

had 58, or about 14 percent, fewer controllers than called for by its standard.

In 1991 we found, at both centers and terminals, that the placement of FAA Academy graduates was inconsistent with the standards. Some graduates were placed at facilities that had more staff than called for by the standards rather than at equivalent facilities, in the same region, that had fewer staff than the standards indicated. Specifically, we found that FAA placed Academy graduates at six centers with more controllers than the standards prescribed. FAA headquarters officials believe that many deviations from the staffing standards are based on the regions' special knowledge of operational needs. For example, regions might explain placing more staff at a facility than the standard indicates because of a higher than anticipated attrition rate, a greater work load than anticipated, or the facility's special ability to train controllers.

FAA expects the number of controllers to decrease through attrition to 17,721 by the end of fiscal year 1992. In fiscal year 1993, FAA is requesting funds for only 17,871 controllers, although its staffing standard indicates that 18,128 are needed. An Air Traffic official said FAA requested about 250 controllers fewer than the standard indicates because (1) the agency is revising its screening process for hiring new controllers and wants to take on relatively few controllers during this transitional year and (2)

the number of controllers planned for fiscal year 1993 meets FAA's goal to maintain staffing levels to within 5 percent of the standard. We suspect that this shortfall will make it harder for FAA to meet staffing needs in subsequent years. Reaching the fiscal year 1994 staffing standard of approximately 18,500 controllers would require FAA to add over 600 controllers in 1994.

We believe that FAA does not currently have sufficient information to know whether differences in actual staffing and the standards are justified. FAA has not analyzed either the staffing or the training capabilities at specific facilities despite being tasked by the House Appropriations Committee to analyze its controller requirements for each facility. FAA was to report by December 31, 1991, on these staffing requirements for the next 3 fiscal years, the number of controller candidates needed to meet these requirements, and its actions to correct disparities between the actual staffing and the staffing needed at facilities. FAA has contracted for a study of its staffing requirements for controllers, but the study will probably not be completed until 1993. Furthermore, FAA is planning to inventory facilities' training capabilities this year. Until these tasks are complete, FAA cannot be sure that its regions are making the best decisions about placing controllers.

FAA is reforming its screening and training process. The new process is intended to reduce the unacceptably high washout rate at

the Academy, reduce the relocation costs associated with moving controllers as they become more experienced, and improve recruiting since the screen can be administered at multiple sites. Under the new process, candidates will be screened for up to 5 days to determine their aptitude for controlling air traffic, rather than the 9 weeks that screening currently takes. Training would then take place at the FAA Academy for 4 or 5 months. Full implementation of the plan is scheduled for fiscal year 1994.

In testimony last year, we discussed a concern about the new screening and training process. The new screening process places greater reliance on FAA's ability to accurately determine candidates' aptitude because the agency intends to train candidates who pass the screen for the entire 4 or 5 months, after which the candidates will take a "performance verification" test. An Air Traffic official has said FAA would provide the test results for the screening process, but we have not received them yet. Without the test results, we cannot assess the accuracy of the screening process for predicting the aptitude of candidates to become controllers.

#### Maintenance Work Force Is Insufficient to Meet Needs

As of March 1992, FAA had a field maintenance work force of about 8,900 to service ATC equipment at over 28,000 facilities across the country. However, the staffing standard for the field

maintenance work force shows that a work force of about 11,700 is needed in fiscal year 1992, which is 24 percent larger than FAA has now. By fiscal year 1995, the standard indicates that a field maintenance work force of about 11,900 will be needed--an increase of 3,000 over the present number. Airway Facilities officials expressed concern about the staffing situation, but said funding constraints limited their ability to hire more staff. The fiscal year 1993 request level will fund the same work force level as in fiscal year 1992.

As recently as 1989, FAA expected to need fewer maintenance technicians in the near future. Staffing standard projections in 1989 called for a field maintenance work force of about 9,700 in fiscal year 1992 and about 8,600 in fiscal year 1995. The 1989 projections were based on a decreasing maintenance work load. However, FAA now expects maintenance requirements to increase because of the slower than anticipated replacement of aging equipment, an expected increase in the number of facilities, and an increase in the number of services performed by maintenance staff.

FAA's efforts to reduce the gap between the field maintenance work force and the work load have not succeeded. FAA estimates that about 38 percent of the field maintenance work force will be eligible to retire by 1995 and had hoped that the Federal Employees Pay Comparability Act of 1990 (P.L. 101-509) could help retain staff. 'On a case-by-case basis, the act (1) permits agencies to

pay allowances of up to 25 percent of employees' base pay in order to retain the employees and (2) permits rehired retirees to receive both a full salary and retirement benefits. However, since the act was passed, applications have been approved for only three engineers. Several FAA officials said that the process is cumbersome and not well understood in the field. A personnel official said field maintenance staff would be receiving more information about the program and instructions on completing the paperwork.

