might be expected from the use of highly automated migration aids. The curve at the extreme right illustrates pilot testing using manual remediation.

Most projects start off slowly, the FAA applications are no exception. In order to become Year 2000 ready, the FAA must significantly accelerate their progress during the next few months. However even when they do, experience shows that this higher rate will not be sustained. Finding the cause and fixing the last 10% of the problems can take 20-30% of the time. Furthermore, the use of these curves as a planning and schedule tracking tool over time is a highly reliable indicator of a project's schedule performance.

To give the FAA the benefit of the doubt, we selected the average Beta curve. It shows equal time on the learning curve and on the completion segment. We then assessed their progress against that curve using our CODE-TRAC™ project management tool. The results were not encouraging. Even if the FAA stops slipping their schedule, they would miss their deadline by more than 7 months. If they continue to slip at the same rate, they would finish almost 9 ½ years late. The FAA schedules are "open," and therefore not reliable.

According to the GAO report, the number of application systems is large; more than 875 systems, 18,000 subsystems, and 65 million lines of code. Furthermore, through November 15, 1997 the Department of Transportation reported that the FAA's large complex systems were only 3% through program remediation. Although this number should rise with later data, we will not have a reliable number until all 65 million lines of code and their data have been analyzed or accounted for.

Furthermore, testing is projected to take more than 50-70% of a project's schedule. A strong testing discipline is required. Our Year 2000 project planning methodology suggests an approach that may be helpful to the FAA. In order to maximize overlap with Year 2000 remediation, we recommend that baseline testing begin prior to the remediation of programs. Given the current situation at the FAA, I recommend that baseline testing phases begin no later than June, but preferably sooner.

Integral to executing each of the FAA's applications are extensive information processing and communication technologies. These systems depend on 80 inter-related computers just for the en-route system to safely guide and direct aircraft. What makes the FAA problem particularly serious is that the FAA is running computers that are between 20-25 years old.

What makes the situation even more difficult is that special instructions have been added to the FAA computers. The Agency also has it's own proprietary computer operating system software that is used no where else in the world.

In order to reduce the risk to the integrity of the FAA flight control system, I recommend the establishment of a pilot project on a cluster of "Year 2000 Time Machines." The first step would be to replicate the FAA's current operating system on a computer such as the IBM R/390, and to pilot test selected FAA systems operation in this "Year 2000 Ready" computer environment. We previously used such a system to replace similar computers that are central to the FAA's en-route system.

The next step is to make provisions for attaching the radar detection hardware and flight controller's displays to several of the systems and check out the Flight Control Systems applications. Following that, the FAA could use Year 2000 software vendor tools to bridge current data and current applications to make them Year 2000 ready. These tools selected should require little or no program changes. The following step should be remediating and testing changes to the critical applications. After that is complete, the renovated applications can be judged by the FAA as to their suitability for operation.

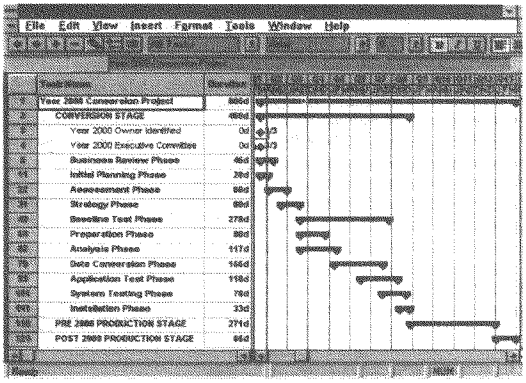
The recommendations I propose are not a quick fix. Furthermore, there is no way to completely test applications as complex as air traffic control. The number of logical paths cannot be bounded. Therefore, no solution will come with a 100% guarantee. However, what I propose could be helpful in your search for an inexpensive and practical short term solution. It could help the FAA maintain their vital services. Thank you for the opportunity to testify, I hope that I have been helpful to the FAA and to your committees.

Presentation to Congress The Year 2000: At the FAA -The Time for Action is Now!

Handout

Thank you Mr. Chairman. I understand that there is a great deal of concern that computers used in the United States air traffic control system could fail after December 31, 1999, if not sooner, due largely to Year 2000 problems. Based on the GAO report, input from your staff, and Tech-Beamers research, I believe that there is little chance that all the FAA's 414 critical applications will be Year 2000 ready by year end, 1999. I agree with the GAO report that the enormous problem involved with correcting these systems is not primarily technical, but a project management one. Tech-Beamers has been identified as a premier Year 2000 service provider. I am pleased that we can share with the Science Committee's Subcommittee on Technology and the Government Reform and Oversight Committee's Subcommittee on Government Management, Information and Technology and the FAA some of the experiences that we had in managing major conversions. There are many problems to be addressed by the FAA. One of these is the requirement for an objective (quantifiable) methodology for planning and tracking FAA project schedules. There is a proven way to gather and report such schedule information. I will also make other recommendations that should be helpful in reducing the risk due to the FAA's en-route air traffic control system due to antiquated mainframe computing systems.

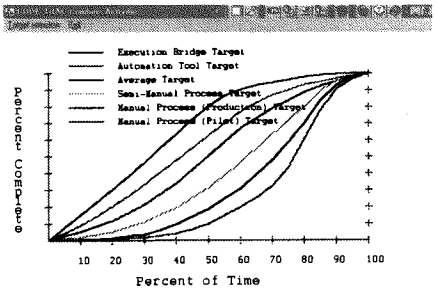
There is no quick fix to the FAA problem. However, one of the first steps should be the creation of a detailed project plan, with milestones such as the one summarized here.



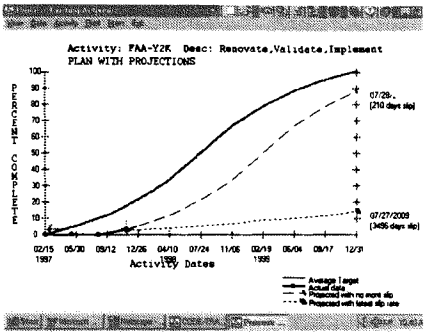
In general, project planning and tracking methodologies most organizations use are antiquated. From the data I have seen, the FAA project is no different. These methods are undisciplined, rely largely on intuition and hunch, and are constrained by edict. Industry experts report that 80% or more of computer projects fail to meet their dates with the function committed. This is unacceptable for the Year 2000.

Considering the scope of the Year 2000 problem at the FAA, they have little choice but to use a disciplined project planning and tracking methodology to manage their schedules.

Having established the overall project plan, it becomes important to use a methodology for planning and tracking the progress of each of the major plan activities.



My experience evaluating the schedule performance of several hundred projects has shown that the progress of large software projects tend to follow a family of curves known as Beta Curves. The percent completed is represented to the left of the curves and elapsed time is represented at the bottom of the chart. The curve at the extreme left, is characteristic of progress that might be expected from the use of highly automated migration aids the can be used to bridge the applications current data and code without change, and to the extreme right the initial attempts to utilize manual renovation.



Most projects start off slowly, the FAA applications are no exception. In order to become Year 2000 ready, the FAA must significantly accelerate their progress during the next few months. However when they do, experience shows that this higher rate will not be sustained. Finding the cause and fixing the last 10% of the problems can take 20-30% of the time. Furthermore, the use of these curves as a planning and schedule tracking tool over time is a highly reliable indicator of a project's schedule performance.

To give the FAA the benefit of the doubt, we selected the average Beta curve. It shows equal time on the learning curve and on the completion segment. We then assessed their progress against that curve using our CODE-TRAC™ project management tool. The results were not encouraging. Even if the FAA stops slipping their schedule, they would miss their deadline by more than 7 months. If they continue to slip at the same rate, they would finish almost 9 ½ years late. The FAA schedules are "open," and therefore not reliable. I believe that there is little chance that all the FAA's 414 critical applications will be Year 2000 ready by year end, 1999.

According to the GAO report, the number of application systems is large; more than 875 systems, 18,000 subsystems, and 65 million lines of code. Furthermore, through November 15, 1997 the Department of Transportation reported that the FAA's large complex systems were only 3% through program renovation. Although this number should rise with later data, we will not have a reliable number until all 65 million lines of code and the data is analyzed or accounted for.

Furthermore, testing is projected to take more than 50-70% of a project's schedule. A strong testing discipline is required. Our Year 2000 project planning methodology suggests an approach that may be helpful to the FAA. In order to maximize overlap with Year 2000 renovation, we recommend that baseline testing begin prior to the renovation of programs. Given the current situation at the FAA, I recommend that baseline testing phases begin no later than June, but preferably sooner.

Baseline Test Phase

ID	Task Name	Duration
42	Baseline Test Phase	278d
43	Assemble Test Team	10d
44	Test Team Training	15d
45	Prepare Initial Test Plan	15d
46	Define Test Variations	20d
47	Review Test Variations	8d
48	Create and test Test Cases	20d
49	Develop Test Scenarios	15d
50	Create Testing Plan	15d
51	Application Baseline Test	85d
52	Prepare System Test Bucket	30d
53	Baseline System Test	60d

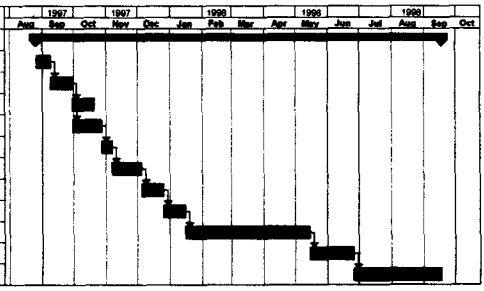


Figure 1-16

Baseline Testing is a term used to define a group of testing related activities that encompass both component/application and early system test preparation. It forms the starting point for all the testing that is to follow. It is key to the success of the date conversion effort. To be most cost effective, it should be done using disciplined testing methodologies. This includes breaking down testing into manageable segments with clear objectives for each. Since these activities are not dependent on making the code changes to the applications, it can begin early in the date conversion phase. The longer it is delayed, the greater the risk of truncating the testing effort and increasing the risk of introducing errors into the operational system(s).

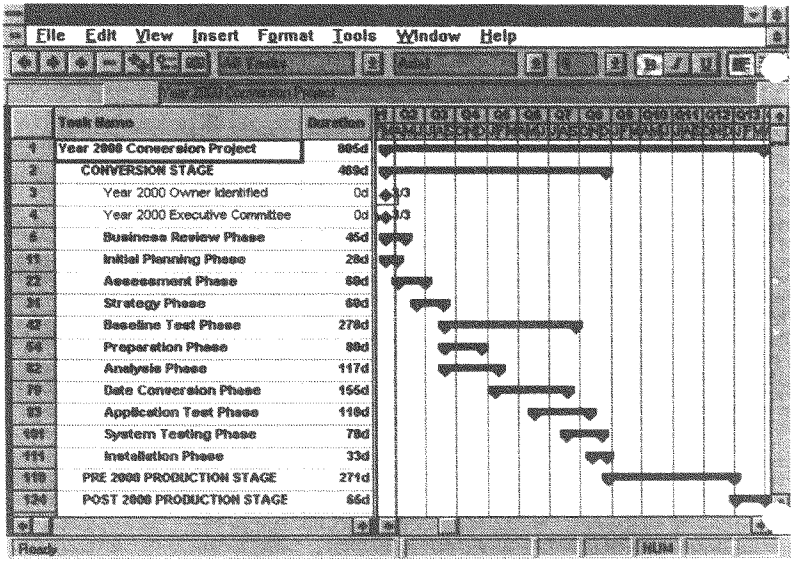
Integral to executing each of the FAA's applications are extensive information processing and communication technologies. These systems depend on 80 inter-related computers just for the en-route system to safely guide and direct aircraft. What makes the FAA problem particularly serious is that the FAA is running computers that are between 20-25 years old.

What makes the situation even more difficult is that special instructions have been added to the FAA computers. The Agency also has it's own proprietary computer operating system software that is used no where else in the world.

In order to reduce the risk to the integrity of the FAA flight control system, I recommend the establishment of a pilot project on a cluster of "Year 2000 Time Machines." The first step would be to replicate the FAA's current operating system on a computer like an IBM R/390, and to pilot test selected FAA systems operation in a "Year 2000 Ready" computer environment. We previously used such a computer to replace similar ones that are central to the FAA's en-route system.

The next step is to make provisions for attaching the radar detection hardware and flight controller's displays to several of the systems and check out the Flight Control Systems applications. Following that, the FAA could use Year 2000 software vendor tools to bridge current data and current applications to make them Year 2000 ready. These tools selected should require little or no program changes. The following step should be renovating and testing changes to the critical applications. After that is complete, the renovated applications can be judged by the FAA as to their suitability for operation.

