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FAA REAUTHORIZATION

Opportunity Exists to Address
Safety, Capacity, and
Efficiency Issues

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Mr. Chairman and Members of the Subcommittee:

We appreciate the opportunity to discuss S.1491, the Federal Aviation Administration Authorization Act of 1993, as well as other issues related to the Federal Aviation Administration's (FAA) facilities and equipment, operations, and research activities. Among other purposes, the bill would authorize \$2.05 billion for the Airport Improvement Program (AIP) for fiscal year 1994, require FAA to establish an inventory of Instrument Landing Systems, and direct FAA to review its procurement process, personnel administration, and organizational structure. In all of these areas, FAA faces important challenges that affect the safety, capacity, and efficiency of the aviation system. Our testimony is based on issued reports and information that FAA provided to update the status of certain programs.

In summary, we found that:

- A short-term problem facing the AIP is the pressure on discretionary funds. From fiscal year 1992 to 1993, discretionary funds as a percentage of total AIP funds decreased because total AIP funding was reduced while the proportion of set-aside funds was increased. Pressure on discretionary funds also resulted from the increase in Letter of Intent (LOI) commitments as a percentage of discretionary funds. Under these circumstances, FAA has fewer funds available for new discretionary grants or additional LOIs. As a result, FAA has less flexibility to use the AIP to meet the immediate needs of the national airport system. The proposed legislation offers a solution by providing additional discretionary funds. A key longer-term question for the AIP is the appropriate mix and level of entitlement, set-aside, and discretionary funds. FAA could better advise the Congress on this question if the agency developed goals for the AIP in such areas as safety and capacity and developed performance measures to identify where the airport system needs strengthening. The House Committee on Public Works and Transportation directed FAA in 1987 to develop goals and measures, but FAA has not made substantial progress. FAA officials questioned whether the agency should establish goals and measures because, in their view, FAA has only a limited role in airport development. Given FAA's leverage over set-aside and discretionary funds, we believe FAA officials may be underestimating their influence.

- Serious cost and schedule problems have weakened the aviation community's confidence in FAA's ability to manage the air traffic control modernization program. As a result, proposals have been recently advanced to remove the air traffic control function from FAA. In our opinion, regardless of the outcome of the debate over these

proposals, FAA still has the opportunity to make significant progress with its modernization program. For instance, FAA must field such systems as the Airport Surface Detection Equipment (ASDE-3) radar this year as planned. Also, FAA must follow through on management initiatives being taken to address problems with the Advanced Automation System (AAS), a project that could provide significant benefits to the airline industry. Furthermore, FAA must determine, on a runway-by-runway basis, which precision landing capabilities are needed and whether the replacement of each Instrument Landing System with a higher capability system is justified. FAA must also thoroughly assess all precision landing systems so that the most cost-effective alternatives can be chosen. In 1992 we found that FAA was supporting the development of the Microwave Landing System (MLS) but was not providing needed budgetary support for the development of a satellite-based landing system.

- FAA spent much of the 1980s ensuring that it had a sufficient number of air traffic controllers and safety inspectors to fulfill all of its responsibilities. Today, the primary challenge is not one of overcoming staffing shortages but rather one of effectively distributing its controller work force among key facilities and targeting its inspector resources to those areas needing the most attention. FAA is moving forward to develop a system for better targeting inspection resources to areas needing the most attention. In other resource areas, FAA does not have reliable estimates on the number of technicians needed to maintain the existing air traffic control system. With the expected increase in the number of new systems over the next few years, it is important that FAA determine the number of technicians needed and the best mix between FAA and contractor maintenance.

- FAA continues to make progress in responding to the Aviation Safety Research Act of 1988. FAA has expanded research in areas directed by the act--such as simulation modeling of the air traffic control system. Similarly, FAA is taking steps to respond to a recommendation we made last year to track long-term research. In addition, FAA has developed a Research, Engineering, and Development (RE&D) Plan. However, FAA has not included resource estimates in the plan. Such information is important because FAA and industry officials estimate that FAA would need a significant funding increase--100 percent more by fiscal year 1995--to implement the plan. Given current budget constraints, it is not prudent to believe that such increases will be forthcoming. To ensure the success of its RE&D Program, FAA must (1) incorporate RE&D goals into other programs, such as the Capital Investment Plan, to

modernize the air traffic control system; (2) utilize research conducted by other federal agencies and explore opportunities to coordinate federal and private industry research; (3) integrate various technologies to address existing and future capacity, security, and safety concerns; and (4) incorporate human factors into all research. FAA has started to incorporate goals into other programs, but it faces system integration challenges and has yet to determine how to fully utilize other federal research efforts.