Although equipment redundancy and the excellent efforts of technicians have kept overall system availability at about 99.8 percent, the effects of staffing shortfalls are being felt. The mean time to restore component equipment within the ATC system increased 35 percent between calendar years 1988 and 1991. Also, FAA increased its use of overtime to about 250,000 hours in fiscal year 1991, which is a 36-percent increase from fiscal year 1988. Until now, FAA believed it was adequately performing its maintenance duties related to safety with less staff than requested by deferring in the short term maintenance activities not related to safety. FAA now believes it needs more staff and is developing options for alleviating the shortfall that still exists. Options include continuing to have contractors provide the maintenance for new systems and deferring training so staff can conduct maintenance.

More Effective Use of Safety Inspectors  
Could Provide Better Coverage

FAA has taken positive steps to address some of the identified shortcomings in its aviation safety inspector programs. The inspector work force is responsible for routine surveillance of airlines, certification of airlines' operations, accident and incident investigations, and safety promotion. FAA has increased its inspector work force from 1,300 in fiscal year 1983 to about 2,600; developed and is now updating a staffing standard to determine the number of inspectors needed; improved hiring and training processes; institutionalized a program to perform in-depth inspections of selected airlines; and developed national guidelines for its inspection program that establish the number and frequency of inspections that must be undertaken.

Notwithstanding these positive steps, FAA could do considerably more to maximize the use of its inspector resources. FAA's fiscal year 1993 budget request holds the level of inspectors constant at its current level. We recently recommended that FAA develop an effective inspection information system to help assess how inspection resources are used. Currently, FAA's management cannot determine if inspectors are spending sufficient time on surveillance--their number-one priority. Analyzing fiscal year 1990 inspection data, we found that (1) FAA's district offices did not conduct about 28 percent of the approximately 19,000 required inspections; (2) about 25 percent of about 3,600 airlines--mostly

air taxis--did not receive at least one operations, maintenance, or avionics inspection as required; and (3) inspectors spent 23 percent of their time performing inspections--falling short of FAA's requirement to spend 35 percent.

Furthermore, we reported that FAA inspectors had identified more than 9,000 problems that were, or had the potential to be, in noncompliance with safety regulations or other operating practices. Since it had not analyzed its inspection data, FAA could not determine whether inspectors had followed up to ensure that the airlines corrected identified problems. We also found that in some instances, FAA's routine inspections were not effective in discovering safety violations that led to emergency orders revoking commuter and air taxi operating certificates. In these cases, FAA became aware of the safety violations as the result of tips or accident investigations.

Lastly, FAA does not have a system to target its inspection resources to airlines that pose the greatest safety risk. Using a system developed for the Department of Defense to assess airlines' performance, we found that for 97 airlines, FAA's inspection coverage was too great for 17 and too little for 17. FAA is developing the Safety Performance Analysis Subsystem, which will assess all airlines' safety risk and help the agency better target inspections. FAA plans to evaluate a prototype system by fiscal year 1993.

## FACILITIES & EQUIPMENT ACCOUNT

FAA's requested appropriation of \$2.7 billion for facilities and equipment (F&E) represents a 13-percent increase over the amount in the fiscal year 1992 appropriation. The F&E account funds the modernization of the ATC system. FAA has taken some positive steps to reform its acquisition process for equipment. However, these reforms have not yet alleviated problems with costs and delays in modernization projects.

### FAA Is Reforming Its Management of ATC Modernization

To solve the long-standing problems in its modernization projects, over the past 2 years FAA has begun to institute major reforms to its acquisition process. For example, FAA now requires at the start of projects mission needs statements, which are to identify goals, capabilities, required resources, and potential risks for these projects. Another reform is to thoroughly and independently test systems, the "fly before buy" concept, before committing to production. Acquisition reform has already made a difference by preventing the agency from prematurely awarding a contract for production of the \$1.4 billion Voice Switching and Control System.

However, following through on these reforms is critical for success, though this task is made difficult for FAA because of the

large number of projects it has to track. Projects added since the original modernization plan now account for about half of FAA's F&E budget. Furthermore, the leadership at FAA has changed several times during the evolution of the modernization effort. Over the modernization plan's 10-year history, FAA has had seven different Administrators and Acting Administrators. We believe the new FAA Administrator's support for reforming the acquisition process will be a vital element in the modernization program's success.