The recommendations I propose are not a quick fix. Furthermore, there is no way to completely test applications as complex as air traffic control. The number of logical paths cannot be bounded. Therefore, no solution will come with a 100% guarantee. However, what I propose could be helpful in your search for an inexpensive and practical short term solution. One that could help the FAA maintain their vital services. Thank you for the opportunity to testify, I hope that I have been helpful to the FAA and to the Science Committee's Subcommittee on Technology and the Government Reform and Oversight Committee's Subcommittee on Government Management, Information and Technology.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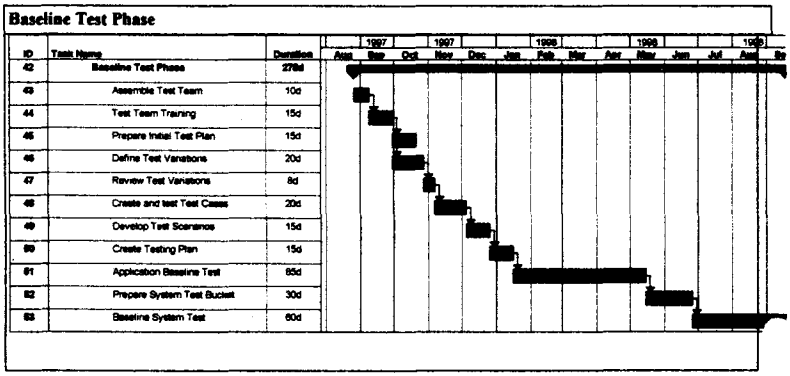
2 CONVERSION STAGE 489d
3 Year 2000 Owner Identified 0d
4 Year 2000 Executive Committee 0d
Business Review Phase 45d
Initial Planning Phase 28d
Assessment Phase 59d
Strategy Phase 60d
Baseline Test Phase 278d
Preparation Phase 80d
Analysis Phase 117d
Data Conversion Phase 155d
Application Test Phase 110d
System Testing Phase 79d
Installation Phase 33d
PRE 2000 PRODUCTION STAGE 271d
POST 2000 PRODUCTION STAGE 65d
Ready


Baseline Test Phase
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Task Name
Duration
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44 Test Team Training 15d
45 Prepare Initial Test Plan 15d
46 Define Test Variations 20d
47 Review Test Variations 8d
48 Create and test Test Cases 20d
49 Develop Test Scenarios 15d
50 Create Testing Plan 15d
51 Application Baseline Test 85d
52 Prepare System Test Bucket 30d
53 Baseline System Test 60d
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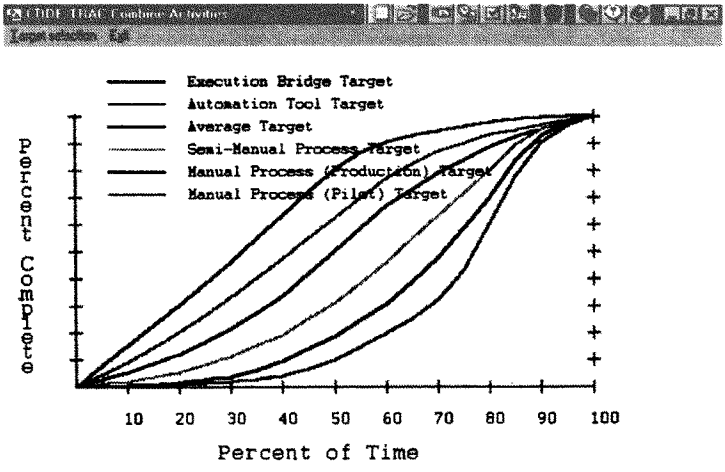
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Automation Tool Target
Average Target
Semi-Manual Process Target
Manual Process (Production) Target
Manual Process (Pilot) Target
Percent Complete
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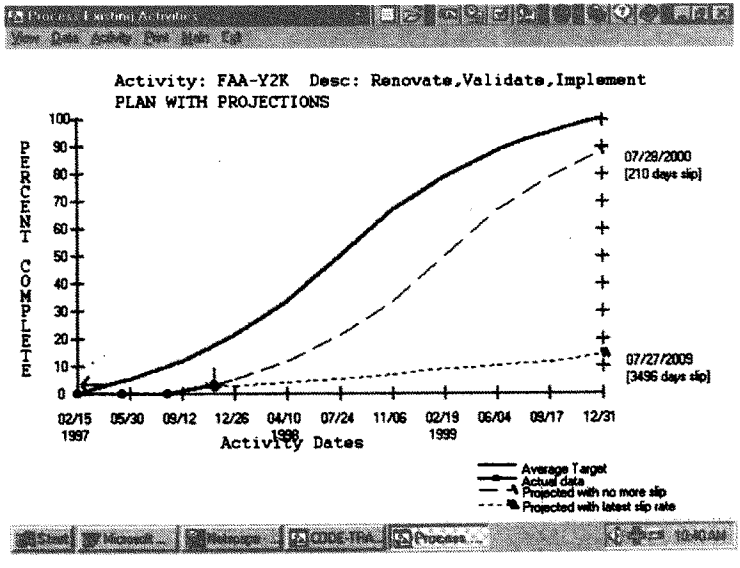
Percent of Time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PLAN WITH PROJECTIONS
PERCENT COMPLETE
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07/29/2000
[210 days slip]
07/27/2009
[3496 days slip]
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05/30
09/12
12/26
04/10 1998
07/24
11/06
02/19 1999
06/04
09/17
12/31
Activity Dates
Average Target
Actual data
Projected with no more slip
Projected with latest slip rate

The Year/2000 Problem: The Time for Action is Now!

By Stanley Graham

My name is Stanley Graham, I am a senior management consultant with Tech-Beamers, Inc. My company was formed and staffed largely by former IBM'ers. We are considered leaders in the application of advanced computer technology and the Year/2000 problem. I am a computer industry veteran of 38 years, with significant experience in major computer conversions and testing. I hope to bring to the Year/2000 problem the perspective of someone who has been there; a businessman, computing center manager, management consultant, vendor, author and student of history. Toughened by failures and buoyed by successes, someone who is comfortable in applying common sense to the application of mathematics and science to real world problems. Therefore, I believe that I bring a unique point of view to the Year/2000 problem. I am here to share with you both general recommendations on what should be done now to help reduce the economic impact and casualties in the Year/2000 and how to apply these solutions to the FAA system's Year/2000 project.

Despite improvements in awareness of the Year/2000 problem over the last two years, little progress has been made in implementing the solutions. For example, the data through November 15, 1997 indicates that of FAA's some 150 large complex systems (including the FAA) are only three percent complete through program remediation stages. Furthermore, I believe that in the Year/2000 there will be widespread disruption of services throughout the world, that includes vital air transport and travel world wide.

There is a perception that the Year/2000 is only a mainframe problem. It is not. Although many mainframe systems may fail, departmental systems, workgroup servers, and networks that connect industries will fail as well. Information sharing networks for authorities, and person to person communication will be compromised. Business PC's and personal computers at home will not escape the Year/2000 problem. The Internet will not be spared. These failures, for the most part, will not stop computers from computing. Problems of that kind are usually easy to fix. Most failures will be "soft failures." While almost all computers will continue to operate, bad data will be broadcast through a network of interconnected computing systems. This will challenge our communication systems, undermine the integrity of our industrial and governmental infrastructure and networks that provide services for our basic needs. In some cases bad data will remain hidden in massive data banks only to surface at some unexpected time in the future.

Need Decisive Action Now

Unless we take decisive action now, computer systems in large corporations and all levels of government will fail. Computer systems in small businesses and non-profit organizations will also fail. Without the resources to fix the problems, the shock to these organizations will often be fatal. It is likely that the problems will begin by widespread loss of electrical power and disruption of transportation systems world-wide. These will be directly attributable to Year/2000 problems in the software that drives the computers and the embedded microcomputers that manage the grids of widely disbursed, interconnected utilities and transportation networks. Even though not all the evidence is in, those of us who are closest to the problem believe the time for decisive action is now.

Despite breakthroughs in the underlying technology, since the 1960's little has changed in the management of computer projects. The project planning and tracking methodologies most organizations use are antiquated. They are largely undisciplined, rely heavily on intuition and hunch, and are constrained by edict. Industry experts report that 80 percent or more of computer projects fail to meet their dates with the function committed. This is unacceptable for the Year/2000.

It is common knowledge that the technology and uses of computers have undergone dramatic changes over the last 38 years. Breakthroughs in the density of packaging data has dramatically altered the amount of information that can be stored inside the computer and is readily accessible on line. The speed of

processing is accelerating: recent breakthroughs in chip performance promise that processor speeds will soon exceed expectations of even the most optimistic technology watcher. Improvements in price performance have brought a staggering number of new uses and hundreds of millions of new users to computers.

Year/2000 Dwarfs All Projects

The conversion from second generation mainframes to IBM's 360 was the most complex, but not the most challenging conversion the industry has had to face. In technical terms, the Year/2000 conversion is trivial. However, in the 1960s we counted computers in the low thousands. Now we must consider hundreds of millions of computers ranging from embedded micro computer chips, some 250 million personal/business computers, hundreds of thousands of departmental minicomputers, workgroup servers, and tens of thousands of corporate mainframes and networks of interconnected heterogeneous systems. This includes unrestricted networks such as the Internet. There are tens of billions lines of code and complex program logic that must be investigated and changed to make applications Year/2000 ready. Therefore, the Year/2000 is the most challenging problem the industry has ever had to face.

The Year/2000 problem so dwarfs all prior computer projects, that it will become known as the greatest threat to global financial, economic, communication networks, transportation, and to industrial and governmental infrastructures since the introduction of the computer. Political and industrial leaders will be judged by history on how well they faced the problems, and how effectively they led the efforts to ensure their institution's survival into the 21st century. By 2010, scholarly and popular history books, video documentaries, and Harvard Business School Case Studies will chronicle the failures and successes, using these projects.

Delay Not An Option

There is no way to delay the Year/2000. Problems will begin almost immediately. Systems will fail simultaneously across the nation and the world. Therefore, crisis management on a scale never before performed will be essential. Priorities must be reset to focus on the Year/2000, and special programs will be required to help manage the risk. While Year/2000 teams struggle towards compliance, many applications should be triaged. By mid 1999, crisis management teams must be thoroughly prepared to handle worst case scenarios.

The industry's leading computer manufactures, economists, and consultants are adding their voices to the growing chorus of the concerned. We may differ on exactly what will be disrupted and how extensive the damage will be. However, we all agree that this is the greatest challenge that the computer community has ever faced. According to a report on Bloomberg TV on Friday January 16, seven percent of software has already failed due to the "Year/2000 bug."

Credit cards are a simple way to illustrate the problem. In the business page of *The New York Post* it was reported that some merchants can't process credit cards with an expiration date of "00." It is easy to check a credit card to confirm that the expiration date does not go beyond 1999. Most credit card companies have not yet been able to fix their systems to accept dates beyond the year 1999. This is but one early indicator of the Year/2000 problem. In addition, major banks have been working on the Year/2000 problem for four years or more. Most have yet to finish.

The history of the Information Technology (I/T) industry is full of missed project schedules. Consultants that studied the issue suggest a miss rate of 80 percent or more. At a Year/2000 conference in 1996 of about 150 managers and professionals, the audience was asked if anyone had participated in a project that came in on schedule with the promised functions. Not a single hand was raised. In past conversions, we had the option of extending our schedule. However, the Year/2000 is immutable, and there is very little room for maneuvering.

Although there has been increasing awareness of the Year/2000 issue in 1996 and 1997, very serious problems still lie ahead. Many Year/2000 project managers are not really certain where they stand on the conversion project, where they are going (what their business objectives are), how to get there (the tools and resources required), and how long it will take to become Year/2000 ready. Yet, the survival of their organization, and vital services to hundreds of millions of people are at stake.

False Security

For most, things are going too well today to focus on problems two years in the future. With the exception of Asia. there is good economic news, the Federal Reserve seems satisfied that the rate of inflation is under control, the stock market, despite its high volatility keeps trending upward. Unemployment is low, and consumer confidence is high. The outlook seems fine on "Main Street."

After a period of deep uncertainty, the Information Systems (I/S) managers jobs are now more secure. They are back to where they were 10 years ago. These are like utility managers providing computing power to their organization. Their challenges center around reacting to today's problems and opportunities. Almost all were educated in a highly competitive environment by educators using rote methods. Many are uncomfortable with mathematics and statistics, and share a distrust of basic science. Furthermore, since few computer executives had to face a project with an immovable deadline, it is not surprising that they did not have the opportunity to develop the basic skills, methodology, and approach needed to plan and track project schedules objectively.

The Year/2000 project manager will be confronted with many problems. One is finding and keeping the profes-

sionals that are vital to the success of the conversion. In addition to retaining their current employees, staffing the Year/2000 projects is certain to be a challenge. It is already a problem, and will only get worse as was reported in the January 13 edition of *The New York Times* article "Software Jobs Go Begging." In addition, corporate executives must re-learn the lessons of respect for the individual that was a common practice when the computers were introduced.

The Historical View

In the 1960s, the computer industry was in its infancy, programmers were drawn from diverse disciplines; at IBM primarily mathematics, music, and the liberal arts. Programming was a craft, not a profession. Machine instructions were coded by hand. If we wanted tools, we had to invent them. We were forced to repeat information over and over again. We struggled over how to package data in the tightest space possible as 80 columns in a punched card offered little room for programming commands and data, certainly not the redundant 19xx four-digit date. Changes were made in batch mode. The ability to make and test changes immediately were a programmers dream, somewhere far off in the future. When we made coding errors (and we all did), we waited 4 hours or more to get the corrections re-coded and run back through the system. Key-punch errors were a source of consternation. Despite these frustrations, we accepted each new challenge, convinced that no technical problem was too difficult to solve. Those who seek to find blame for the Year/2000 problem may select our generation. However, it is more than likely that given the information that we had, they would have made the same decisions.

Today the computer industry is populated by a new generation, supplied largely from the baby boomers who from their earliest school days grew comfortable with computers. Most take for granted the benefits of interactive computing. However, they suffered pains that most in my generation did not experience. Many have been treated as liabilities and unnecessary expenses. They have suffered the pain of layoffs and their families severe dislocations over the last five years.

Some in the Hudson Valley unable to pay their mortgages, dropped off their keys at the Credit Union seeking entirely new careers and opportunities wherever they could find them. Wal-Mart, McDonalds, local real-estate offices, and driving delivery trucks were for many the kind of jobs they secured. It is only within the last two years that the situation has turned around. It is not surprising that they, as well as many of the mainframe professionals in other organizations in other parts of the country, no longer share the optimism and loyalty to their organizations of the teams in the 60's and 70's. However, these people, like the foot soldiers in any war, will be essential to help solve the Year/2000 problem. Organizations will be forced to build their employees' morale and win back the hearts and minds of these professionals if they wish to survive.