AIRPORT IMPROVEMENT PROGRAM ACCOUNT

The proposed bill, S.1491, addresses a short-term problem facing the AIP--namely, the pressure on the discretionary fund. From fiscal years 1992 to 1993, discretionary funds as a percentage of total AIP funds decreased from 21.6 percent to 16.7 percent, because the 1993 AIP reauthorization (1) set the total funding level \$100 million below the 1992 level and (2) allocated a greater proportion of total AIP funds to the noise and military airport set-asides. Pressure on the discretionary fund also resulted from the increase in LOI commitments as a percentage of total discretionary funds, from 30 percent in fiscal year 1992 to 45 percent in fiscal year 1993. Assuming a continuation of current law and no new LOIs, LOI commitments would increase to 52 percent of discretionary funds in fiscal year 1994. The bill provides a remedy by providing additional discretionary funds if the AIP funding level is less than \$1.8 billion.

Regarding LOIs, the Senate Appropriations Subcommittee on Transportation has asked us to evaluate their use by FAA. We intend to report our findings and recommendations by the end of this year. Our preliminary findings are that LOIs have proven to be a highly effective means of helping airports plan and finance development projects. However, assuming the current program level of \$1.8 billion, FAA has committed a substantial percentage of future discretionary funds through LOIs. Clearly, the overuse of LOIs could affect FAA's flexibility to fund other deserving projects in the future.

A longer-term question for the AIP is the appropriate mix and level of set-aside and discretionary funds. We testified in May 1993 that FAA could do more to help the Congress address this question. We stated that FAA has not made substantial progress in developing goals in such areas as safety and capacity and performance measures for the AIP, as the House Public Works and Transportation Committee requested in 1987.¹ In our view, by developing goals and performance measures, FAA would be in a better

¹Airport Improvement Program: Opportunity to Consider FAA's Role in Meeting Airport System Needs (GAO/T-RCED-93-43, May 26, 1993).

position to determine if scarce AIP funds are being put to the most cost-effective use. For example, FAA could set a goal, such as a 1-percent annual increase in the number of tie-down spaces at reliever airports--to reflect its intention to support the continued viability of those airports. FAA could then measure the number of spaces annually. Such information would put FAA in a better position to fund the most cost-effective reliever airport projects and perhaps argue for a change in the level of reliever airport funding.

FAA officials questioned whether the agency should set goals for improving the nation's airport system or be held accountable for achieving such goals, because they believe that FAA has only a limited role in directing airport development. FAA officials cited the following reasons for the limited role: (1) the program's formula specifies the manner in which most of the funds will be allocated, (2) airport sponsors play a significant role in selecting AIP projects, and (3) locally assessed Passenger Facility Charges (PFCs)--with the potential to reach about \$1 billion annually as early as 1995--have emerged as a significant funding source for airport development. Although these reasons have some merit, they are not, in our view, persuasive. The Congress has given FAA the authority to decide how to spend discretionary and, within broad purposes, set-aside funds. Furthermore, although airport sponsors determine their development needs, they could do so within the framework of national goals.

On the basis of discussions with FAA officials, we do not expect the next version of the National Plan of Integrated Airport Systems (NPIAS), which FAA intends to publish in January 1994, to emphasize goals or performance measurement. In February 1992, we testified that the current NPIAS was not an effective plan or a useful tool for policy makers for three reasons.² First, NPIAS established no measurable national goals and therefore provided little direction for funding airport improvement projects. Second, NPIAS was viewed by many as a "wish list," because it included projects that would never be funded under the AIP, could not be afforded by sponsors even with federal assistance, or were scheduled as many as 10 years into the future. We noted that a national plan would be a more reliable basis for goals if it were built on the 5-year capital improvement plans currently used by most commercial service airports. Third, NPIAS contained no mechanism to measure airports' performance against goals.

²Airport Development: Improvement Needed in Federal Planning (GAO/T-RCED-92-30, Feb. 19, 1992).

Our recent review of a potential new Chicago-area airport highlights shortcomings in FAA's approach to the AIP.³ We found that FAA headquarters and Great Lakes regional officials did not have specific goals for reducing flight delays nationally. Also, they did not evaluate how a new airport could decrease flight delays systemwide and relied on the airport sponsors' analyses that focused on delays in the Chicago area. By analyzing the effect of projects on achieving systemwide goals, FAA can better determine how limited AIP funds should be allocated. Such analysis is critical given the impact that funding one project can have on the availability of AIP funds for other projects. For example, according to the sponsors' analysis, annual discretionary AIP grants over a 5-year period for a new Chicago-area airport would average from \$110 million to \$318 million, depending on the site selected. At this funding level, the least costly sites could use the full allocation of discretionary funds typically available to the entire Great Lakes region. The more costly sites could use the full allocation for several regions.

