

**GAO**

**Testimony**

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**ADVANCED  
AUTOMATION SYSTEM**

**Implications of Problems and  
Recent Changes**

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Mr. Chairman and Members of the Subcommittee:

We appreciate the opportunity to testify on the Federal Aviation Administration's (FAA) Advanced Automation System (AAS). At a cost of \$5.9 billion, AAS is the largest acquisition in the agency's \$36 billion effort to modernize the nation's air traffic control system. AAS, which has five components, is intended to replace the computer hardware and software, including workstations, currently used by controllers in en-route, terminal, and tower control facilities. Also, AAS is expected to include the new automated capabilities needed to cope with predicted increases in air traffic and to provide operational benefits to users, such as more fuel-efficient routes.

As we testified before your Subcommittee last year,<sup>1</sup> FAA's effort to develop AAS has been beset from its inception by major schedule delays and cost increases resulting from managerial and technical factors. Since our testimony, FAA and the prime contractor for AAS, International Business Machines Corporation (IBM), have attempted to address those problems. However, the problems continued and major changes have been made to the system. In our testimony today, we will discuss these developments. Specifically, we will highlight (1) the problems confronting AAS, (2) their causes, and (3) the implications of the problems and changes affecting the system. This statement is based on past reports and testimonies and our ongoing work for the House Committee on Appropriations. (See app. V for a list of related GAO products.)

In summary, we found the following:

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<sup>1</sup>Air Traffic Control: Advanced Automation System Problems Need to Be Addressed (GAO/T-RCED-93-15, Mar. 10, 1993).

-- Over the years, we have reported to the Congress on the serious cost and schedule difficulties that have affected AAS. Today we have to report that despite several FAA management initiatives, problems continue and, without corrective action, may worsen. Last year, FAA announced a \$1.2 billion cost increase, raising the total cost of the AAS project to \$5.9 billion, compared with the 1988 estimate of \$4.3 billion. As a result of the problems with AAS, the agency recently commissioned several reviews to support decisions on the project's future. In a candid report,<sup>2</sup> FAA's AAS Task Force estimates that the agency may need an additional \$1 billion to complete system development and implementation. The report also projects a likely schedule delay of 20 months for the Initial Sector Suite System (ISSS), which would put this component over 4 years behind schedule. Because FAA plans to begin formal testing of ISSS in June 1994, better estimates of the system's strengths and weaknesses as well as cost and schedule may be available after this testing is completed later this year.

-- AAS' cost and schedule problems have resulted from several technical and managerial factors. First, FAA and IBM's development and implementation plan, including cost and schedule estimates, was overly ambitious given the highly demanding requirements and the complex software architecture for this system. Second, FAA did not provide adequate oversight of IBM's performance, especially during the initial development of the key ISSS component. As a result, IBM's lack of progress did not always surface in a timely manner.

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<sup>2</sup>Review of Cost and Schedule for the Advanced Automation System Program, Federal Aviation Administration, Mar. 3, 1994.

Third, FAA was indecisive in resolving some issues about basic requirements, such as the format of new electronic flight data strips to be used by controllers. In our opinion, the above factors--not inadequate funding or federal procurement rules, as contended by some proponents of an air traffic control corporation--have caused the AAS' problems.

- Problems and recent developments affecting AAS will have important implications. First, the bulk of the benefits to users have been delayed because of the schedule extension. These benefits are expected mostly from a new automated capability, Automated En Route Air Traffic Control (AERA). FAA planned to implement AERA in the last component of AAS, the Area Control Computer Complex; however, the agency now intends to include an early version of AERA--albeit limited in capabilities--in ISSS. Second, because the scope of the system has been reduced as a result of FAA's plans for limited consolidation as well as strategic automation, the agency will have to acquire additional automated systems to enhance air traffic control facilities that were expected to be supported through AAS. Third, unless development costs are reduced or the Congress increases FAA's funding, completing the system as planned could crowd out other modernization projects. Fourth, if the 20-month schedule delay projected by the AAS Task Force becomes a reality, the agency may need to initiate interim measures--such as replacing, at a cost of \$60 million, equipment in its en-route air traffic control facilities. Fifth, if FAA follows the current plan to accept parts of ISSS before all critical requirements are met, the agency faces the risk of additional costs to fix the system.