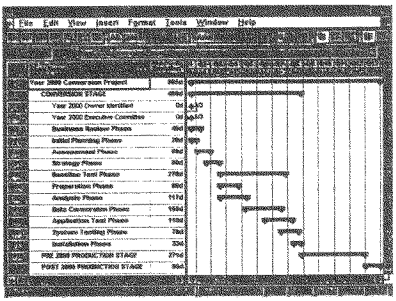


Figure 1

Most in the industry now realize that there is no "silver bullet" and there will be no quick fixes to the Year/2000 problem. However, there are software and hardware computer tools by computer manufacturers and independent software vendors for: planning and tracking Year/2000 project schedules, finding non compliant code, executing programs as if it was the Year/2000, changing non compliant programs, providing bridges for current data and programs that allow for a more orderly transition. There are also "time machines" to replace ancient mainframes, to aid in remediation and testing, and to pilot test networks of Year/2000 ready processors. Despite improvements in productivity as high as 400 percent, few of these tools have gained wide acceptance. Since there is so little time left, Year/2000 conversion teams should be encouraged to use and, if necessary, adapt the tools for their own organization's use.

Intelligent planning, project discipline, hard work, and intelligent risk taking is required. The objective should be reasonable, not perfect solutions. CIO's must be told that since there is no perfect solution, their assignment is to maintain the vital services of the organization. Project managers should be counseled that if they see us through the crisis, they will be suitably recognized and rewarded even if some errors get by. Flexibility is essential. We should not place a manager's job in the balance if some mistakes are made in the process. These are the field commanders making dozens of decisions a day, with inadequate resources and time.

Fixing An Insoluble Problem

Project managers are being told to fix what is essentially an insoluble problem, that is, assuring that every application is Year/2000 compliant. Unless properly directed, many will resign before the project is over, while others may seek to offload responsibility and avoid taking the blame for the problems that are certain to follow. There will be

a waste of precious time, resources, and dollars focusing on the infinite set of conditions that might arise. Many problems that can be solved will be missed. Breaking insoluble problems into solvable parts is required. Compliance will be the goal, but frustration and failures will further erode project schedules.

Unless otherwise instructed, project managers will establish dates by fiat, without having thought through the dependencies and how each part of the project plan fits together. (See Figure 1.) Project managers will routinely underestimate the time for testing. Many will conclude that it is not worth the effort, ignoring the admonitions of the auditors, experts, and consultants who urge them to increase their focus on testing. Many will assert that they will make their schedule, while at the same time they position themselves to deflect blame onto others if they miss their commitments. Given no clear quantitative plan, those responsible for auditing the project will make straight line extrapolations. They can demonstrate, based on the project's history, that the project will not meet its schedule.

Both the project managers and auditors are better served if they used a family of curves that experience has shown is useful in planning and tracking project schedules. These curves are known as "Beta" curves. (See Figure 2.) These curves are a highly reliable indicator of projects' schedule performance. Use of such a methodology can provide an objective view of the status of a project, and the quantity of slip early enough to take corrective action.

Tech-Beamers CODE-TRAC™ and TEST-TRAC™ tools implement this methodology. The "Beta" curve is used to represent the planned schedule, an important step. It is helpful to recognize that successful and failed projects look the same at the outset. Both experience a "learning curve" (a period of relatively slow progress). After the learning period is over, there is an inflection point after which the project progresses at a higher rate.

Furthermore, there is an even more serious problem, one that project managers invariably face. From observations over the last several years, Year/2000 projects will be no different. The project manager assumes when making good progress that it will continue at the same rate. It does not. Most invariably find that the last 10 percent of the problems can take 20-30 percent of the time. This is why edict driven schedules connected by a straight line from start to finish just does not work. (See Figure 3.)

Impossible To Guarantee Compliance

Testing is projected to take 50-70 percent or more of a project's schedule. Unfortunately, there is no way to completely test any major application for Year/2000 readiness. The number of logical paths is infinite (beyond counting). Therefore, it is not responsible to guarantee that any application is 100 percent Year/2000 compliant. Failure to recognize this will lead to confrontation and finger-pointing. Instead, vendors and their customers should work together to develop solutions to the organization's key business needs and "work-arounds" to solve short term problems.

Furthermore, every day computer applications that have been operating for years experience problems; some of these problems could have been avoided, others not. Manual workarounds and overrides are an every day occurrence. Therefore, we must recognize that we live in an imperfect world. Considering the progress to date on the Year/2000 problem and the amount of time that is left, the best that can be expected are solutions that maintain an acceptable level of vital services as we enter the new century.

Almost all those that have studied the problem seriously over the last several years are convinced of the importance of the challenges that lie before us. It may be helpful to think of the Year/2000 problem as if it were a global war. There are bound to be many casualties, many organizations and institutions will not survive beyond the Year/2000. The enemy is the inevitable passage of time, our inability to comprehend the scope of the threat, to coordinate the solutions, the history of failures to meet deadlines, and a lack of under-

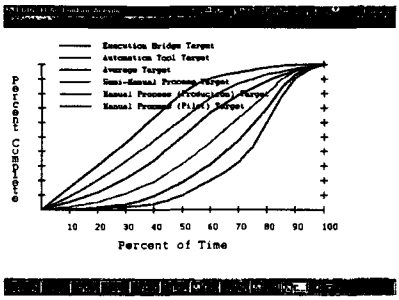


Figure 2

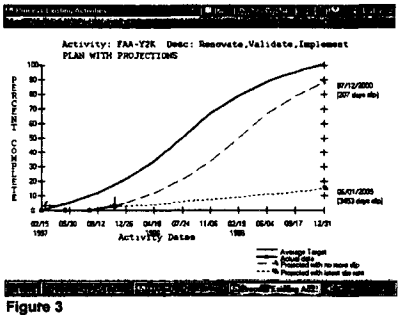


Figure 3

standing of the weapons at our disposal.

We cannot be deterred by those who demand absolute proof of the problem before taking decisive action. When the proof is at hand, and it will be in 1999, it will be too late to win battles that could have been won. Our casualties will be greater than they need be.

Dire Consequences

This war should not last long. Some hard failures in our systems will occur immediately, even though soft failures may take several years to become apparent. The consequences of failure to fix the problem will streak across the globe, like tens of thousands tornadoes disrupting the lives of hundreds of millions of people by denying them vital services.

We have become dependent on global communication and transportation systems, these will be affected. Every organization will be affected, including those that were convinced they were prepared, when data feeds from non compliant systems compromise their networks. Additionally, many small businesses and non profit organizations will not be able to compete for the conversion staff, or may realize too late the danger of the approaching force and will fail to make adequate back-up plans. Many of these organizations will be compromised and fail.

Conclusion

There are things to be done. Information sharing must be expanded, the Internet is an excellent vehicle to communicate solutions. We must discourage "not invented here" and capitalize on the experience of others. Furthermore, survival is the first priority. Therefore, many projects should be deferred or cancelled.

The evidence is accumulating. There are wake up calls being sounded by many industry consultants, leading hardware vendors such as IBM and Digital Equipment, Governmental leaders such as Congressman Horn, Congresswoman Morella and SEC Chairman Levitt. Publications such as the *Year/2000 Journal* an enlightened press corps, and print and video media have begun to make a difference. Only if Government and Industry work together with an informed population, can we hope to minimize the economic dislocation and Year/2000 casualties. As Robert Alloway of Congressman Horn's staff suggested; "When the time comes, being right will not be enough. We must influence others to take action now."

In conclusion, although there is danger, there is still time to marshal the resources to help reduce the risk. There are tools that can help, and time left to develop emergency backup plans to mitigate the damage. However, it is vital to understand the seriousness of the problem and to act now to mitigate it's effect. Current spending priorities must be reset. Although accountability is required, with no 100 percent solution, contracts and warranties must reflect this reality.

The Year/2000 migration teams should be encouraged to use the best Year/2000 tools and methodologies while working with, not confronting vendors. Employee and management morale must be rebuilt through rewards and recognition of the difficulty of Year/2000 assignments. Crisis management procedures must be developed now, and teams staffed as soon as possible. Furthermore, every decision maker must recognize that we live in an imperfect world where applications and systems need repair. That means that even after the Year/2000 migration is complete, there will still be work to be done. The time for action is now!

An article based on this presentation will appear in the March/April 1998 issue of *Year/2000 Journal*: PO Box 550547, Dallas, TX 75355

Bio Brief

STAN GRAHAM

The Vice President of Tech-Beamers, Inc. is a highly regarded professional with more than 35 years experience of innovation and contribution to many leading fields of information technology. Major strengths communicating expertise and providing guidance to technical professionals, information system management, and business executives.

EXPERIENCE

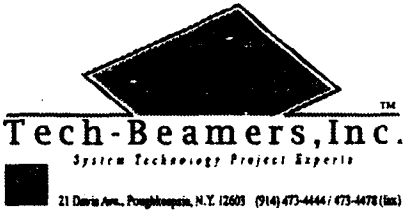
As chairman of the IBM S/360 conversion task force, he defined the strategy and product requirements for converting from second to third generation computers. As operations manager of the Poughkeepsie Pogramming Cnter, he managed the largest commercial data center in the world. As the program manager for the IBM client/server strategy, he chaired the interdivisional task force that defined the market requirements and quantified the opportunity of client/server for mainframe-network connected systems. These requirements, after validation through extensive customer studies, were encapsulated into the S /390 client/server strategy and are still being applied to gauge IBM's client/server products.

On the headquarters staff of the Vice President of Scientific and Technical Computing, he defined and validated the market for open and heterogeneous systems and tracked the growth of IBM's large scientific and commercial processors and operating systems. He also managed all the user publications for IBM's Distributed Systems in Kingston, New York. As the laboratory director's liaison to MIT, he participated in early studies on the use of optical media (laser disks), and human factors in the IBM San Jose Human Factors Lab. He was also a guest lecturer for the New York University Management Institute and American Management Association, and Director of IBM's world-wide Council on Computer Assisted Learning. As the systems test planning manager, he defined and applied new test technology to the measurement and tracking of both the quality and schedules for mainframe operating systems and applications.

As the technical center manager for VM/370, he and his team were responsible for the announcement of VM/370 and support of VM's first customers. As program manager and business strategist for the MVS system, he evaluated and quantified the business value of advanced computing technologies for new mainframe opportunities. He was also liaison to several IBM laboratories including: IBM Research in Yorktown Heights, NY, the Science Centers in Boston, MA, Los Angeles, CA, and Tokyo, Japan, the Image Processing Development Laboratory in Bethesda, MD, and Multimedia Products in Atlanta, GA.

Since his retirement from IBM in 1993, Stan has managed Tech-Beamers. It is a company whose system specialists: plan, configure, integrate, market, and install advanced computer based solutions using S/390 products. As a management consultant to a client /server hardware company, he provided that company's management advice on integrating application program development on the desktop with IBM P/370 technology, and managed the first P/370 technical center. He also designed and developed a PC based business model for quantifying the cost of computing, and the value of client/server solutions As a member of the IBM S/390 Developers Association, he managed the testing of a project to port Unix applications to IBM's S/390 systems. He also prepared and taught the course, an "Introduction to Client / Server" to IBM personnel in East Fishkill, N.Y.

As a management consultant, he is considered an industry leader in Year 2000 issues and solutions. He is on the editorial board and has authored several articles on Year 2000 testing and project management methodologies that appeared in the Year /2000 Journal. He is also a frequent guest speaker at Year 2000 conferences. In addition, he designed and is product manager for three Year 2000 project management products marketed by Tech-Beamers. CODE-TRAC, QwikStart and TEST-TRAC have gained industry approval as best methodologies, and appeared in the books on Year 2000 Best Methods edited by the Society of Information Management and the Association of Information Technology Professionals.



Ms Constance A Morella
Chairwoman
Subcommittee on Technology

Mr. Stephen Horn
Chairman
Subcommittee on Government
Management, Information and
Technology

This confirms that, to the best of my knowledge neither Tech-Beamers, Inc nor Stanley Graham has not received any Federal Government Funding related to the matters to which I am testifying.

Stanley Graham
Vice President and Senior Management Consultant

Mr. HORN. You've been very helpful.

Let us proceed to questions. We'll have 5 minutes for each member of the panel. After myself, the co-chairwomen Mrs. Morella, and then we'll alternate between Democrats and Republicans.

Let me begin with taking the Inspector General's report, Administrator Garvey—the gentleman sitting to your left—and he makes some interesting comments on page 2 and 3. He said, "Our testimony today will identify FAA actions that must be taken to effectively solve the year 2000 problem." I'm going to skip the first one, but I'm going to start in at two on the top of page 3. The Inspector General says: the FAA must "expeditiously appoint a person with strong technical leadership and authority to manage the year 2000 program."

I take it you've done that. Is that correct?

Ms. GARVEY. That is correct, Mr. Chairman.

Mr. HORN. That's Mr. Long, is it?

Ms. GARVEY. Yes, it is.

Mr. HORN. All right. No. 3, "Make a prompt decision on the Host computer fixes." Where are we on that?

Ms. GARVEY. Well, again, we've been working very closely with the Inspector General, Mr. Chairman. We are on a two-parallel, or taking a two-track approach. We are repairing and making the existing system Y2K compliant as we look at a more aggressive replacement of the Host system.

I've talked with the IBM people myself, personally, about some of the issues that they have raised, and we believe the belt and suspenders approach, a two-tracked approach, is the right approach, and I believe the Inspector General agrees with us on that, but I don't want to speak for him.

Mr. HORN. Mr. Mead, do you agree?

Mr. MEAD. Yes. Neither—both approaches are probably necessary, but you would not want to look at the replacement of the Host as a backup by the year 2000 for the repair of the Host.