According to FAA officials, progress in developing goals and performance measures would be enhanced if FAA could use AIP funds to support systemwide airport development planning. AIP has a set-aside category for local airport planning but not for nationwide planning efforts. If the Congress wanted to speed FAA's progress, one option would be to establish a specific national planning set-aside for FAA's use. This could provide a strong signal to FAA and the aviation community about the emphasis placed on systemwide goal-setting and planning.

FACILITIES AND EQUIPMENT (F&E) ACCOUNT

The F&E account funds the Capital Investment Plan (CIP), FAA's program to modernize the nation's air traffic control (ATC) system. Major CIP projects--such as AAS--have continued to experience serious cost and schedule problems. These problems have weakened the aviation community's confidence in FAA's ability to manage the modernization program. Citing federal procurement and personnel rules as a major cause of problems with the modernization program, both the National Commission to Ensure a Strong Competitive Airline Industry and the Vice-President's National Performance Review have proposed the establishment of a federal corporation to perform ATC functions. Regardless of the outcome of the debate over these proposals, FAA can still address long-standing problems in the modernization program. We do not believe current procurement or personnel rules impede FAA in any way from taking such actions as (1) ensuring that management initiatives to address AAS problems are continued throughout the course of the project; (2) supporting development of alternative precision landing systems; and (3)

³New Chicago-Area Airport: Site Comparison, Selection Process, and Federal Funding (GAO/RCED-93-105, Feb. 22, 1993).

establishing modernization goals and measuring progress against those goals.

CIP Projects Have Experienced Cost Growth and Schedule Delays

Overall CIP costs have continued to grow. As we reported in April 1993, FAA's cost estimate through the year 2000 is now \$32.8 billion, an increase of \$869 million over the previous year's estimate of \$31.9 billion.⁴ A significant portion of the increase is due to the inclusion of new projects in the CIP, but cost increases on existing major projects also occurred. We found that 9 of 12 projects we reviewed had cost increases, ranging from \$1.7 million to \$77.1 million. In addition, 7 of the 12 had cost increases pending FAA's approval. For example, the ASDE-3 radar has \$30 million in pending changes to fix a persistent target-splitting problem, make needed site configuration changes, and pay the contractor for hardware and software changes it has already made.

In addition, major CIP projects have continued to experience significant schedule delays. For example, the first implementation milestone for the ASDE-3 radar--a system that could prevent runway incursions--was delayed for a year because of continuing software problems. ASDE-3 is now 6 years behind its original schedule. On average, major CIP projects are 5 years behind the original schedules set in 1983.

Furthermore, the serious problems that FAA and its contractor, International Business Machines (IBM), have experienced with AAS are well-known. FAA announced this year that a key initial segment of AAS--the Initial Sector Suite System (ISSS)--has been delayed again. As a result, this segment is about 3 years behind 1988 contract milestones. Our work on AAS found several factors that led to these problems.⁵ First, FAA and IBM agreed to an AAS plan that was too ambitious and significantly underestimated the technical challenge required to develop it. As a result, they set schedules that proved unrealistic. Second, FAA did not provide the needed oversight of IBM's performance. For example, FAA did not have good quantitative information on IBM's progress in software development. Third, FAA did not effectively resolve some major

⁴Air Traffic Control: Status of FAA's Modernization Program (GAO/RCED-93-121FS, Apr. 16, 1993).

⁵Air Traffic Control: Uncertainties and Challenges Face FAA's Advanced Automation System (GAO/T-RCED-93-30, Apr. 19, 1993).

system requirements issues for ISSS, such as flight strip definition and controller screen format.⁶

To address problems with ISSS, FAA and IBM announced a series of management initiatives that, in our view, are reasonable under the circumstances. These initiatives include increasing FAA's and IBM's top management oversight and establishing a structure for resolving requirements issues in a timely manner. We recognize that it will take time for these management initiatives to work but believe they are critical to a successful modernization program.

Because projects have encountered serious schedule delays over the years, the aviation industry has questioned FAA's ability to manage the modernization program. This coming year is vitally important to FAA's credibility, because FAA has promised that several key systems--including Terminal Doppler Weather Radar, the Mode S radar, ASDE-3, and the new long-range radar (ARSR-4)--will be operational in the field and that AAS will be kept from slipping further behind schedule.

Facility Consolidation Will Have Major Budgetary Implications

FAA has announced a major change to its ATC facility consolidation plan, which will increase CIP costs. FAA's original plan, developed in 1983, was designed to consolidate over 230 terminal radar approach control facilities and air route traffic control centers into just 23 facilities. The \$32.8 billion estimate is based on that level of consolidation. Because that plan had important limitations, including operational feasibility problems, FAA has considered alternatives since 1987. Last spring, FAA announced its decision to proceed with a "limited consolidation plan." FAA has recently reported to the Congress that the plan will lead to the establishment of 22 centers, 9 consolidated terminals, and 170 unconsolidated terminals--in total, about 200 facilities.