We noted last year that contrary to its own internal order, FAA included several acquisitions in its fiscal year 1992 budget request that did not have approved statements of mission needs. This year, however, our review of the budget indicates that FAA is complying with this important requirement. Beginning with its fiscal year 1994 request, FAA is requiring that all modernization projects have an approved statement of mission needs before the projects are included in the Capital Investment Plan (CIP) and the budget.

Despite these positive steps, our work to date indicates that some improvements are still needed in the mission needs process. FAA's acquisition order states that mission needs statements should include quantitative support, such as the results of studies, data analyses, or air traffic forecasts. However, most of the statements we have reviewed do not include such support. The statements generally do not quantify shortfalls of the current

system or the extent to which the new projects are intended to alleviate the shortfalls. Without quantifying shortfalls and objectives, it will be difficult to revalidate the mission needs statements throughout the acquisition, develop appropriate operational requirements, and measure the extent to which completed projects improve the ATC system.

At the direction of the House and Senate Appropriations Committees, FAA is also taking action to align its budget process more closely with the acquisition process delineated in "Office of Management and Budget Circular A-109." This reform will show acquisitions' progression through development and production, phases in which the prior budget presentation often blurred distinctions. Our review of the new budget categories indicates that FAA's budget will comport more closely with A-109 by having separate development and production categories. However, FAA has not yet established an order, as directed by this Committee, that clearly describes the criteria under which funding is to be budgeted.

Cost Increases and Delays  
in F&E Projects Persist This Year

Our annual status report shows FAA's latest financial plan for modernization requires \$31.9 billion of total F&E appropriations

for fiscal years 1982 through 2000.<sup>1</sup> The Congress has already appropriated \$13.4 billion, or 42 percent of this amount. The total cost estimate for modernization is about \$600 million more than it was last year.

Last year, 8 of the 12 major acquisitions that we reviewed had increases in total estimated costs. This year, 7 of the major acquisitions had cost increases ranging from 4 to 21 percent and totaling about \$400 million. The major acquisition with the largest cost increase was the Advanced Automation System (AAS). AAS increased in cost by about \$219 million primarily because of changes needed to improve interfaces between controllers and the portion of the system to be installed in ATC towers.

Last year we reported that 8 of the 12 major acquisitions we reviewed had slipped behind schedule. This year, delays occurred in 7 of the 12 major acquisitions that we reviewed in detail. A project with a major delay since last year is the Central Weather Processor. The last-site implementation date slipped 2 years because of questions raised by an FAA team's review of the usefulness of the project's Real-time Weather Processor component. However, this schedule slip accommodates a thorough analysis of requirements that we believe is more important than implementing a system that does not meet users' needs.

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<sup>1</sup>Air Traffic Control: Status of FAA's Modernization Program (GAO/RCED-92-136BR, Apr. 3, 1992).

Delays cause FAA to rely longer on its old ATC equipment and postpone much of the benefits expected to accrue from modernization. These benefits include reduced delays for flights, pilots being able to fly their preferred routes, and a reduced risk of accidents. FAA estimates that users of the ATC system have realized \$24 billion in benefits through fiscal year 1991 from completed and partially completed modernization projects. However, delays postpone much of the \$258 billion in benefits FAA expects from the remaining projects.

FAA notes that virtually all of the originally planned modernization projects are under contract, but the signing of contracts is clearly not a good measure of success. For example, the Mode S contract was signed about 8 years ago, and FAA still does not have one operational system. Another way to view progress is to consider the number of projects completed and the number of new projects added to the modernization plan each year. FAA completed 6 modernization projects this past year, for a total of 36 completed projects. These projects account for about 3 percent of the estimated cost of modernization through fiscal year 2000. FAA added 5 projects to its modernization plan this year, compared to 94 last year. The plan now includes about 200 projects.

UNCERTAINTIES CAUSED BY MAJOR  
MODERNIZATION CHANGES ON HORIZON

FAA faces three major issues in its modernization effort, each involving significant funds. First, FAA is considering more than doubling the number of consolidated facilities that form the basis of its modernization plan. Second, FAA is planning to integrate satellite technology into its land-based ATC system. Third, FAA is revising its system of support contracts for modernization. We will address each issue in turn.

As you know, FAA has become concerned about the operational feasibility of consolidating all 202 terminal radar approach control and en-route centers into 23 facilities. FAA vulnerability studies indicate that if a consolidated facility failed, adjacent facilities could not adequately manage the airspace. As a result, FAA is considering having 53 or 54 consolidated facilities. Last year we emphasized the importance of deciding on the number of consolidated facilities, and the House Committee on Appropriations directed FAA to report its consolidation plan, including an implementation schedule and funding estimates, by February 1, 1992. However, FAA did not meet this deadline and still has not delivered a consolidation plan.