Mr. HORN. Go ahead.

No. 4 would be "Develop a suitable contingency plan for the Host computer in case the planned efforts fail." Now, do you feel you have a suitable contingency plan?

Ms. GARVEY. We believe, Mr. Chairman, that we do have a suitable contingency plan. In fact, the issue of contingency plans is something that we've talked a great deal about with both GAO and the IG, and with members of your staff. We believe we've got a good contingency plan in place. Some others have raised questions about it because of the interconnectedness of the system—do we need something even more. We're going to take a look at that. In fact, that's one of the first issues that Mr. Long will be looking at.

Mr. HORN. The other—point 5 is "Have an independent review of plans to fix and certify the existing Host computer?" Do you feel your two-tracked system solves that, or what?

Ms. GARVEY. Well, we feel that that's part of it. But I will tell you that we also have on board an independent firm—as a matter of fact, they were just lined up at the end of the assessment period—to do an independent validation of all of our systems, including the Host.

Mr. HORN. No. 6, "Develop a master schedule for fixing and testing all mission-critical systems." Have they given you such a master schedule?

Ms. GARVEY. It has been done for the air traffic control, Mr. Chairman. It will be done for the rest of the agency within the next 2 weeks.

Mr. HORN. Seven is "Promptly identify and secure resources needed to get the job done." Now I assume that means new money, or is that old money?

Ms. GARVEY. Well, it's a little bit of both. We certainly used the appropriations that Congress has given us. We've also absorbed some of the cost, about $33 million, absorbed from other parts of the program. We have a reprogramming request that is now working its way through the administration and we'll be forwarding that very shortly to our appropriate committees. That's for 1998.

Mr. HORN. This is reprogramming the money at the end of the last fiscal year?

Ms. GARVEY. This is for 1998; yes, Mr. Chairman. And in——

Mr. HORN. How much did you have over, within FAA, at the end of that fiscal year?

Ms. GARVEY. In 1998, we believe the costs were about $89 million in total. We got——

Mr. HORN. Well, I'm thinking of September 30, 1997, midnight. How much did you turn back to the Treasury?

Ms. GARVEY. I'm sorry, I can't give you that answer. We'll get that for you.

Mr. HORN. Can we have that filed for the record? I'd like to know: No. 1, how much came out of FAA money; how much came out of the Department of Transportation money? Dr. Raines and I have agreed from the day he came here as OMB Director, that we ought to have reprogrammed every single dime we could put our hands on in the end of the last fiscal year. And if we just let it go back to the Treasury, somebody isn't asserting leadership and executing leadership throughout the whole administration. So that's a common question I'm asking all agency heads.

Ms. GARVEY. Thank you, Mr. Chairman. We'll get that information for you.

Mr. HORN. OK. It will be at this point in the record without objection.

[The information referred to follows:]

FAA turned back $16 million to the Department of Treasury in Fiscal Year 1997. Of this amount, $8 million was in the Facilities and Equipment budget, $5 million was part of the Operations budget, and $3 million was part of the Airports budget.

In Fiscal Year 1997, the Department of Transportation as a whole turned back a total of approximately $23 million. Of that amount, $1 million came from the Office of the Secretary, $5 million from the U.S. Coast Guard, $1 million from the Research and Special Programs Administration, and the FAA turned back the remaining $16 million. It is probable that other modal administrations within the Department lapsed some small amount of funding that may not be reflected due to rounding.

Mr. HORN. "Report monthly to the Secretary and Congress on progress made toward fixing the Year-2000 problems." What sort of a reporting system does the Secretary have to know what's going on in his department?

Ms. GARVEY. Well, I will tell you that the Deputy Secretary is part of our monthly meeting. Each one of the administrators meets with the Deputy Secretary, and that is always the first item of business for reporting to the Deputy Secretary. And we do that then, each of the modes, on a monthly basis. The Deputy Secretary is particularly interested in the FAA. As a matter of fact, he and I spent New Year's Eve at the war room to see it in operation, to see how it was being done.

Mr. HORN. My last question to you, and then I'll yield to Mr. Gordon, and then we have a vote after that: do you have any comments to make on what the GAO has said, what the Inspector General has said, what the private consultant has said, that you heard and didn't agree with? This is your chance to get it on the record.

Ms. GARVEY. Well, I will say, and I will say this emphatically, I've actually said it to them both personally, I think the help that we've received from GAO and the IG has been extraordinarily helpful. There is a sense of collaboration and we really want to get this done. We want to approach it in the right way. And if we're missing something, we need to know it. And I think we've got a very productive and good working relationship.

I've not had a chance to meet Mr. Graham before. We had a little conversation during the break, and I look forward to talking with him in a little more detail about some of the suggestions that he has made as well.

Mr. HORN. Mr. Gordon, your time to question; 5 to 6 minutes, and then we've got to vote and we'll recess again. We have two votes, one is a 15-minute vote we're in now, and then that's followed by a 5-minute vote. But we should be back within 20 minutes.

Mr. GORDON. Administrator Garvey, by virtue of only being at the FAA for 6 months, you have the advantage of saying that much of the, unfortunately, I guess, well-founded criticism of the FAA is somebody else's mess. But that won't last for long. This is, as you well know and have stated, a very important matter. If FAA does not make their deadlines, it will be a black mark that you will carry forever in your life, and it's going to be—I think devastating is too strong a word—but it's going to be a critical impact to this country. I don't think that planes are going to fall from the sky. We're not going to see it in that kind of, hopefully, life and death. But this country is going to be brought to a stand-still, and it will be devastating. It's very, very important, and you know that.

And that's why we need regular reports. And we can't take a Polyanna approach to this. If there are problems and you have to have more help, or if it's not working, we don't want to hear "I'm sorry," after the problem has met us.

I guess one of the concerns I have is the interface. I know you have talked some about that. It seems that there's been a strong effort to try to deal with the internal systems, but I'm concerned about the thousands of interfaces that you're going to have to deal with. We need to know more about that.

I'm also concerned about interaction with the other stakeholders—the airline industries, the airport authorities. It doesn't help if part of it's fixed and the rest isn't.

And this also leads to my concern about it on an international basis. And I've asked GAO to make a report on that situation and what seems to be going on. And one of the things—pieces of information—they just came back to me saying, they asked the Department of Transportation for information concerning interfaces and when it came to the FAA that was left blank—that you weren't able to provide any information. So they can't get on with your job.

These are more statements than questions because of the lack of time. These are concerns. They aren't going to go away. If you have anything you'd like to say now, fine. And if not, we'll need to know more about this in the future.

Ms. GARVEY. I'll be very brief, those are very serious concerns. We are working closely with ICAO. We have a meeting scheduled in March with my counterparts in Europe. We have another one next fall in Montreal with all of my counterparts from across the world. And one of the issues, in fact at the top of the agenda, is year 2K. We're working very closely with ICAO who is collecting some of this information. I will get to you the most current information that we have, but you're absolutely right that's a critical and serious concern.

I've met with every one of the CEO's of all of our major airlines, and Y2K is one of the first issues that we talk about. Ray Long, Monte, and others in the FAA, are meeting regularly with the airlines individually. We have another meeting set up next Monday with folks from ATA. We're taking that very seriously.

I think we need to do a little bit more work with airports, but we're going to do that. I look forward to working with folks in that industry as well.

Mr. GORDON. We all want you to succeed. It's important.

Ms. GARVEY. Thank you, sir.

Mr. HORN. I think we'll recess now. And we will come back. Hopefully, we'll make it back by 3:50. So, you've got a 20 minute recess. Sorry to do that to you, but we're paid to vote. And while all the work gets done in hearings, it is disruptive, and we apologize for voting. Thank you.

[Recess.]

Mr. HORN [presiding]. To continue the hearing, Mr. Gordon had about 1 minute left, and we'll in the meantime yield to Mr. Gutknecht, the vice-chairman of the Subcommittee on Technology, for his questioning; 5 minutes.

Mr. GUTKNECHT. Well, Mr. Chairman, I don't expect to take the whole time.

This, I guess, is for Mr. Willemssen. If you were to estimate for us the percentage of FAA systems that will be fixed and tested by the deadline, what would you estimate the percentage to be?

Mr. WILLEMSSEN. I think it's difficult, at this point, to come up with a realistic estimate. What I would encourage FAA and the Administrator to do, though, at this point in time, is set priorities at a very defined level, even within mission-critical. We're on record as saying that there is insufficient time left to think that all systems can be fixed. And therefore, we've got to place a priority on fixing the most urgent systems, so much, to the extent that, if I were in the Administrator's shoes, I would put more attention on thoroughly testing those mission-critical systems before I focused

on even renovation activities on some of the lower-priority activities and systems.

Mr. GUTKNECHT. Mr. Willemssen, you can't hit a target you don't have. What would you say is a realistic target?

Mr. WILLEMSSEN. Pardon? A realistic——

Mr. GUTKNECHT. A realistic target, what percentage?

Mr. WILLEMSSEN. I would say, we need as a realistic target to try and hit 100 percent of mission-critical systems and the focus needs to be on those systems. And the non-mission critical systems I would, frankly, not put as much attention on at this point in time.

Mr. GUTKNECHT. What would you feel is critical? In talking with Mr. Horn over on the House floor, we were talking about this, what would you feel would be an adequate—see I believe in setting targets and then assessing how you are doing in terms of hitting targets. It seems to me, it might be helpful, if we had periodic reports on what you have accomplished in the last period—whether it's a month, 6 weeks, 2 months, whatever—and then what do you expect to accomplish in the next period of time. Do you think that's a reasonable way to proceed? And is that an appropriate oversight methodology for the Congress to take?

Mr. WILLEMSSEN. It would be an excellent way to proceed. And I would also encourage FAA, as they are doing that, to think in terms not just of individual systems, but as a key business process. Let's say, for example, separating airplanes in the en route environment and looking at it from end-to-end in all the systems and data transfers that occur in between. It could be from the receipt of a flight plan to the receipt for the information in the cockpit. You've got to look at it from an end-to-end perspective to make sure that everything is addressed in a full integrated environment and tested that way also.

Mr. GUTKNECHT. Ms. Garvey, it looked like you perhaps wanted to jump in and comment on that question.

Ms. GARVEY. Well, I would just reiterate what you've said, which is the need to have timeliness and benchmarks and a clearly laid out plan. I mean, our goal is to get those 234 mission-critical elements fixed and repaired by December 31 of this year. I think the suggestion from GAO about priorities even within that is something that I know Mr. Long is looking at and we'll continue to work with him on that issue. And we're very happy, and should be, giving you monthly reports which will outline exactly the kind of progress that we've made. But our goal, again, is to get those 234 repaired by December 31.

Mr. GUTKNECHT. But we don't really need—and I would just say this from my perspective, and I think on behalf of members of this committee—we don't need volumes of information.

Ms. GARVEY. Absolutely not.

Mr. GUTKNECHT. I mean, if you could put it on two pages and report once a month, I think that would be extremely helpful.

Ms. GARVEY. Mr. Vice Chairman, I like one-pagers, so I agree with you, we will do that.

Mr. GRAHAM. I believe it is both the right thing to ask, and in a very net way, I described the methodology that may be useful.

And I'll be in contact with Ms. Seymore to see if we can work that out.

Mr. GUTKNECHT. Well, if we could accomplish nothing else than to get regular reports, updates, with targets, and what we're accomplishing month-to-month, I think that would at least push the ball down the field in the right direction.

With that, I would yield back the balance of my time.

Mr. HORN. I thank the gentleman. I might add, before I ask the co-chairman for her 5 minutes, scheduling congressional hearings sometimes gets results. I have before me the Executive order of the President, dated February 4, 1998, on what will happen in terms of the year 2000 conversion. So that's progress. We've asked for this for about a year and it will be inserted in the record without objection.

[The information referred to follows:]

White House Briefing Room

February 4, 1998

EXECUTIVE ORDER

Message Creation Date was at 4-FEB-1998 12:50:00

THE WHITE HOUSE

Office of the Press Secretary

For Immediate Release February 4, 1998

EXECUTIVE ORDER

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YEAR 2000 CONVERSION

The American people expect reliable service from their Government and deserve the confidence that critical government functions dependent on electronic systems will be performed accurately and in a timely manner. Because of a design feature in many electronic systems, a large number of activities in the public and private sectors could be at risk beginning in the year 2000. Some computer systems and other electronic devices will misinterpret the year "00" as 1900, rather than 2000. Unless appropriate action is taken, this flaw, known as the "Y2K problem," can cause systems that support those functions to compute erroneously or simply not run. Minimizing the Y2K problem will require a major technological and managerial effort, and it is critical that the United States Government do its part in addressing this challenge.

Accordingly, by the authority vested in me as President by the Constitution and the laws of the United States of America, it is hereby ordered as follows:

Section 1. Policy. (a) It shall be the policy of the executive branch that agencies shall:

(1) assure that no critical Federal program experiences disruption because of the Y2K problem;

(2) assist and cooperate with State, local, and tribal governments to address the Y2K problem where those governments depend on Federal information or information technology or the Federal Government is dependent on those governments to perform critical missions;

(3) cooperate with the private sector operators of critical national and local systems, including the banking and financial system, the telecommunications system, the public health system, the transportation system, and the electric power generation system, in addressing the Y2K problem; and

(4) communicate with their foreign counterparts to raise awareness of and generate cooperative international arrangements to address the Y2K problem.

(b) As used in this order, "agency" and "agencies" refer to Federal agencies that are not in the judicial or legislative branches.

Sec. 2. Year 2000 Conversion Council. There is hereby established the President's Council on Year 2000 Conversion (the "Council").