Retaining a large number of facilities under the limited consolidation plan will increase F&E costs, because the plan will require additional building refurbishment and equipment purchases. In total, FAA now estimates that, through the year 2004, limited consolidation will increase F&E costs by over \$1.5 billion. Because we have not completed our review of FAA's consolidation plan, including the analyses supporting it, we cannot report its full impact on F&E costs. However, it is clear that the plan will have far-reaching budgetary implications.

⁶Flight strips provide controllers with basic status information, such as aircraft routes, altitudes, and air traffic clearances. Controllers presently mark up the paper versions to record changes in status and to coordinate information with each other.

FAA Needs to Address Long-Standing Modernization Problems

FAA has the opportunity to take several other steps to ensure a sound modernization program. These include developing well-supported mission need statements, supporting the development of alternative precision landing systems, and establishing goals to measure progress.

Developing Well-Supported Mission Need Statements

Over the past few years, FAA has taken several steps to improve its management of acquisitions. These steps included a commitment to follow a more disciplined approach to acquisition. For example, FAA requires mission need statements for all new projects in the CIP and F&E budget.

In January 1993, we reported on this vital first step in FAA's acquisition process.⁷ We found that many of FAA's mission need statements for new CIP projects do not justify that a need exists for the projects. The 25 approved mission need statements we examined listed 110 deficiencies in the air traffic control system, deficiencies that could cost \$5 billion in new investments to fix. However, many of these statements were not supported with either qualitative or quantitative evidence. The statements merely indicated that deficiencies had adverse effects on FAA's operations.

Since the time of our report, FAA has revised its acquisition policy to emphasize the importance of mission analysis and supported the statements with evidence of current or projected problems. The agency has recognized that mission analysis is not a bureaucratic exercise but rather a sound business practice to help ensure that capital investments are really needed.

Supporting the Development of Alternative Precision Landing Systems

For many years, FAA pursued the complete replacement of the Instrument Landing System (ILS) with the MLS.⁸ This project has been estimated to cost \$2.6 billion. However, as FAA experienced delays in developing MLS, other alternatives for precision landings

⁷Air Traffic Control: Justifications for Capital Investments
Need Strengthening (GAO/RCED-93-55, Jan. 14, 1993).

⁸Precision landing systems are categorized by different minimum standards of height and visibility. Category I equipment allows aircraft to descend to a height of 200 feet above the ground when the runway visual range is at least 1,800 feet. Category II and III equipment allows aircraft to descend closer to the runways.

have arisen--the existing ILS enhanced with an aircraft-based computer system and a satellite-based landing system. As we reported in November 1992, FAA had not determined, on a runway-by-runway basis, which precision landing capabilities will be needed and whether the replacement of each ILS with a system having greater capability is justified.⁹ FAA had also not given sufficient budgetary support to the development of a satellite-based system. We recommended that FAA provide the necessary funding and prepare a new mission need statement for precision landing systems in general. We emphasized that this statement should be ready before FAA decides on replacing existing ILSs.

FAA's Satellite Program Office has conducted several flight tests of a satellite-based landing system using the Department of Defense's Global Positioning System (GPS). By the mid-1990s, FAA intends to augment GPS to support special Category I precision approaches and plans to complete its evaluation of the feasibility of using an augmented GPS for Category II and III precision approaches. At the same time that FAA will complete its feasibility study, the agency will also be receiving 12 prototype Category II and III MLSSs.

If proven feasible for all types of precision approaches, a GPS-based system could have a major impact on the costs to the airline industry. Some airlines are already installing GPS avionics to support aircraft operations during other phases of flight. Cost estimates are not yet available for GPS avionics upgraded for precision landing capability. However, using GPS for precision landings may allow airlines to forgo some of the substantial costs of equipping their aircraft with MLS avionics--which are estimated to range from \$252 million to \$336 million for the commercial aviation fleet. The potential costs to aviation users make it essential that FAA thoroughly assess its needs and alternatives for precision landing systems, as we have recommended.

Finally, we would like to comment on the bill's proposal that an inventory of ILSs be established to make the systems available to airport sponsors on an expedited basis under the AIP. We believe this idea has some merit, because it has the potential of simplifying and speeding up the acquisition process and providing cost savings to airports and the federal government.