Without a finalized consolidation plan, it is not clear what additional funds will be needed over the next few years. Also, FAA cannot take the steps needed to allow consolidation to commence by

1997, as planned. These include planning for new buildings, exercising options in existing contracts for additional equipment, and preparing to relocate as many as 6,000 controllers and technicians. Options for procuring the terminal portion of AAS, for example, expire in April 1994. FAA is currently working on its fiscal year 1994 budget request and needs to know how many terminal AASs it will require in order to avoid renegotiating the options. In addition, the AAS contractor, IBM, has emphasized the need for a decision before this fall, when the design of the area control computer complex phase of AAS is finalized. The design depends on the number of ATC facilities involved and their size.

A change in FAA's consolidation plans will have a major impact on F&E funding levels over the next few years. FAA's March 1992 reauthorization proposal states that \$200 million may be needed in fiscal years 1994 and 1995 to establish more area control facilities than currently planned. However, previous estimates of the cost to establish additional area control facilities suggest that the total cost would be much higher. FAA has estimated needing an additional \$2.5 billion during the next decade over and above the amount in its current funding plan. FAA also estimated, in 1988, a \$4 billion increase for another plan that included about 10 fewer facilities.

Regarding satellites, there is wide recognition that this technology has the potential to enhance the ATC system and

significantly affect the modernization program. The Senate and the House Committees on Appropriations tasked FAA to develop an aggressive transition plan that (1) examines the potential savings in modernization costs from an early transition to satellites and (2) assesses the benefits the Department of Defense's satellite navigation system could have for commercial airlift. In recent testimony on FAA's F&E reauthorization, the Air Transport Association emphasized that FAA's transition plan should include the key technical decisions that will have to be made, milestone dates for accomplishments, and projected costs and benefits of the proposed transition. This information would be very useful from a budgetary perspective and for tracking FAA's progress in applying satellite technology to ATC. On March 25, 1992, FAA transmitted its report to the Appropriations Committees addressing the integration of satellites into the ATC system. We intend to evaluate the report and provide our views to the Committees.

Another major change in FAA's management of its modernization effort involves the Systems Engineering and Integration Contractor (SEIC). In addition to handling overall systems engineering and integration, the SEIC handles field support work and technical assistance. Martin Marietta's Air Traffic Control Division has been FAA's SEIC for the last 8 years, but its \$1 billion contract with FAA ends in January 1994. FAA has decided to split the SEIC contract into several smaller contracts. FAA officials told us that the primary reasons for this new approach are to (1) increase

competition from splitting the contract into specific areas of expertise and (2) improve management efficiency by having smaller contracts to manage. FAA plans a total of seven new support contracts to cover the SEIC's responsibilities, at an estimated cost of least \$1.5 billion over the next 7 years. We have two concerns about FAA's plans: (1) FAA's budgeting for support contracts does not facilitate congressional oversight, and (2) FAA has not thoroughly analyzed all possible alternatives.

FAA has not clearly identified the costs associated with the new support contracts in its fiscal years 1992 and 1993 budget estimates. The costs for most of the new contracts are included in the budgets of the systems being procured. However, FAA generally identifies major acquisitions such as these support contracts separately in its budget to allow for the most effective oversight by this Subcommittee and the rest of the Congress.

FAA's policy is to assess the benefits and costs of high-cost F&E efforts. However, when FAA considered three alternatives to the current support contract, the agency did not analyze the benefits and costs of the alternatives. FAA also did not consider a fourth alternative--conversion of contract support to in-house staff. FAA officials estimate that in-house support would cost about \$45,000 less per staff year, on the average, than contractor support. In-house support has the potential for cost savings and

is appropriate since modernizing the ATC system is a continuous rather than finite program.

GOALS NEEDED TO ESTABLISH PRIORITIES  
AND MEASURE PERFORMANCE

FAA could improve its operations by making better use of measurable goals in its program plans. Although significant plans exist in three of FAA's major program areas--ATC modernization; airport planning; and research, engineering, and development (RE&D)--the agency has not established nor included in these plans appropriate goals and objectives. Together, these programs account for between \$4 billion and \$5 billion of annual congressional appropriations from the Airport and Airway Trust Fund. These funds are entrusted to FAA for effective administration. Establishing specific goals for increased productivity by controllers or reduced flight delays for each of these programs would allow decision-makers in FAA and the Congress to better determine the program's direction, progress, and accountability.