We are making recommendations to ensure that future investment decisions regarding AAS are based on sound information. But before addressing the individual issues in greater detail, we would like to provide a brief background.

## BACKGROUND

FAA's air traffic control mission is to promote the safe, orderly, and expeditious movement of aircraft. Air traffic controllers maintain separation between aircraft by utilizing radar and flight plan information processed by computers and displayed on video screens at controllers' workstations. FAA uses three types of air traffic control facilities to control aircraft: airport towers, terminal facilities, and en-route centers. AAS is scheduled to replace computer hardware and software, including controller workstations, at all three types of facilities. As originally introduced in 1983, AAS was to accommodate the consolidation of over 230 terminal and en-route facilities into 23 area control facilities. However, in 1993 FAA adopted a more limited consolidation strategy that will involve consolidating only a small number of terminal facilities. As we will discuss, that decision has major implications for AAS and coming FAA budgets. Appendixes I and II depict the scope of AAS under the full and limited consolidation strategies, respectively.

FAA introduced the AAS project in the early 1980s and decided to pursue a two-phase acquisition strategy. First, the agency awarded competitive design contracts to both IBM and Hughes Aircraft Company in 1984. FAA expended about \$700 million during this first phase.<sup>3</sup> In July 1988, FAA awarded a contract

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<sup>3</sup>About 60 percent of the funds expended during this first phase were appropriated through the Research, Engineering, and Development account.

to IBM for the second acquisition phase; that is, the development and production of AAS. At that time, FAA estimated the project would cost \$4.3 billion and be completed in 1998.<sup>4</sup> Late in 1993, the agency announced that the cost of the project would be \$5.9 billion. On March 1, 1994, IBM sold the company unit that was developing AAS--Federal Systems Company (FSC)--to Loral Corporation. However, FAA is still working with IBM because the parties have not yet entered into a novation agreement.<sup>5</sup> According to FAA officials, the Department of Defense's Defense Logistics Agency will be responsible for negotiating the novation for all government contracts affected by the sale of FSC.

As currently defined, AAS has five components:

- The first component, the Peripheral Adapter Module Replacement Item (PAMRI), replaces communications equipment that connects en-route centers with external systems, such as radars, weather processors, and other air traffic control systems. PAMRI, which is the least complex of the components, is currently in operation at the 20 continental en-route centers.
  
- The second component, ISSS, will replace current controllers' workstations and computer systems at en-route centers with new systems, including higher-resolution color radar screens. ISSS will interface with the primary computer systems used by the en-route centers, known as the Host computer. ISSS is a critical component of AAS, as it will provide the

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<sup>4</sup>Cost estimates do not include research, engineering, and development costs that totaled \$436 million.

<sup>5</sup>Generally, a novation substitutes a new party to a contract and discharges one of the original parties by agreement of all three parties. A novation also involves extinguishing an old obligation and establishing a new one.

hardware and software platform for later components under development. Thus far, most of the work done by the contractor has been on ISSS.

- The third component is the Terminal Advanced Automation System (TAAS). It is designed to replace the existing systems used at terminal facilities with new workstations and computer hardware and software. Terminal facilities separate aircraft flying within 20 to 30 miles of airports. TAAS will build upon networks, hardware, and software developed for ISSS.
- The fourth component of AAS is the Tower Control Computer Complex (TCCC). It replaces equipment that permits controllers in tower facilities to guide aircraft on the ground and in the immediate vicinity of the airport. At selected airport towers, it will replace existing systems with workstations designed for the tower environment. TCCC will also allow towers to better interface with terminal facilities.
- The fifth and last component envisioned is the Area Control Computer Complex (ACCC). It is designed to replace PAMRI and the Host computer system used at en-route centers. Also, it is expected to support advanced automation capabilities, including Automated En Route Air Traffic Control (AERA), which will allow controllers to grant more fuel-efficient routes.