Establishing Goals to Measure Progress

Last year, we recommended that FAA incorporate measurable goals in the CIP to help guide funding decisions. FAA has not yet published an update to the December 1991 CIP. However, our review of a draft CIP indicates that FAA will incorporate measurable

⁹Airspace System: Emerging Technologies May Offer Alternatives to the Instrument Landing System (GAO/RCED-93-33, Nov. 13, 1992).

goals. For example, one goal is to increase airport and airspace capacity by 20 percent by 1999. Another is to reduce runway incursions by 80 percent by 2000.

Now that FAA is taking this important step, it would be helpful for decision makers in both the executive branch and the Congress if FAA reported its progress against these goals. Up until now, FAA has reported its progress in terms of the number of CIP projects under contract and completed. Those are not true indicators of progress because they do not show how FAA is improving the safety and efficiency of the air traffic control system, which is the overall goal laid out for the CIP and the F&E budget.

According to FAA officials, they are developing performance measures to track progress against these new CIP goals. Measuring progress against goals would help the Congress in making decisions on where to focus F&E resources. Additionally, FAA would be in a better position to analyze its performance and detect deficiencies in existing systems. This would result in improved mission need statements and better support for its F&E projects.

OPERATIONS ACCOUNT

The Operations account funds the salaries, benefits, and training of FAA's major work forces--air traffic controllers, safety inspectors, and maintenance technicians. FAA spent much of the 1980s ensuring that it had sufficient numbers of controllers, inspectors, and maintenance technicians. Today, the primary challenge is not one of overcoming staffing shortages but rather one of effectively distributing controllers and technicians among key facilities and targeting inspector resources to those areas needing the most attention.

Strategy Needed to Overcome ATC Facility Staffing Imbalances

As of April 1993, the overall size of the controller work force was less than 1 percent short of the 17,900 prescribed by FAA's staffing standards. However, in total, ATC centers are staffed at 6.6 percent greater than the standards, while terminals are 5.2 percent less than the standards. Since 1991, the Congress and FAA have been aware of staffing imbalances. These imbalances occur (1) between terminal and center facilities, (2) among terminals, and (3) among centers. For example, FAA's recent staffing study, using current standards to measure imbalances, indicated that 210 terminals were understaffed by about 1,000 controllers and 167 terminals were overstaffed by about 800 controllers.

To ensure that individual air traffic facilities are properly staffed, the House Appropriations Committee requested FAA to

analyze staffing at each facility and to report by December 31, 1991, on its staffing needs and the actions needed to correct the disparities. When FAA performed its analysis using May 1992 data, it identified problems with its staffing standards. According to Air Traffic officials, the standards do not adequately consider complexities unique to each facility, such as training and attrition rates. Therefore, FAA does not want to submit a report to the Congress until it develops solutions to the imbalances.

FAA recognizes that it must consistently and accurately measure staff needs before implementing a solution for the imbalances. Once staffing needs are accurately determined, FAA has several options for correcting the imbalances. These options include (1) assigning controller candidates to understaffed facilities, (2) reassigning controllers at overstaffed facilities to understaffed facilities, (3) allowing overstaffed facilities to continue operating with current staffing levels and not hire replacements for those that leave through normal attrition, and (4) contracting out towers and reassigning the freed-up controllers to understaffed facilities. FAA estimates that if it contracted out the operation of low-activity towers at a rate of 10 per year, it could save a total of \$93 million to \$101 million and reduce staff by about 900 through the year 2012, without negatively affecting safety. Recognizing the significant savings that could accrue, the House Appropriations Committee recommended providing \$7.3 million in fiscal year 1994 for FAA to contract out the operation of 25 low-level towers and to decommission 13 towers that have been temporarily closed since the early 1980s.

FAA officials are aware of these options and recognize the short- and long-term limitations of implementing them. For example, in the short term, FAA cannot relocate controllers from overstaffed facilities to understaffed facilities because FAA does not believe that it has sufficient permanent change-of-station funds to pay for the moves. To partially address this concern, the House Appropriations Committee recommended providing \$8.5 million in fiscal year 1994, primarily to move controllers from 25 low-level towers that would change from FAA to contractor operations. In the long term, FAA's consolidation plan can have staffing implications, create the need for new staffing standards, and require the movement of controllers to consolidated facilities.

Opportunities for FAA to Better Use Its Inspector Work Force

FAA's fiscal year 1994 budget request maintains the number of safety inspectors at about 2,500. These inspectors oversee about 7,300 commercial aircraft, 10,500 nonscheduled commercial aircraft, 192,000 general aviation aircraft, 4,700 repair stations, 650 pilot training schools, and 190 maintenance schools. Given these varied responsibilities, FAA must identify opportunities to target resources toward those areas needing the most attention and to

follow through on safety initiatives begun over the last several years.