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(a) The Council shall be led by a Chair who shall be an Assistant to the President, and it shall be composed of one representative from each of the executive departments and from such other Federal agencies as may be determined by the Chair of the Council (the "Chair").

(b) The Chair shall appoint a Vice Chair and assign other responsibilities for operations of the council as he or she deems necessary.

(c) The Chair shall oversee the activities of agencies to assure that their systems operate smoothly through the year 2000, act as chief spokesperson on this issue for the executive branch in national and international fora, provide policy coordination of executive branch activities with State, local, and tribal governments on the Y2K problem, and promote appropriate Federal roles with respect to private sector activities in this area.

(d) The Chair and the Director of the Office of Management and Budget shall report jointly at least quarterly to me on the progress of agencies in addressing the Y2K problem.

(e) The Chair shall identify such resources from agencies as the Chair deems necessary for the implementation of the policies set out in this order, consistent with applicable law.

Sec. 3. Responsibilities of Agency Heads. (a) The head of each agency shall:

(1) assure that efforts to address the Y2K problem receive the highest priority attention in the agency and that the policies established in this order are carried out; and

(2) cooperate to the fullest extent with the Chair by making available such information, support, and assistance, including personnel, as the Chair may request to support the accomplishment of the tasks assigned herein, consistent with applicable law.

(b) The heads of executive departments and the agencies designated by the Chair under section 2(a) of this order shall identify a responsible official to represent the head of the executive department or agency on the Council with sufficient authority and experience to commit agency resources to address the Y2K problem.

Sec. 4. Responsibilities of Interagency and Executive Office Councils. Interagency councils and councils within the Executive Office of the President, including the President's Management Council, the Chief Information Officers Council, the Chief Financial Officers Council, the President's Council on Integrity and Efficiency, the Executive Council on Integrity and Efficiency, the National Science and Technology Council, the National Performance Review, the National Economic Council, the Domestic Policy Council, and the National Security Council shall provide assistance and support to the Chair upon the Chair's request.

Sec. 5. Judicial Review. This Executive order is intended only to improve the internal management of the executive branch and does not create any right or benefit, substantive or pro-cedural, enforceable at law or equity by a party against the United States, its agencies, or instrumentalities, its officers or employees, or any other person.

WILLIAM J. CLINTON

THE WHITE HOUSE,
February 4, 1998.

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Mr. HORN. And now, for the co-chairman and the chairwoman of the Subcommittee on Technology, 5 minutes to Mrs. Morella.

Mrs. MORELLA. OK, thank you.

I wanted to thank you for the testimony and thank you for the charts we saw, which show that when you want to do it you can. I am sure there have been people meeting and working around the clock for this kind of achievement. May it continue that we see those results.

I was in Farmington, MN, with Mr. Gutknecht a while ago and we actually saw the Host computer at the en route center there. And I'm curious about how soon does the Host need to be replaced? I guess, Ms. Garvey, you'd the best one to answer that.

Ms. GARVEY. Chairwoman, it is a question that we are obviously looking at very carefully. We are taking a parallel approach at this time. We are really taking a two-tracked approach, if you will. We are looking at an aggressive replacement of the Host. We've always known we needed to replace the Host, and the question has been when. We are also making the system Y2K compliant. So we're really taking an aggressive approach to both—a belt and suspenders approach.

Mrs. MORELLA. I'm aware of it. Yes, Mr. Mead, I'd love to have you answer that.

Mr. MEAD. They need to get started very soon on the replacement of the Host. Here's why. Inside each en route center, of which there are 20, there are 2 Host computers. In each Host computer there are two devices—or two components—called TCMs, which I think are thermal conducting devices—anyway, it's a component, it's rare. There are about 96 of these in the United States that need to be working. There are seven spares left. In the last 3 years, FAA has had to replace nine of them. Now, it may be that in addition to the seven, there are a few out there that can be cannibalized from Host computers that aren't in the en route centers—they are, say, at the tech center. But that's not very many spares. They don't make these anymore.

And I think that's one factor that independent of the year 2000 problem that is a driving rationale behind accelerated replacement of the Host computer. But, I also would caution, I think it is very unlikely that you would have a replacement for the Host computer installed in all 20 en route centers by January 1, 2000.

Mrs. MORELLA. Right. So, in other words, you honestly believe it cannot be replaced by January 1, in the year 2000. And I know that you are using the double-pronged approach, with new equipment and then renovation. And I know that you've got that patch. If the patch fails, what do you do?

Mr. MEAD. Well, maybe some others want to contribute to that. There is a backup even to that called the DARC system. The DARC system is workable, but when it's working, the controllers have to slow down traffic fairly dramatically. And it's also a system that does not identify flights by name, at least that's my recollection. It will show that there's a plane there, but it won't show what particular flight.

Mrs. MORELLA. So you might have to curtail an awful lot of traffic.

Mr. MEAD. Or slow it down. I think, for my money, I'd devote my energies—my driving energies—to fixing that Host and replacing it as expeditiously as possible.

Mrs. MORELLA. I don't know whether it's been mentioned, about IBM feeling that they don't really have the ability to repair it, renovate, and yet——

Ms. GARVEY. If I could just comment on that. I spent a good deal of time with one of the senior executives from IBM, talking with him a week ago, really at length about this issue. And he was most supportive of the two-tracked approach for some of the reasons that Mr. Mead mentioned. He said you really have to get it repaired and renovated at the same time that you are trying to aggressively move forward on the——

Mrs. MORELLA. In the hopes that one of them is going to work.

Ms. GARVEY. Well, again, it's the belt and suspenders approach, and we think that's the prudent and a wise thing to do. I might also mention there is a team working today, offsite, just devoted to the whole issue of Host and how quickly can we move that schedule up. So, I think in the next few days, we'll have even more definitive answers than we have today.

Again, I will mention that we're working very closely with Mr. Mead's office on this issue.

Mrs. MORELLA. Because I would wonder how you are trying to avoid FAA's past mistakes in procuring new computer systems and software programs while you are replacing the Host.

Ms. GARVEY. I think one—that is certainly, I'm well aware of the track record and well aware of the challenges. I think one of the ways that we're trying to approach this is, again, putting the right kind of resources to it, establishing some very clear timeliness, establishing some clear benchmarks, involving people even outside the agency to help solve the problem. And I believe that's an approach that will work. I'm certainly paying a great deal of attention to it and know it's an issue that's extremely important.

Mrs. MORELLA. I know you're paying attention to it, and that's critical.

May I ask Mr. Willemssen a question, too?

Mr. HORN. Sure.

Mrs. MORELLA. Mr. Willemssen, based on what you know, what's the chance that the FAA will not complete all of its renovations and its testing activities by the deadline, honestly?

Mr. WILLEMSSEN. If the pace that we have seen over the last, since we did this job, continues, we don't think FAA would make it in time. If the pace consistent with the flurry of activity over the last week or two continues, then we have a much brighter hope that, indeed, we are going to make it in time for the mission-critical systems.

Mrs. MORELLA. Under the worst case scenario, what reductions in capacity to the national air-space system would be necessary? And, I wonder how a reduction would affect commercial airlines in the industry? It seems to me you've got a concept of intra-operability that's critical that we need to look at too.

Mr. WILLEMSSEN. I totally agree with you. And that's why I would, again, encourage FAA to set priorities in terms—the highest priority, I assume, might be along the lines of the mission of sepa-

rating aircraft in the en route, track-on, and tower environments, and understanding all the systems in relationships and external parties to providing that mission and making sure it's done as it should be. And I think if there is focus on those kind of top priorities, that FAA has a good chance of making it in time. Again, with the caveat, we strongly encourage that there be thorough testing of all the year 2000 fixes in as operational a setting as possible with as many different test scenarios as possible.

Mrs. MORELLA. Have you all done any synchronizing with foreign airliners?

Ms. GARVEY. We have had some very direct communications with ICAO which is, of course, the international agency that would be focusing on this and many other issues. I mentioned a little bit earlier, that I will be meeting with my counterparts from Europe in March, and next fall we'll be meeting also with all of my counterparts from the rest of the world in Montreal. And this will be one of the top issues. But our staffs are working very closely with the ICAO, the international organization, to really synchronize, as you've suggested, and coordinate all of our efforts.

I think that takes a great deal of effort. And I think we're going to need our colleagues at State as well to help us. Very often, it may not have the same priority in some of the other countries, so we really want to make sure that we keep on those issues.

Mrs. MORELLA. We'd like you to keep us posted, because we even hear that there are some international airliners that said they would not go into the United States if they felt there would be some kind of a problem. They evidently feel that they are in pretty good shape in terms of compliance. So it would be good to get your report.

Mr. Chairman, I yield back for other speakers.

Mr. HORN. Thank you very much.

And I now will yield 5 minutes to the gentleman from Virginia, Mr. Davis.

Mr. DAVIS. I missed the testimony, so I get to ask a few questions.

Let me just say that I was at a Y2K conference today, and the whole emphasis and the concern has been on the FAA, quite frankly. Taking the first plane out, we've had previous hearings. Everybody's a little bit nervous because in some of these other agencies, if they miss the deadline, if they mess it up, you are delayed in getting a check or getting processed. FAA is life and death. And so for that reason, the pressure is really on. And if you look at the report cards the chairman has given you before, and I don't know what you can do to make us more comfortable except to keep coming back and give it the kind of scrutiny and high-level supervision that it deserves, but it is a very unforgiving time period, at this point. And as we've talked before, we have to have this tested and I think have some independent audit of this, as we look forward and make sure it's working. And it's not just the FAA, it's everybody you interact with, which makes it even more complicated in terms of the testing back and forth.

What are we doing with some of the systems that you are talking to through computers that we're interacting with to ensure that

they are up to snuff? They may not be right under the supervision of the FAA, but you are constantly communicating with them.

Ms. GARVEY. In addition, Congressman, to the international efforts that we've mentioned a little bit earlier, we are in very close communication with our colleagues at the airlines, close communication with ATA, working with them hand-in-hand, and I believe that that kind of cooperation is going to continue. We are working with individual airlines, but again, as well as collectively. I believe there is a meeting scheduled even on Monday to meet with ATA and talk about ways to make sure that we are communicating and are coordinating our efforts.

Mr. DAVIS. Is there any apparatus—it may have been raised before—that on the date, on January 1 and right around there, that the flights may be limited and testing back and forth to see how it works? Do you expect—I don't know what you expect in terms of ticket sales at that point for flights back? I'd expect that you would actually have a lot of people taking trains or driving, maybe than——

Ms. GARVEY. You may very well be right, Mr. Congressman. I will tell you that Ray Long, who is our program manager, is going to be returning home that day to California after working on this assignment. I have said that I would like to accompany him. But I will tell you, I did try to get a ticket and they did tell me that they are not yet ready to take reservations for that day. I intend to be traveling on that day. And actually, I may invite someone from the press to accompany me.

Mr. DAVIS. I don't know if you have any takers or not.

Is it true that some insurance companies are considering declaring exclusions on electronic equipment on aircraft because of concerns over it being 2000 compliant?

Ms. GARVEY. I'm not aware of that issue. But Mr. Mead or Mr. Willemssen?

Mr. DAVIS. If an airline were to lose insurance coverage for electronic systems, that would have an impact, obviously, on the whole operations level. But you're not aware of anything at this point?

Ms. GARVEY. I'm not aware of anything, but we can certainly ask that question when we meet with the airlines early next week.

Mr. DAVIS. And you noted, I guess, that in terms of dealing with the foreign countries, that at least we are having some interaction with them at this point. What is their status? I guess different countries are at different levels in terms of where they are moving toward this. Can you give us any overall assessment?

Ms. GARVEY. I think that's really an accurate assessment. Depending on which country we are talking about, I think they are at various degrees of success with that issue. Mr. Mead, you may have some other observations. I know Japan is doing very well, we were visiting there recently.

Mr. MEAD. I think it is fair to say that the next wave of attention on FAA's part ought to be on the foreign air traffic control systems. That's an area of huge growth in the airline industry. And foreign air traffic systems vary greatly. Some are more modern than ours, some are more archaic. They are all over the map. And I, frankly, don't know what the status is of foreign air traffic control systems

and what they are doing to comply with the Y2K. It is something that deserves attention.

Mr. DAVIS. I mean, sooner or later somebody has to put that list together and come back—probably sooner rather than later—and do some kind of assessment of who we're dealing with. Because that is what I would guess one of the more likely problems is when you are crossing over international boundaries with different systems where some kind of accident electronically could occur.

Ms. GARVEY. Mr. Davis, we will provide for the record the information we have to date and let you know of some upcoming conversations and meetings as well.

Mr. DAVIS. OK. I think the rest I'll probably glean from your testimony. But I appreciate your being here today. I just would add that the concerns that I hear on this when they talk about Federal agencies, politically you always worry about Social Security—and they started this long before anybody else, and there are political ramifications to that. But in your case it is life-or-death ramifications. I know you are aware of that, but we're going to continue to ask to hear from you and look up dates as we move forward, because it—but I thank you for being here today.

Mr. HORN. I thank the gentleman for that very crucial question. Mr. Gordon had raised it. Unfortunately he had another commitment and couldn't come back. Just how are you going to assess what your interconnections are from international airlines? Because, if they still have bugs in their systems, you're going to have bugs in the system is the way I understand it. And what are you doing to make that assessment?

Ms. GARVEY. Well, let me say, the first step which is what ICAO is doing now which is collecting the information of what is happening in the other countries——

Mr. HORN. When you use that phrase, you're talking about the International Civil Aviation Organization.

Ms. GARVEY. That's right. I'm sorry, Mr. Chairman, yes. So the first step is that issue. And the issue of validation is not one I know the answer to. And I will work with our staff and find out how we're going to handle that. I think Mr. Mead is right. It's going to be our next real pressure point. And I expect that at the March meeting with our European counterparts it will be a good part of our agenda and a good part of our discussion.