Guiding FAA's spending of the F&E appropriation, which is intended to modernize the nation's ATC system, is the Capital Investment Plan (CIP). Although FAA included measurable goals in the CIP's predecessor--the National Airspace System (NAS) Plan--FAA has not developed such goals for the CIP. As stated in the NAS Plan, the purpose of establishing a plan with specific goals and objectives was to end the "series of piecemeal adjustments and

improvements" that had marked the modernization effort until then. The 1988 NAS Plan included such a goal when it proposed to reduce operational errors in the ATC system by 80 percent between 1984 and 1995. Reestablishing goals would form a basis for measuring the progress and benefits of the roughly \$2.5 billion per year modernization effort beyond simply counting completed projects and reporting whether projects are on schedule and within budget. Congressional oversight would be able to focus more on the results of federal spending.

As we testified in February of this year, FAA also has not established goals for its National Plan of Integrated Airport Systems (NPIAS).<sup>2</sup> This plan forms the initial basis for guiding the spending of \$1.9 billion in grants-in-aid authorized for developing public-use airports. The NPIAS includes estimates for needed development in 5 basic categories at almost 3,300 public-use airports that are eligible for federal aid. The current plan identifies \$40 billion of development costs over a 10-year period. Because FAA's budget request and authorization usually represent only about five percent of that amount, decision-makers must work hard to determine which of the many competing projects to fund. However, because the NPIAS establishes no measurable national goals, such as the number of new runways to be constructed or the amount flight delays should be reduced, it provides little guidance

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

for making funding choices among airport improvement projects or distinguishing among the projects on the basis of their potential to improve the national airport system. FAA officials have concurred with our conclusion that establishing measurable goals for its national airport plan would produce operational benefits and have stated their intention to develop such goals.

Finally, FAA has requested \$230 million for RE&D in fiscal year 1993. After reviewing FAA's draft RE&D plan, we reported that the plan establishes goals so ambitious that research and development alone could never hope to achieve them.<sup>3</sup> For example, these goals include increasing airspace and airport capacity at least 20 percent by 1999, increasing capacity an additional 20 percent by 2005, and reducing runway incursions by 80 percent by the year 2000. However, only in combination with ongoing capital investment and airport development projects can RE&D projects be expected to achieve these goals.

#### CONCLUSIONS AND RECOMMENDATIONS

In conclusion, Mr. Chairman, FAA has made great strides in the last decade in improving the nation's ATC system and ensuring safety. We believe future progress will depend on FAA's actions to address concerns, as raised in our testimony, about the adequacy of

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<sup>3</sup>Aviation Research: Progress Has Been Made but Several Factors Will Affect Program Success (GAO/T-RCED-92-39, Mar. 10, 1992).

staffing levels, targeting of resources, modernization cost increases and delays, and uncertainties about consolidation and satellites.

We believe that FAA needs to improve its planning in such areas as the modernization of the ATC system, airport development, and research and development. Good planning involves a reasonable vision of the future and the ability to break that vision down into measurable increments or goals. We believe that through its planning, FAA needs to commit itself to appropriate goals that will help guide funding decisions and also act as benchmarks for measuring progress.

Accordingly, we have recommended that the Secretary of Transportation direct the FAA Administrator to (1) include measurable goals in its CIP; (2) establish goals for each development project category in the NPIAS; and (3) develop goals for the RE&D plan that are appropriate for that plan.<sup>4</sup>

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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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<sup>4</sup>FAA Budget: Key Issues Need to Be Addressed (GAO/T-RCED-92-51, Apr. 6, 1992).

RELATED GAO REPORTS AND TESTIMONIES

Air Traffic Control: Status of FAA's Modernization Program  
(GAO/RCED-92-136BR, Apr. 3, 1992).

Aviation Safety: Commuter Airline Safety Would Be Enhanced With Better FAA Oversight (GAO/RCED-92-40, Mar. 17, 1992).

Aviation Research: Progress Has Been Made but Several Factors Will Affect Program Success (GAO/T-RCED-92-39, Mar. 10, 1992).

Air Traffic Control: Challenges Facing FAA's Modernization Program  
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Aviation Safety: Better Oversight Would Reduce the Risk of Air Taxi Accidents (GAO/T-RCED-92-27, Feb. 25, 1992).

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Aviation Safety: FAA Needs to More Aggressively Manage Its Inspection Program (GAO/T-RCED-92-25, Feb. 6, 1992).

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FAA Staffing: Better Strategy Needed to Ensure Facilities Are Properly Staffed (GAO/T-RCED-92-8, Oct. 16, 1991).

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Major Acquisitions: Top Management Attention Needed to Improve DOT's Acquisition Process (GAO/T-RCED-91-45, Apr. 24, 1991).

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