In previous reports on FAA's inspections of domestic and foreign carriers and aging aircraft, we explained the difficulties that FAA faces in providing sufficient inspection coverage.¹⁰ We recommended that FAA develop clear guidance for inspectors, defining which of their many high-priority areas should take precedence. During our review of aging aircraft, for example, inspectors told us that they also had other high-priority activities and lacked guidance to determine how many aging aircraft to inspect. FAA concurred and plans to issue guidance requiring inspectors to include the purpose of each inspection and the aircraft's age in its data base.

We also recommended that FAA develop criteria for targeting inspections to high-risk conditions. Targeting will help FAA determine how it could best use its limited inspector resources. FAA agreed and has been developing the Safety Performance Analysis Subsystem (SPAS). SPAS is a computer-based system that analyzes information in various FAA data bases that, among other things, identifies potential problem areas for inspection emphasis. FAA plans to spend about \$10 million to develop a prototype system through fiscal year 1995.¹¹

For SPAS to succeed, FAA needs to (1) define the telecommunications network needed for the inspectors to enter and retrieve data from the system, (2) ensure that the system is not too complex and that inspectors are trained on the system, and (3) ensure that data used by SPAS contain complete and accurate information. For example, the Program Tracking and Reporting Subsystem (PTRS) is a key data base that FAA plans to use in SPAS. However, we previously reported that PTRS contains inaccurate data.¹² Also, FAA does not currently plan to include the results of foreign carrier inspections in SPAS, primarily because it does not collect such information as financial data to develop the same

¹⁰Aviation Safety: Unresolved Issues Involving U.S.-Registered Aircraft (GAO/RCED-93-135, June 18, 1993); Aircraft Maintenance: FAA Needs to Follow Through on Plans to Ensure the Safety of Aging Aircraft (GAO/RCED-93-91, Feb. 26, 1993); Aviation Safety: Increased Oversight of Foreign Carriers Needed (GAO/RCED-93-42, Nov. 20, 1992); and Aviation Safety: Problems Persist in FAA's Inspection Program (GAO/RCED-92-14, Nov. 20, 1991).

¹¹Although FAA will require additional funds to purchase telecommunications hardware and software and provide training, it has not determined the amount of additional funds needed.

¹²Aviation Safety: Problems Persist in FAA's Inspection Program (GAO/RCED-92-14, Nov. 20, 1991).

safety indices for assessing risk that it collects for domestic carriers. Despite these limitations, we believe that SPAS could be an important management tool for targeting limited resources.

FAA Does Not Have Reliable Estimates on
Maintenance Technician Staffing Needs

At an April 1992 hearing before the Subcommittee on Transportation and Related Agencies, House Committee on Appropriations, the then-FAA Acting Administrator stated that the staffing standards for maintenance technicians were suspect and had not been closely evaluated. According to the staffing standards, FAA needs about 12,700 maintenance technicians in fiscal year 1994. In its budget, however, FAA is requesting an end-of-year staffing level of 8,923 for 1994, or 237 fewer than the level requested for fiscal year 1993 and 30 percent less than the staffing standards would require to maintain the ATC system.

We share FAA's concern about the reliability of the staffing standards because FAA has consistently maintained a high level of system availability with a less experienced work force that is well below the levels prescribed by the standards. As of February 1993, FAA had about 8,950 technicians to service equipment at almost 29,000 facilities. Furthermore, the average experience level of technicians has declined from almost 21 years in 1988 to about 18 years in 1993. To help bridge the gap between estimated staffing needs and availability, FAA has relied more on contractors to maintain new equipment and on increased overtime usage. In fiscal year 1994, FAA expects contract maintenance and overtime to account for about 5 percent of staffing needs. FAA now contracts for the maintenance of 17 systems, compared to 6 in 1987. In fiscal year 1994, FAA is proposing to increase contract maintenance to 27 systems at a cost of about \$52 million. Also, FAA increased its use of overtime to almost 239,000 hours in fiscal year 1992, a 30-percent increase from fiscal year 1986.

FAA's efforts to compensate for staff and experience shortages, coupled with equipment redundancy, have kept overall system availability at about 99.8 percent. However, indications are that FAA's ability to maintain availability at 99.8 percent could deteriorate. For example, the mean time to restore equipment increased to over 14 hours in 1992, a 45-percent increase since 1988 because of (1) less experienced technicians and (2) older equipment to maintain. In addition, FAA generally hires technicians at the end of the year. According to FAA officials, this practice affects scheduling the training that technicians need to become fully qualified, which usually takes 3 to 5 years. In a no-growth environment, the experience and system performance levels could decline further if the 2,100 technicians eligible to retire by 1995 leave the work force.