Mr. HORN. Earlier in this decade, one of your predecessors plus a lot of career civil servants and others ran up a bill of $4 billion developing a new computer system. And my first year in Congress, 1993–1994, Mr. Oberstar, the very able chairman of the Aviation Subcommittee, took Mr. Mica and myself out to look at that operation. And you walked in the room and you knew right away something was wrong because everybody there had a new bright idea, they adopted it and there was just no management or anything. And that's why they ran up $4 billion.

And at the time I said, "Have you ever talked to Lufthansa." And everybody looked at me sort of blank. And it happens to be that last year I had a chance to go up in the Lufthansa tower in Berlin. And I asked the president of Lufthansa who knew what had happened there and I told him the story. I said, "Has anybody from the FAA ever been in here looking at this?" He said, "No. Nobody's

ever been in here." Now, they bought their system from Raytheon, an American firm. It's in Boston. It works well. And I must say, I don't understand why we can't learn from other people that are doing very highly technical things and solving the problem. Because, as I say, your predecessors ran up the tab for $4 billion.

IRS did the same. We're holding a hearing on that in a week or so.

And it just seems to me you've got a real problem in that agency in terms of getting the support staff to the Administrator to face up to a lot of questions, especially the ones I've gone over with the Inspector General who I think is a very helpful man to know personally.

And I am worried about those international connections. Lufthansa is probably ahead of us with new equipment and everything else. On the other hand, we need to check Latin America, Asia, Africa, you name it, in order to make sure all the hard work you are doing is not for naught.

Now, I feel compelled to ask you one question. You've been on the job 6 months. As you look back, do you feel your staff let you down on this issue? And when did they first bring it to your attention?

Ms. GARVEY. Well, let me say, yes, I have been on the job 6 months, and it's been a very exciting 6 months, I might add. I guess the only point that's been made at the table, and this is said with great respect because I have a lot of respect for GAO, but I really believe that the flurry activity has been much longer than a couple of weeks.

I mentioned a little bit earlier that we spent New Year's Eve, the Deputy Secretary and I, at the control center. And there was a lot of activity at that point.

I think people have been working very hard since I've been there on this issue. I think we did get a very late start, but I have great confidence in Mr. Long. I've got great confidence in the air traffic control people who are working on this issue, and great confidence in the people we've assigned to other elements. We will get this done. I am determined to do that. I wish I could promise you 100 percent success. I think that would be foolhardy, today, but I can tell you that it will receive my highest priority, and I believe it will receive the staff's highest priority as well. I want to give them the leadership that they need to get it done.

Mr. HORN. When was your attention first focused on this problem? Did your staff give you any sort of briefing when you came on board and was this one of the key issues?

Ms. GARVEY. We did discuss it a little bit in preparation, frankly, for my confirmation hearing. So there was some, certainly, attention at that point. The IG and I received a briefing in a little bit more detail in the fall, and that certainly was a key point for us. And there is no doubt that a hearing of this sort is very helpful in helping us focus some efforts as well. The GAO report was very active in the fall months, in just about November, and so getting the results at that time was important as well. So I would say the fall, particularly October and November as we were getting some of the reports from both the IG and the GAO, was a time of real focused activity.

I will tell you, we've had some discussions even internally about management—something that I know I've heard from the GAO—and our decision at that time was really to wait until we were closer to the assessment being completed to make some changes. And we've done that. And again, something we talked about in the fall but we said, "let's get through the assessments, let's get through this phase and then see where we are." And I think we've made the right decision in that area.

Mr. HORN. Has the Secretary ever mentioned this issue to you, or any other executive in Transportation?

Ms. GARVEY. The Secretary mentions it quite frequently. As a matter of fact, he told me that he was at an event over the first of the year, and he said he was with industry and many industry people were mentioning it as well. So we've talked about that.

And as I mentioned a little bit earlier, the Deputy Secretary is—it's the top of all of our agendas when we meet with him once a month. It's the first question he asks us. Where are you on the year 2K? You know, what's the progress to date? Ken, you may want to add to that.

Mr. MEAD. I'll just relay a humorous incident. You know, I haven't been at DOT that long myself. I arrived there toward the end of June. And it wasn't too long thereafter that the Secretary and the Deputy Secretary told me, they said, "Well you know, in the executive branch we have to file reports with the Office of Management and Budget." GAO, of course, doesn't. And anyway, he pointed that one of the reports that they have to send over is about Y2K compliance. And it's presented for the Secretary's signature to the Director of OMB. And they wanted assurances that what he was were representing about the Department was accurate. So we built a team under the leadership of Ms. Leng, and that, in truth, I think, was a real eye-opener for me, when we could see what the actual status was in the Department. And we're continuing that effort. And I hope that the Administrator—I believe that the Administrator—has found that helpful as well.

Mr. HORN. Well, as I think I've told some of you this story, that you should be right at the top with Social Security if the Federal Highway Administration in 1989 had listened to a top woman professional that brought this to their attention, and they just dismissed it. And there was no way, apparently. And maybe there isn't now in Transportation, because Mr. Peña told me he didn't know anything about it—where this ever comes up the management decisionmaking hierarchy so the Secretary, when he has a meeting of his management group can turn and say, "Well any of you have other problems." Certainly the FAA Administrator is the major user of critical systems within Transportation. And the question would be who else is involved. They never did that. They could have been right where Social Security is if they just listened to somebody that knew what they were talking about. And they never did.

I yield 5 minutes on the second round here to our co-chairman, Mrs. Morella.

Mrs. MORELLA. Thank you. I was trying to briefly scrutinize this Executive order and I know that you just got it and we really just got it. And I'm delighted that we do now have it before us. And it

does look to be reaching out to the private sector and other governmental entities, as well as also foreign. It says, "Communicate with foreign counterparts to raise awareness and generate cooperative international arrangements." And the council on the year 2000 conversion, called the Council, lead by a chair, who obviously will be John Koskinen, and then a vice-chair, which I think will probably be Sally Katzen, overseeing all the various activities.

I know that you will have a critical role in this council and it will be very interesting to also get your response as you look at the Executive order to see if it needs to be strengthened in any way.

I'm just very pleased that finally the President has come out with what we had been calling for for a very, very long time—the Executive order.

I just wonder if there is anything we haven't asked you that you would like to tell us. We've commented on the fact that it's been very late in starting; a track record that is not good, even after the start; problems, particularly with the Host computer at the 20 en route areas; the concept of intra-operability. Is there something that we haven't mentioned or asked you that you feel would be appropriate that you would like to share with us? Are there problems that we haven't mentioned, except for contingency plans? I direct this to anybody on the panel who would like to make any other comments.

Mr. MEAD. I have just one item.

Mrs. MORELLA. Mr. Mead.

Mr. MEAD. I'm an admirer of goals and objectives that you can almost touch. And for that reason, I would just reiterate what's in our prepared statement about the timeline for getting ready for the year 2000. I do believe November 1999 is cutting it way too close.

Mrs. MORELLA. When you think about the fact that there are less than 23 months left, and if in fact you need 12 months to validate, then that only leaves, it leaves like 10½ months really left in order to do the renovation. That is assuming that you've already done all of the assessments that are necessary, too. So it's an unrelenting deadline.

As somebody had once said when we talked about what's happening in other countries—one of the hearings that we had was on the global implications—and someone said they had submitted a survey to all of the countries in the General Assembly about what they were doing about the millennium bug. And somebody answered, "we can spray any thing, any time." Indeed, it is far more serious than that. And I appreciate your being here—the preparations you've done, the meetings you've had with us. And I look forward to hearing from you as you continue to progress. And I appreciate the Inspector General, GAO, having the private sector here, and Ms. Garvey, I particularly appreciate your commitment and perseverance. Thank you.

Mr. Chairman.

Mr. HORN. Well, we thank you. And I'm delighted to finally find out what the United Nations did do. We, I think in the summer of 1996, wrote the Secretary General and thought that he might want to bring this up among the various nations. And we had a great response from Mr. Gorbachev, but he wasn't in power in Russia, but he at least got them to circularize the Russian cabinet. And

we haven't seen those results, but that's their problem not our problem.

Let me ask a few closing questions, here, of really all of you. Mr. Willemssen, I want to ask you first. If you're forced to estimate the percentage of FAA systems that will be fixed and tested by the deadline, what would that percentage be based on your analysis?

Mr. WILLEMSSEN. If the Administrator follows through on some of the key areas that we've talked about today—determining priorities; committing to thorough testing end-to-end for mission critical business processes; more aggressively pursuing external and internal data exchanges and interfaces; and making sure that we have contingency plans in place, not just for specific systems, but for delivering on the mission—and if we continue to see the kind of aggressiveness that we have witnessed very recently, I think there's a good chance that for mission-critical systems, we can succeed.

Mr. HORN. We've discussed the contingency plans on a number of occasions and each one of you has really mentioned it in your review. You looked at what they call the contingency plan. Or did you find one?

Mr. WILLEMSSEN. Yes. We have seen them for individual systems. What we have not seen yet, and I'm not aware that they exist, are back-up plans for ensuring continuity of operations for a critical process. That's more than just disaster recovery for an individual system or a component and sliding something else in. If indeed you have massive failure, you've got to look for a total system back-up. What are we going to do next? Are we going to go to a DOD facility? Are we going to go to another en route center? Those are the kinds of things you need to look at from a more global perspective. And instead of—it's also important to look at specific systems, but we'd like to see that more global perspective also.

Mr. HORN. Usually one type of contingency is to keep the current system and run that. But in this case the current system is the problem. And what is your advice? That they simply look at options throughout the Federal Government in terms of large massive computers that maybe have been debugged by that time?

Mr. WILLEMSSEN. And one of those options still has to be with the existing computers, unfortunately. In some cases I think that will be the next best step that we do not necessarily want to minimize here. It certainly is less than ideal, but that may indeed be the only thing that can be done.

Can I make two other quick points, Mr. Chairman? One is: I think it's especially crucial that FAA be able to retain a cadre of key staff that it has who are expert in many of these aging systems. And if they were to lose those staff, the agency would be at even greater risk. It's very important that those staff be retained.

Mr. HORN. There's no question that that's a major factor. We've said from the beginning, as you get closer and closer to that date, the people with experience will be bought off either by the private sector or other Federal agencies, in terms of promotions and everything else. So that is a key point you're making there. Thank you.

Mr. WILLEMSSEN. The other point I want to make is there is a lot of uniqueness in many of the FAA components—in many of the FAA systems. There are also a lot of commercial, off-the-shelf products that are, in many cases, very old, that the vendors are no

longer going to support. They are not going to tell FAA or anyone else that they are going to be year 2000 compliant. In looking at some of the assessment packages last night and this morning, I see for a couple of critical environments there are a lot of COTS products—commercial off-the-shelf products—where there is some to be determined on what needs to be done. So that's another critical area that the Administrator needs to focus on.

Mrs. MORELLA. Will the gentleman yield on that?

Mr. HORN. And some of them were—just a minute—some of the them are presumably 2000 compliant. And then when they get the system in, they aren't. That was the experience of the agency for International Development. We gave them and "A" in 1996, and an "F" in 1997, because they bought the system which was their insurance.

There are a lot of used car salesman in this operation, I've found, in computing. They make a lot of promises. And unless you have your own test pattern that will check that, that you can get through January 1, 2000, and it won't just be a 00, you're in deep trouble and a lot of money has been spent. So whatever FAA does, I'm sure you're bright enough with all your experts around you, to make sure that they pass that test and you've put them in an operational mode before you pay the vendor's check.

Excuse me, now, Mrs. Morella.

Mrs. MORELLA. On the labor intensive part of it, there are also a lot of cottage industries that are being developed as a result of this. And I'm curious about how you handle the labor problem, since you mention the importance of personnel. Are you able to keep these experienced people? Are you pulling back people into the work arena who know those lines of code, formulas, the cobalt, and whatever is necessary? Are you subcontracting? Are you recruiting new people? I think that's a whole dimension that we haven't really focused on because we really didn't want to micromanage. But I think it's important.

I also know that there's a lot of work being doled out off-shore. I don't know what FAA's doing about this. And maybe you'd be able to enlighten us.

Ms. GARVEY. Let me speak a little bit about the personnel issue because I do think that is critical. Thanks to Congress, we do have much more flexibility. We have a personnel reform system which allows us to recruit and to raise some of our pay for some particular technical areas, and that's an enormous benefit to us and it allows us to keep some people with some good strong incentives. We have been fortunate enough to hire some of the IBM employees who know that system and who are part of this renovation that we're doing on the Host. And we know how important it is to keep those employees and to keep them through this project. So, we're very much aware of that and grateful to Congress for the kinds of personnel reform that allows us to do that.

Recruiting new people, that's something we are going to have to do, though I was talking to staff the other day about that. It is tough, as you've suggested. Everyone wants the Y2K guru, if you will. So, we are aggressively doing that. But I will say that, at this point, we are relying very heavily on our technical expertise within

the FAA and the folks at Coopers and Lybrand, who are an enormous help to us and a terrific business partner.

I want to just mention one other point the chairman raised, and that is the issue of validation of the equipment we are buying. That is a very serious issue and we learned, as you suggested, the hard way, that just taking the word of the contractor isn't always the most appropriate action and that you really do have to do an independent evaluation in validation. And we are doing that with all of the equipment that we purchase.

Mr. HORN. Has the General Services Administration been of any help to you in that area, in validation?

Ms. GARVEY. We are actually using, I believe, one of their contractors, as a matter of fact, to help with that. So, yes, they have been.

Mr. HORN. Let me ask you this question: I'm told that FAA is an unusually decentralized agency. The regions are fairly autonomous, and the history of field-Washington headquarters cooperation is not particularly great. Is that a fair characterization? And how does it affect year 2000 conversion?