#### COSTS HAVE INCREASED AND SCHEDULE DELAYS ARE LIKELY

AAS' problems have continued and, without corrective action, may worsen. Over the last several years, we have reported on the serious cost and schedule problems that have affected AAS. As noted above, the total cost estimates for the system had risen

from \$4.3 billion in 1988 to \$4.7 billion by early 1993. Furthermore, schedule problems had become more acute. In particular, delays for the ISSS component totaled about 3 years over the milestones set in the 1988 contract.

To address these problems, FAA introduced several initiatives. In early 1993, FAA increased management attention to the project, including elevating the AAS project by having the program director report directly to the Administrator and making him accountable for containing costs and keeping the project on schedule. FAA also established a dedicated ISSS team on-site at IBM and empowered the team to resolve technical problems as they arose. To strengthen oversight, FAA and the contractor agreed to a revised development plan, including a series of checkpoints for informally testing ISSS. FAA reported to this Subcommittee on the progress made on some of those checkpoints.<sup>6</sup>

Late in 1993, FAA announced that the cost of the system would increase by \$1.2 billion, to \$5.9 billion. Concerned about this increase and the overall status of the project relative to what was originally contracted in 1988, FAA commissioned several internal and external reviews to assess the condition of the system. These included the aforementioned AAS Task Force review that estimated the cost and schedule needed to complete AAS and a review by the Center for Naval Analysis that addressed organizational, management, and financial concerns. The Task Force released its report in March 1994 and the Center for Naval Analysis is expected to report later this month.

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<sup>6</sup>The purpose of establishing checkpoints was to assess how well ISSS would operate under increasingly more demanding requirements, albeit none as demanding as those specified in the contract. For example, Checkpoint 4 included a stability demonstration in which software would run for 25 hours on 62 ISSS controller consoles. IBM completed this demonstration by running the software for 49 hours. The contract calls for 210 consoles to run continuously under ISSS.

Following the release of the AAS Task Force report, FAA formed an internal working group to thoroughly evaluate all AAS components. The group will revalidate the need for particular requirements and assess their benefits. The FAA Administrator is waiting for the results of these efforts before announcing the agency's actions on AAS.

Without changes to the project, costs are likely to escalate. The AAS Task Force estimates that if AAS is permitted to continue on its present course, the cost to complete it is likely to range from \$6.5 billion to \$7.3 billion, with a most likely or mid-range cost of \$6.9 billion. The difference between the FAA and the Task Force estimates results from different estimates about the cost of developing software. Appendixes III and IV provide FAA's estimated costs for the system.

It is now probable that ISSS, which has been delayed 3 years, will experience additional delays. The AAS Task Force reported that the likelihood of meeting the October 1996 date for first implementation of ISSS at a site is remote. It projected a range of possible schedule delays from 9 months to 31 months, with a most likely delay of 20 months. This would put this component over 4 years behind schedule. Better estimates of the system's strengths and weaknesses as well as cost and schedule will be available after ISSS is formally tested at the FAA's Technical Center. This testing is scheduled to begin on June 6, 1994, and end on November 15, 1994. It was supposed to start on April 1, 1994, but was delayed for 2 months to address various technical issues.

#### MANAGERIAL AND TECHNICAL FACTORS HAVE LED TO COST AND SCHEDULE PROBLEMS

Several major managerial and technical factors have led to the cost and schedule problems that have beset AAS since FAA

signed the contract with IBM in 1988. These include an overly ambitious plan, inadequate oversight of software development, and changing and unresolved system requirements.

### The AAS Plan Was Overly Ambitious

In our opinion, one of the major causes of cost and schedule problems was the ambitiousness of the initial AAS plan. Both FAA and IBM underestimated the effort required to accomplish the mammoth task of replacing the computer hardware and software in en-route, terminal, and tower facilities and consolidating all en-route and terminal facilities.

Also, the AAS software ranks among the most complex in the world. The software must operate in a real-time environment in which hundreds of functions must be executed within processing cycles measured in seconds or else the data expire--which is unacceptable in a highly automated air traffic control environment. AAS software is also expected to be fault tolerant; in other words, it must be able to monitor its own execution and recover from failures without losing any data. As a result, AAS software development is extremely complicated in comparison to software development efforts that do not have real-time or fault tolerant requirements.