More accurate and reliable staffing standards for maintenance technicians would enable FAA and the Congress to make more informed decisions on allocating resources. Furthermore, delays in FAA's CIP projects and facility consolidations will affect the number of technicians needed and where they will be assigned. To better utilize maintenance technicians, FAA is currently taking actions to (1) screen applicants and streamline the training process, thus shortening the time needed to progress to the journeyman level; (2) reduce work load by identifying more efficient means to accomplish the required activities; and (3) reduce maintenance activities not related to safety. However, it is important that FAA determine the number of technicians needed and the proper mix between FAA and contractor maintenance.

RESEARCH, ENGINEERING & DEVELOPMENT ACCOUNT

FAA's RE&D program plays an important role in ensuring the safety, security, and efficiency of the U.S. air transport system. In response to the Aviation Safety Research Act of 1988, FAA has increased research in aircraft safety, simulation modeling, and human factors and developed an RE&D Plan. The RE&D Plan enjoys industry support and provides information on, among other things, aircraft safety, security, and weather research. However, FAA has not included resource estimates--either staff or dollars--for research efforts, as we recommended.¹³ Such information is important for several reasons.

First, according to FAA and industry officials, FAA would need \$500 million annually--a 100-percent increase over current funding levels--by fiscal year 1995 to implement the plan. Second, some research areas, especially human factors and airport technology, could cost significantly more in the next several years. Third, in the next decade, FAA will be making difficult decisions on allocating scarce RE&D resources to many competing areas, such as aircraft safety and ATC. Without cost and staffing information, neither the Congress nor FAA can adequately oversee decisions to ensure that resources are being used most effectively and that trade-offs have been made wisely.

¹³Aviation Research: FAA Could Enhance Its Program to Meet Current and Future Challenges (GAO/RCED-92-180, June 3, 1992).

FAA Is Instituting New Controls to Set Priorities and Funding Levels

FAA is taking steps to help set priorities and establish funding levels. For the past several years, FAA has been struggling to define a process to set research priorities, determine the correct balance of long- and short-term research, and establish funding levels for its research program. In March 1993, FAA issued a new acquisition policy that, among other things, requires priorities to be based on an analysis of mission need statements, beginning in fiscal year 1995.¹⁴

These statements are intended to justify the need for an investment, clearly state the investment's purpose, relate the project to FAA's overall needs, and highlight the risks involved. Although not guaranteeing a successful acquisition, mission need statements are intended to provide a sound basis for investment decisions. For the RE&D Program, FAA officials are optimistic that mission need statements will help them identify, fund, and deploy promising technologies.

Efforts to Track Long-Term Research Are Under Way

For many years, the Congress has been concerned that FAA's RE&D Program is not sufficiently future-oriented. According to FAA officials, about 20 percent of the fiscal year 1994 budget is allocated to long-term or future-oriented research. Such research is important because it can identify potential safety problems before they result in catastrophic accidents or incidents and enhance the industry's competitiveness. We previously reported that many projects FAA had classified as long-term were actually short-term or a combination of short- and long-term efforts. We also found that FAA does not track information on the amount of long-term research conducted. Consequently, budget and planning documents do not indicate the level of funds for short- or long-term efforts. Tracking such research would allow FAA to make judgments on the overall direction of the RE&D program, identify trends, and make the necessary adjustments. Therefore, we recommended that FAA develop a mechanism to track long-term research. FAA is exploring ways, including modifying the RE&D information system, to implement this recommendation and expects to have procedures in fiscal year 1995.

¹⁴Office of Management and Budget Circular A-109 establishes guidelines for top-level agency management to review acquisitions at four key decision points. Approval of a mission need statement is the first decision point.

FAA's RE&D Efforts are Difficult to Estimate

FAA's total RE&D efforts are difficult to estimate because some research is funded from other sources, including other federal agencies and the F&E account for modernizing the ATC system. For example, several important RE&D projects that utilize emerging technologies--such as Terminal Air Traffic Control Automation--receive both RE&D and F&E funds.¹⁵ We previously reported that FAA needed to link its process for acquiring major projects with its budget to enhance project management and reduce the potential for cost growth and schedule delays.¹⁶

On the basis of our recommendations, FAA now delineates F&E funds for engineering, development, test, and evaluation in its budget. FAA is requesting about \$549 million in its fiscal year 1994 F&E budget to research and test specific problems associated with, for example, the AAS and the Voice Switching and Control System. Therefore, if F&E funds are considered, FAA expects to spend almost \$800 million on research, engineering, and test-related activities in fiscal year 1994.

Several Interrelated Factors Will Affect the Success of FAA's RE&D Program

In June 1992, we reported that several interrelated factors will affect FAA's ability to meet current and future challenges. These factors are (1) incorporating RE&D goals into other FAA programs; (2) utilizing research conducted by other federal agencies; (3) integrating various technologies to address existing capacity, safety, and security concerns; and (4) incorporating human factors into all research. These factors are important today and will ultimately shape FAA's ability to meet its RE&D goals.