Ms. GARVEY. That is certainly an issue I've heard and the fact that the regions are decentralized—that they have a good degree of power—and autonomy is something, that we've been aware of. And I think that's why, frankly, when Mr. Long was appointed, why we thought it was important—even as a part of broadcast to all of our 48,000, employees today, in the 60 centers that are hooked in—it was important for them to hear directly from me that this a key part of the management team reporting directly to me. And really, when he makes a request, we've got to have it.

So, I think that message has been communicated and we'll continue to communicate that as well.

I will say, having visited many of the centers, they know how important this is and they are working very hard to get the right information into the right place at headquarters. I think we've got to give them central focus points so that they know where it has to go and who they should be reporting to on this issue.

Mr. HORN. Did you have a plan sent to you around December 1, that was presumably the plan for how you reach those goals and solve the year 2000 problem?

Ms. GARVEY. We've certainly had a plan for air traffic control that I think has been very successful. And frankly, that's one of the reasons why Mr. Long was chosen, because he's got a good proven track record.

Mr. HORN. And you approved that plan, did you? Or his——

Ms. GARVEY. Well, I've been briefed on it and I didn't necessarily have to sign anything. I was made aware of it. Yes, very much aware of it and feel very comfortable with the work that they have been doing. Those really are the goals and the timelines that you've all talked about in the hearing.

Mr. HORN. Now, as I understand it, from your staff, the Federal Aviation Administration intends to pay for all of the year 2000 efforts with existing funding. Now, I heard mentioned in a previous round of a reprogramming situation. And apparently there will be a reprogramming package coming forward, but everything will be within your current budget. Is that correct?

Ms. GARVEY. That is correct, Mr. Chairman.

Mr. HORN. Do you have reprogramming authority as Administrator, or do you have to go to the Secretary?

Ms. GARVEY. We go through the Department, Mr. Chairman. I will say that the Secretary has been very supportive of this and asked what the needs are and has been very supportive of our efforts.

Mr. HORN. Now, has there been any problem with sign-off by either authorizations or appropriations subcommittees in Congress?

Ms. GARVEY. The information is currently with OMB. They are reviewing it for us. And they have promised us that they will get it to the appropriate committees very, very shortly, and very soon.

Mr. HORN. In the budget the President submitted to us on Monday, what is the appropriation, if any, that FAA is asking for that is relevant to this particular problem?

Ms. GARVEY. We have asked for $36 million, Mr. Chairman, in the President's budget for 1999.

Mr. MEAD. Mr. Chairman, on the appropriations front, a very interesting phenomena, I haven't seen it occur too frequently: although deliberations are about to begin on FAA fiscal year 1999 appropriations, there are a number of very important issues that have surfaced not just on the Y2K issue that have a bearing on what's going to happen to the 1998 appropriations. There is the STAR thing, which is the display for the controllers; there are some security issues; the year 2000 issue; there's the WASP program, all of which may bear on this.

I think it's going to be a real stretch to do it all through reprogramming, myself, but we'll see.

Mr. HORN. Where are we on fiscal year 1997's money? Was there any carry-over, or is it all fiscal year 1998 money that's relevant?

Ms. GARVEY. I'm going to need to get back to you on 1997. I'm only aware of the 1998, that's what I've been focused on.

Let me just also be sure that——

Mr. HORN. Well, if you could just file it for the record on the 1997, 1998, and the prospective 1999.

[The information referred to follows:]

In Fiscal Year 1997, FAA obligated $9 million for Y2K.

In Fiscal Year 1998, FAA had designated $18 million of the Facilities and Equipment appropriation, and $37.7 million in the Facilities and Equipment reprogramming package for Year 2000 issues. Another $34.2 million is absorbed within existing programs for Fiscal Year 1998.

For Fiscal Year 1999, FAA has requested $36 million for Y2K, as part of the Facilities and Equipment appropriation, while another $14.9 million would be absorbed in existing programs.

The total cost estimate from Fiscal Years 1997-99 is $149.8 million.

Ms. GARVEY. Absolutely, Mr. Chairman. And one other point on the 1999. I gave you the number of $36 million, which is true for year 2K; that is separate from the Host issue. In the 1999 budget for Host; it's $52 million.

Mr. HORN. And that really has nothing to do with the Y2K, but it helps because it will be adapted. But you have needed that for years, right?

Ms. GARVEY. That is correct. That's been part of our capital program, Mr. Chairman.

Mr. HORN. Now, any comments, Mr. Willemssen? We're going to wind this up. Any more questions? Mr. Mead? Mrs. Morella has a question.

Mrs. MORELLA. Just one final question: The Inspector General has mentioned that the FAA has not yet concluded that any of its air traffic control systems that are currently in development and acquisition, in that phase, are Y2K-complaint. My question is: Does FAA have a process that is in place to ensure that the new products and systems that are under development are Y2K-compliant? And I am thinking of STARS and WAAS, since we are very interested in that, particularly at National Airport?

Mr. MEAD. No, most of the testimony on the progress today has dealt with the air traffic side. The way it was set up at FAA, until just this recent change, the air traffic side, their management of Y2K problems did not deal with air traffic equipment that was under development. That was being held elsewhere in the organization. The Administrator may feel differently on this, but I don't think that they had as disciplined a process as they need to have for the newer systems, and they can install that now, although I hasten to add that the contractors are warranting that everything will be OK, but FAA——

Mrs. MORELLA. So they don't have it now, but they are going to have it, they say? [Laughter.]

Ms. GARVEY. Now I will do a double-check on this, but in asking this very question yesterday, I understand from staff that we do, in fact, do a validation of the equipment that comes in. But let me—I will go back and ask again. I'm always—when the Inspector General and I have slightly different information, I've learned that it's very good to double-check. So I will do that, but I do understand there was a policy statement made, a statement made last March, which said that all of the new equipment that comes in must, first of all, be Y2K compliant and we will do an independent—validation of that. But let me double-check to make sure my information is accurate.

[The information referred to follows:]

See attached memorandum form Monte R. Belger, Associate Administator for Air Traffic Services, to the Associate Administrator for Research and Acquisitions at FAA, concerning Y2K compliance of new equipment to be deployed into the National Airspace System (NAS) (9/22/97).

Subject: **ACTION**: Policy Statement for Y2K Compliance on NAS Systems

Date: SEP 22 1997

From: Associate Administrator for Air Traffic Services, ATS-1

Reply to Attn. of:

To: Associate Administrator for Research and Acquisition, ARA-1

ATS has begun significant Year 2000 (Y2K) assessment/ modification efforts on current National Airspace Systems. Completing these efforts expeditiously is of the highest priority within Airway Facilities (AF).

We need to jointly ensure Y2K compliance of any new system or system upgrade placed into the NAS from this point forward. Accordingly, ATS will not accept for deployment any systems unless they are certified as Y2K compliant according to the compliance criteria issued by the AF Y2K Program Office. The certification must be in writing and signed by the appropriate signatory prior to any joint acceptance activity.

If, for extraordinary circumstances, compliance cannot be met prior to the joint acceptance activity, ARA must develop a plan showing how ARA will make the system Y2K compliant in accordance with the repair schedule/process defined by the AF Y2K Program Office. Funding for the repair activities will be the responsibility of ARA. Prior to deployment, ATS and ARA must acknowledge acceptance of the repair plan through joint signature.

Thank you for your assistance in this critical NAS activity. If you have any questions, contact Raymond Long, Manager of the AF Y2K Program Office, at (202) 366-5342.

MONTE R. BELGER

Monte R. Belger

Mrs. MORELLA. Thank you. Thank you, Mr. Chairman.

Mr. HORN. Mr. Graham, do you have any comments you'd like to make? Anything bother you in the testimony of the other witnesses? And do you have any suggestions that haven't been put on the table?

Mr. GRAHAM. Yes. I am more concerned about——

Mr. HORN. Do you want to get the microphone close to you, please?

Mr. GRAHAM. Sorry. I am more concerned about the survivability of the IBM 3083's. We're experienced—we found that one of our customers actually was using this system, and it was unreliable, regardless of the fact that it was not year 2000-compliant. The drives kept going down. They lost data, which they had to reconstruct. So I am very concerned. IBM has said, I understand, that by the end of this year they will no longer provide any support at all for those systems. So I honestly don't believe that the current mainframes that are in the centers are a viable alternative beyond the year 2000.

The other thing that concerns me is that I learned about 30 years ago that people are much smarter than computers, and that is, they can reason. On the other hand, computers remember what they are told to do very well. The problem is, until you actually execute the programs on the systems, you do not know what their behavior is. A great deal of the remediation is done on static information which is really not accurate.

The other thing I'd like to add is in support of Mr. Mead, that using the banking industry as one example and the securities industry as another example, 6 months is not enough for the final test. A lot of the issues that were raised, including the ones by Mrs. Morella, indicate that there should be a minimum of 1 year allocated to the final integration testing for the FAA system. So I'm a great deal more pessimistic than I think many others here. I'm not suggesting it's an insoluble problem, but I'm much more pessimistic.

The other thing I'd like to add—and I said it very quickly in my statement—and that is there is absolutely no way to ensure that the FAA system, or any other large system in the Federal Government or in industry, will be 100 percent year 2000-compliant. When I managed testing at IBM, we recognized that the number of paths that appear in large applications are unbounded; that is infinite; you can't count them. If you can't count them, you can't test them. Now what you have to do, the management of year 2K, is to minimize the risk. You cannot eliminate it. You cannot demand from any vendor, or should not demand from any vendor, that they prove that they are 100 percent year 2000 compliant.

But I also support the idea that you must—must—validate the vendors' claims. I don't care who it is. The vendor, whether it's IBM or the smallest vendor on the block, is not in a position to be able to do the testing that will ensure that your systems work. It's just not logical. It's not feasible.

I think it's very unlikely, at the 11th hour, that anyone will come in with a fix for the 3083 systems. I don't honestly think you should consider that as a viable alternative beyond the year 2000.

Mr. HORN. Well, I think you've made an excellent point, and I'd like to have the General Accounting Office, the Inspector General, and the FAA to give me a formal letter, which I can put in the record at this point of the hearing, as to: Is Mr. Graham's point accurate with reference to the IBM equipment? Because we need to know that; you need to know that, and I think he's made some very helpful comments and suggestions there. But just to round it out, we might even ask IBM in the process. So I think that's a helpful comment. And, I know from my own experience in the university world, you're absolutely right on separate validation by other than the vendor. You really need to take a look at what's happened in the rest of the executive branch. We need to have those experiences shared with other agencies, as to how they test this equipment to make sure it conforms with what the goal of this whole project is.

[The information referred to follows:]

U.S. Department of Transportation
Office of the Secretary of Transportation

The Inspector General

Office of Inspector General
Washington, D.C. 20590

March 20, 1998

The Honorable Stephen Horn
Chairman, Subcommittee on Government Management,
Information, and Technology
Committee on Government Reform and Oversight
House of Representatives
Washington, D.C. 20515

Dear Mr. Chairman:

I am submitting this information for the record, as you requested in the February 4, 1998, hearing entitled, "Federal Aviation Administration at Risk: Year 2000 Impacts on the Air Traffic Control System." You asked the General Accounting Office (GAO), the Inspector General, and the Federal Aviation Administration (FAA) to address this question: Is Mr. Graham's point accurate with reference to the IBM equipment?

Mr. Stanley Graham of Tech-Beamers, one of the panel members, expressed concerns about the survivability of the IBM 3083 machine--i.e., the Host computer used in enroute centers to control high altitude air traffic. The following paragraphs address the points raised by Mr. Graham.

- Mr. Graham stated one of his customers found the 3083 machine unreliable--the drives kept going down and lost data. We obtained FAA's maintenance records, which indicated a low system failure rate for the Host computers. During the past 3 years (1995 through 1997), the Host computers for all 20 enroute centers combined had a total outage of 44.5 hours out of 526,600 hours of service time (i.e., less than one tenth of one percent of down time). Please note that this rate represented "total" system failures--i.e., when both the primary and backup Host computers were out of service. As stated in my testimony, there are two Host computers at each enroute center. If one fails, the processing is automatically switched to the other machine. This redundancy was designed to mitigate the impact of system failures.

[illegible] do not believe use of 3083 machines is a viable alternative beyond year 2000. We agree. FAA has submitted a reprogramming request to fund the Host replacement project. While it is questionable whether FAA will have the replacement Host computers in all 20 enroute centers by January 1, 2000, it is clear that FAA does not plan to continue using the 3083 computers long after that date. We are initiating an audit of FAA's replacement program. Our objectives are to (1) monitor FAA's program cost and schedule baselines, and risk mitigation efforts, and (2) evaluate whether the Direct Access Radar Channel will be capable of serving as the primary air traffic control system until the Host replacement is completed.

If I can answer any questions or be of further assistance, please feel free to contact me on (202) 366-1959, or Raymond J. DeCarli, Deputy Inspector General, on (202) 366-1964.

Sincerely,

Kenneth M. Mead
Inspector General

GAO

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

Accounting and Information
Management Division

B-279744

May 1, 1998

The Honorable Stephen Horn
Chairman
Subcommittee on Government
Management, Information and Technology
Committee on Government
Reform and Oversight
House of Representatives

Subject: Air Traffic Control: FAA Plans to Replace Its Host Computer System Because Future Availability Cannot Be Assured

Dear Mr. Chairman:

During the February 4, 1998, Joint Hearing of the House Government Reform and Oversight Committee's Subcommittee on Government Management, Information and Technology and the House Science Committee's Subcommittee on Technology on the "Federal Aviation Administration at Risk: Year 2000 Impacts on the Air Traffic Control System," you requested that we provide, for the record, an assessment of FAA's Host Computer System (HCS). Our review objectives were to determine (1) whether HCS has been meeting availability requirements and (2) what issues affect FAA's ability to ensure HCS' availability in the future.[1]

To address these objectives, we analyzed HCS performance and outage data for the past 3 calendar years and the 5-year Host hardware maintenance and sustainment assessment by Lockheed Martin, FAA's HCS sustainment contractor. We also analyzed documents supporting FAA's Host and Oceanic Computer System Replacement program. In addition, we interviewed officials from FAA, Lockheed Martin, and International Business Machines (IBM) Corporation. IBM provided the HCS hardware in the mid-1980s, and its subsidiary currently provides HCS maintenance for Lockheed Martin. We did

[1]System availability is defined as the time that a system is operating satisfactorily, expressed as a percentage of the time the system is required to be operational.

not independently verify the performance data provided by FAA. We conducted our work from February 1998 through April 1998 in accordance with generally accepted government auditing standards.

OVERVIEW OF FAA's HOST COMPUTER SYSTEM

Air traffic controllers in FAA's 20 en route centers control aircraft over the continental United States in transit and during approaches to some airports. HCS is the key information processing system in FAA's en route environment. It processes radar surveillance data, processes flight plans, links filed flight plans with actual aircraft flight tracks, provides alerts of projected aircraft separation violations (i.e., conflicts), and processes weather data.

HCS consists of hardware, a unique operating system, and application software. HCS hardware components are divided into three major categories of equipment: (1) the processor subsystem, which consists of a main processor (IBM 3083), a processor controller (IBM 3082) that checks the temperature and status of the main processor, a coolant distribution unit, and a power distribution unit, (2) the direct access storage subsystem, which consists of disk control units and disk drives, and (3) the peripheral subsystem, which includes modems and printers.

FAA uses two processor subsystems in each of its en route centers to mitigate the impact of system failures. If the primary HCS processor fails, processing is automatically switched to the support processor. When both HCS systems are unavailable, FAA's Direct Access Radar Channel (DARC) system provides backup radar data processing functionality; however, it does so with a degradation in flight data processing capabilities. Specifically, DARC provides basic data pertinent to an aircraft's identification, position, altitude, and speed, but it does not provide automated flight plan processing, controller hand-offs, or a safety alert processing capability, which alerts controllers to impending conflicts between aircraft.

From 1986 to 1988, IBM installed HCS hardware in FAA's 20 en route centers as well as its training and technical support centers. At that time, IBM projected that this equipment would have a service life of 10 years. Since HCS was installed, FAA contracted with Lockheed Martin for HCS hardware maintenance. Lockheed Martin, in turn, subcontracted the work to an IBM subsidiary.

HCS HAS NOT BEEN MEETING AVAILABILITY REQUIREMENTS

For the last 3 years, HCS has not met its availability requirements. FAA has specified an HCS system availability requirement of 99.998 percent. HCS did not meet this requirement in 1995, 1996, and 1997, with average availabilities of 99.972 percent, 99.984 percent, and 99.982 percent, respectively. It also did not meet it in the first 2 months of 1998, with an average availability of 99.992 percent.

HCS' availability rate is driven by unscheduled outages. Unscheduled outages occur for a variety of reasons, including equipment failures, loss of power, software problems, and weather effects. Of the 29 unscheduled outages in 1997, FAA data show that 34.5 percent were due to software, 27.6 percent were due to hardware, and 37.9 percent were due to an assortment of other reasons, such as loss of power, weather effects, and unknown causes.

SPARE PARTS SHORTAGE AND YEAR 2000 ISSUE AFFECT HCS' FUTURE AVAILABILITY

One key issue affecting HCS' future availability is the shortage of critical spare parts. Given that HCS hardware is approaching the end of its expected life cycle, IBM calculated end-of-service dates for each HCS subsystem based on failure rates, available spares, engineering support, plant maintenance, and projected demand. IBM stated that after the end-of-service date, it will maintain the system on a "best effort" basis and the government will be responsible for furnishing any spare parts that become unavailable. Under this scenario, FAA predicts it will encounter longer system outage times–thereby reducing the availability of en route automation systems and threatening air traffic services.

IBM identified eight key hardware units, including the main processor, that will reach their end-of-service dates on or before December 31, 1999. FAA is most concerned about the main processor, which is projected to reach its end-of-service date by September 30, 1998. One key component, the Thermal Conduction Modules (TCM), drives this end-of-service date.[2] Even more specifically, one module of TCM, known as CLVM,[3] is projected to be depleted

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[2]TCM is an IBM-patented technology for packaging electronic circuits for efficient heat dissipation.

[3]According to FAA officials, the meaning of the "CLVM" acronym has been forgotten over time, though it may stand for Cache Link Volatile Memory.

first. TCM technology was discontinued by IBM in the late 1980s and the manufacturing and refurbishing facilities were dismantled. IBM holds all patents on TCM technology and no other manufacturers or vendors are licensed to make or repair them.

In June 1997, Lockheed Martin conducted a worldwide search to identify alternative sources of these parts and reported it could not locate a shelf inventory of TCMs and found no way to guarantee the availability of parts for the HCS main processors (IBM 3083).

Given the six spare CLVM parts it had in inventory on March 4, 1998, and worst-case usage projections,[4] FAA estimated that the inventory of this part will be depleted early in 1999. Using best-case usage projections, the inventory will be depleted in late 1999.[5]

To prolong the life of the current inventory of spare parts, in December 1997, FAA implemented a more conservative replacement policy for TCM parts. Under this new policy, TCM parts are not automatically replaced after experiencing two minor problems, as they were under the prior policy. Instead, each minor problem is reported and analyzed, and each part is evaluated to determine its ability to continue operations. Additionally, once the current inventory of spares is depleted, FAA plans to cannibalize parts from HCS processors located at its training and technical support centers. FAA estimated that it would be able to obtain 26 CLVMs through this cannibalization effort. However, even with cannibalization, FAA states that HCS cannot be maintained beyond 2001.

A second key issue that could affect HCS' availability is the Year 2000 computer problem. While FAA officials expressed confidence that they have resolved date dependencies in HCS' operating system and application software, IBM

Basically, CLVM is the module that provides memory storage for the other TCM modules.

[4]Worst-case usage projections assume that actual part usage rates over the past 3 years will increase by 50 percent each year in the future.

[5]In the past, parts were replaced after experiencing 1 serious or 2 minor problems. Best-case usage projections assume that in the future, parts will not be replaced to correct minor problems, and that the replacement rate for serious problems over the past 3 years will increase by 50 percent each year.

reported that it has no confidence in the ability of the HCS processor's microcode (low-level machine instructions used to service the IBM 3083) to survive the millennium date change because it no longer has the skills or tools to properly assess this code. If there are date dependencies in the processor's microcode, HCS could malfunction or shut down, thereby forcing FAA to operate with the degraded flight processing capabilities provided by its backup system and potentially reducing air traffic capacity. IBM has therefore recommended that FAA purchase new HCS hardware.

FAA PLANS TO REPLACE HCS

Because of concerns about the availability of spare parts and the Year 2000 issue, FAA initiated the Host and Oceanic Computer System Replacement program to replace all HCS processors in its 20 en route centers and training and technical support centers by October 1999.[6] Software and peripheral equipment replacements, which will occur in the later phases of this program, are scheduled for completion by mid-2001. FAA believes this phased approach, with a total system life-cycle cost estimate of about $607 million through 2008, will provide the lowest risk for fast processor replacement and will provide for replacement of other hardware components prior to their end-of-service dates.

While we agree that FAA must act quickly to resolve its HCS spare parts and Year 2000 issues, this acquisition does not come without risks–risks that FAA must mitigate in a short time. In our February 4, 1998, testimony, we reported on several HCS hardware acquisition risks. One of these is the risk of delays and problems resulting from deploying HCS concurrently with FAA's new Display System Replacement (DSR). When upgrading parts of a safety-critical system such as HCS and DSR, it is simpler and safer to upgrade one part at a time. Another risk lies in the difficulty associated with deploying new hardware to 20 en route centers in less than 2 years. In commenting on a draft of this report, FAA officials concurred that this is a risk but stated that they are mitigating it by using a phased approach that will allow them to deploy the hardware first and the software and peripheral equipment replacements later.

The Department of Transportation's Inspector General is initiating two assignments that will address FAA's progress in mitigating these risks. The first is a review of the Host and Oceanic Computer System Replacement's cost, schedule, and risks. The second is a review of FAA's plans for concurrently deploying systems, including HCS and DSR, in 1999 and 2000. Additionally, we have initiated a review of FAA's plans for assuring business continuity should

[6]FAA also plans to replace non-HCS equipment in four Oceanic en route centers.

its systems not be replaced, renovated, or working correctly in time for the year 2000.

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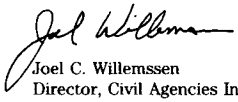
On April 24, 1998, we obtained agency comments on a draft of this letter from officials at FAA and the Department of Transportation (DOT), including the director of FAA's Year 2000 program office, FAA's en route integrated product team lead, and DOT's information technology division manager. These officials generally agreed with the facts presented. FAA officials also commented on particular language in the draft letter, and these comments have been incorporated into the letter as appropriate.

We are sending copies of this letter to the Ranking Minority Member of your Subcommittee and the Chairwoman and Ranking Minority Member of the Subcommittee on Technology, House Committee on Science; the Secretary of Transportation; the Administrator of the Federal Aviation Administration; the Department of Transportation Inspector General; the Director of the Office of Management and Budget; and other interested parties. Copies will also be made available to others upon request.

If you have any questions on the material in this letter, please contact me at (202) 512-6253 or Colleen Phillips, Assistant Director, at (202) 512-6326. We can also be reached by e-mail at *willemssenj.aimd@gao.gov* and *phillipsc.aimd@gao.gov*, respectively.

Sincerely yours,



Joel C. Willemssen
Director, Civil Agencies Information Systems

(511449)

Mr. GRAHAM. Yes, and if I might, Congressman Horn——

Mr. HORN. Yes.

Mr. GRAHAM [continuing]. I'd like to add one more statement. Mr. Alloway, your extremely competent staff member, made the statement to me which I believe probably represents a general feeling in the Congress, and that is—and he didn't mean it in a derogatory way, but he indicated that, in general, the belief is that vendors are venal. The vendor has got to be your most important friend, has got to be your business partner. If you view your vendor as someone who is out to do you dirt, get rid of the vendor; you do not need that. Do not put together ironclad guarantees and warranties that will force a bad vendor to do well; they will not. You must trust your vendor. You must work with your vendor. You cannot guarantee and you should not litigate the problem. Litigating the problem will not solve it. You have got to solve the problem.

Mr. HORN. Well, we thank you. There will be additional questions that both the Democratic and Republican staffs might submit, and if so, those questions and answers will be put, without objection, at this point in the record.

I want to thank every one of you for this hearing. I think there have been some excellent comments made, and I wish you well, Administrator Garvey. You have your hands full. You come well prepared and highly recommended from your experiences in Massachusetts by people in whom I have great faith.

Ms. GARVEY. Thank you.

Mr. HORN. So I'll have great faith in you.

Ms. GARVEY. Thank you.

Mr. HORN. And the problem is, you've got to kick some of that organization of yours into movement because they've had a number of years when they've known about it, and things seemed to have just lagged until you've gotten here. So I wish you well.

I want to thank the people that worked to prepare this hearing, starting with J. Russell George, the staff director and chief counsel of the Government Management, Information, and Technology Committee; Mr. Robert Alloway, who had praise from his uncle, Mr. Graham—anyhow, I'm just kidding, Bob. Don't take it seriously—[laughter]—professional staff member on the subcommittee who was strictly responsible for the hearing, along with John Hynes, professional staff member on the subcommittee, and of course Matthew Ebert, our able clerk, and David Coher, our intern and a very fine young man who we've tested over the last year in my district office as well as here, and Mark Stephenson, a faithful staff member from the minority and an expert in many of these areas. And we also would like to—yes, Richard Russell, the staff director of the Subcommittee on Technology, and Ben Wu, the professional staff member—and I can't quite read the writing here—Jeff Grove, professional staff member, and Michael Bell, staff assistant. And we thank our court reporter, Kitty McKenzie. Thank you very much.

Mrs. MORELLA. May I make one final comment, and thank you for mentioning the staff, too, because I feel my rod and my staff, they comfort me and prepare the papers, in the presence of my constituents; we all feel that way.

But I wanted to point out that the FAA has recognized that they've done a poor job managing the problem, and Ms. Garvey has stated that she intends to raise the problem to the highest levels within the FAA. And although they're way behind where they should be, I think that they have shown us a very aggressive schedule and an intention to address the problem. I appreciate that commitment very much.

And even if they hit all of their goals and milestones on schedule, they may not complete the project until November 1999. We know that the FAA has a poor track record on managing major projects, but this is one where the deadline cannot slip. We hope that we don't need any kind of contingency plans. But like the GAO and the IG, we think that the FAA must establish priorities, work expeditiously to complete the problem.

And I think this has been a terrific panel. You've all worked together. We need every one of you for the kinds of contributions and oversight that you've given. I appreciate it very much. Thank you.

Mr. HORN. Well, I certainly share Mrs. Morella's remarks, and I think one of our problems in this whole area is that, since 1966 until today, the administration simply has not taken the kind of leadership that it should have taken in getting people moving in this area. Thus, we're down to the crunch of less than eight quarters to go, and the number of days I noted in my opening statement. So it's going to be a tough battle, if we're going to satisfy the needs of the American people with a results-oriented government in this area.

Thank you very much for coming.

With that, we're adjourned.

[Whereupon, at 4:55 p.m., the subcommittees adjourned subject to the call of the Chairs.]

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