FAA's RE&D Plan includes nine ambitious but, in FAA's view, attainable goals. For example, the plan shows that FAA expects to increase airspace and airport capacity by at least 20 percent in 1999 and an additional 20 percent by 2005 and reduce runway incursions by 80 percent by the year 2000. Goals are important elements of a good plan because they set expectations and establish a basis to measure performance.

In our opinion, four interrelated and cross-cutting factors will shape FAA's ability to meet the safety, security, and capacity

¹⁵For additional information on emerging technologies, see Air Traffic Control: Status of FAA's Modernization Program (GAO/RCED-93-121FS, Apr. 16, 1993).

¹⁶Aviation Acquisition: Further Changes Needed in FAA's Management and Budgeting Practices (GAO/RCED-91-159, July 29, 1991).

demands of the next decade and beyond. First, the RE&D goals must be incorporated into other program areas. This is important because the RE&D Program must rely heavily on other programs, such as the CIP. We recommended that FAA integrate RE&D goals into other programs or develop goals that are directly achievable by the RE&D Program. In response, FAA has included one goal (increase capacity by at least 20 percent in 1999) in the draft 1992 CIP. However, FAA still needs to integrate RE&D goals into other agencywide efforts, such as the need to significantly reduce the number of accidents on crowded runways. FAA officials told us that they plan to integrate RE&D goals into other programs within the next year.

Second, FAA must utilize research conducted by other federal agencies and private organizations. For example, FAA can make better use of the National Aeronautics and Space Administration (NASA) to bring about major improvements in safety and capacity. In addition, this fall FAA expects to complete an assessment begun late last year on increasing its use of Department of Defense (DOD) laboratories. Although the extent and type of technologies that could be transferred is unknown, DOD and FAA officials believe that they can contribute to FAA's research efforts. Key areas that might benefit FAA include phased array radar technology, sensor fusion, and software testing. The National Aviation Research and Competitiveness Act of 1993 (H.R. 1229) would require the establishment of a joint program for conducting research on aviation-related technologies. In addition, FAA should explore opportunities to coordinate federal and private industry research.

Third, in such areas as ATC and security, an important relationship exists between developing technologies and how the technologies work together (system engineering and integration). For example, in the ATC area, FAA must ensure the integration of ground-based systems and satellites for communications, navigation, and surveillance functions. Also, FAA must ensure that future security devices can successfully blend several technologies to detect a wide range of explosives. In the past, integration problems and issues have contributed to cost increases. For example, costs increased for the Terminal Doppler Weather Radar System because FAA did not fully consider the need to integrate that system with the Low-Level Windshear Alert System.

Finally, for more than 30 years, human error has contributed to over 65 percent of aviation accidents. As a result, FAA has developed a multiyear plan with NASA that focuses on many aspects of human factors in aviation. By December 1993, FAA expects to complete an evaluation of the plan's priorities and determine the correct balance of short- and long-term human factors research. This work will help identify potential safety issues and maximize efficiency in ATC and the operation and maintenance of aircraft.

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In summary, our work has identified some significant challenges for FAA. With regard to AIP, FAA cannot be assured that program funds are used in the most effective manner because FAA does not have specific goals to guide funding decisions or the means to measure performance against such goals. In addition, FAA has made so many commitments under LOIs that it has only limited funds available for new discretionary grants or additional LOIs. In the F&E area, FAA must address three major challenges--fielding systems as promised, coming to grips with the budgetary impacts of facility consolidation, and addressing long-standing problems in ATC modernization program.

In the operations area, FAA continues to face problems affecting its critical work forces--controllers, inspectors, and maintenance technicians. These problems include inadequate staffing standards, staffing imbalances at facilities, and the lack of systems to target resources to areas that pose the greatest safety risk. FAA has several options to correct staffing disparities at air traffic control facilities, but to successfully follow through on any plan will require FAA to first correct its staffing standards. FAA has taken positive steps toward developing a system for targeting inspector resources to high-risk areas, but FAA will have to resolve several significant problems before implementing the system. The maintenance technician work force has been able to preserve the high level of air traffic control equipment availability with staffing shortages and a decline in experience levels, calling into question the adequacy of its staffing standards.

With regard to RE&D, FAA's plan to use mission need statements in fiscal year 1995 to rank research efforts and guide funding decisions is a positive step. However, FAA has not implemented our recommendation to include the requisite budget and staffing information in the RE&D Plan. This information is critically important in today's budgetary environment, where FAA will have to make difficult trade-offs between diverse research areas.

Mr. Chairman, this concludes my statement. We will be happy to respond to any questions you might have at this time.

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