Because FAA and IBM misjudged the technical effort required to complete AAS software development, they agreed to schedules and cost estimates that have proved unrealistic. An April 1992 Volpe Center report done at the request of the House Committee on Appropriations stated that overly optimistic schedules were not met because of factors such as unresolved requirements, design

rework, and software rework.<sup>7</sup> When the schedules for ISSS slipped, the project's cost grew because much of the software work was done under cost-plus-incentive contract conditions.

While FAA and IBM have made some progress toward developing a system that meets FAA's requirements, the system is still undergoing technical difficulties. For example, ISSS and TAAS continue to experience a high level of software "volatility" (that is, software must be added, modified, or deleted to meet requirements). On ISSS, according to the AAS Task Force, software volatility has run at approximately 100 percent. In addition, ISSS software has a large number of open problems--as defined in almost 2,100 program trouble reports reported by IBM as of March 1994. Roughly 800 of these reports are categorized by IBM as emergency, test-critical, or high-priority, meaning that it would be prudent to resolve them before formal testing. In contrast, FAA's ISSS program manager told us that only 400 program trouble reports require resolution before this component is tested. In any case, IBM will have to dedicate substantial resources to fix these software problems.

#### FAA Did Not Provide Adequate Oversight

FAA did not provide adequate oversight of software development progress, especially during the initial development of ISSS. As a result, IBM's lack of progress has not always surfaced in a timely manner. However, FAA's oversight has recently improved. The Volpe report cited inadequate software development monitoring and recommended that FAA increase the number of staff positions within the project office's software development branch. FAA subsequently added two staff members to

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<sup>7</sup>An Assessment of the Status and Technical Risk of Federal Aviation Administration's Advanced Automation System Software Development, IR-MA-1298-2, Volpe National Transportation Systems Center and Intermetrics, Inc., Apr. 1992.

this branch. To further enhance oversight, the agency last year placed the ISSS program manager and a representative concerned with air traffic requirements on-site at IBM.

Furthermore, FAA and IBM established a plan, including five hardware and software testing checkpoints, to informally assess ISSS progress. IBM passed three of the checkpoints on time. It passed the fourth checkpoint with a delay of 2 weeks and plans to complete the last one on May 1, 1994--a delay of 1 month. This last checkpoint was delayed to satisfy test criteria that the system must fulfill before being formally tested at the FAA's Technical Center. Despite this progress, other indicators of IBM's software progress--such as the number of program trouble reports and the extent of software volatility--paint a much less positive picture.

#### FAA Changed AAS Requirements and Was Not Decisive in Resolving Requirements Issues

Throughout the course of the AAS contract, FAA has had difficulty in resolving requirements issues. This has contributed to the project's problems. Last year, we testified before this Subcommittee that the slow resolution of requirements issues, such as the definition of electronic flight strips and controller screen display formats, involved high schedule and technical risk for ISSS. IBM project officials have stated that the lack of clarity and decisiveness by FAA in resolving requirements issues was an important contributing factor to the schedule problems.

The Volpe report recommended that FAA enhance the process for resolving ISSS requirements issues. Last year, FAA designated three top officials--from FAA's AAS program office and its Air Traffic and Airway Facilities units--to make final decisions on requirements issues. While this group resolved some

requirements issues, others remain unresolved. Most importantly, FAA has not resolved the issue of continuous operations--that is, ensuring the continued availability of AAS during software upgrades or a reconstitution of its data base after a primary system failure. While FAA and IBM have discussed several proposed solutions--at an estimated cost of \$350 million--FAA has not made a final decision.

Also, FAA continues to change requirements. One key AAS requirement was that the system had to satisfy a full-scale consolidation of en-route and terminal facilities. As a result of its recent decision to limit consolidation, this requirement changed and TAAS will now be a stand-alone system rather than a bridge for transition to ACCC--which was to combine en-route and terminal functions in consolidated facilities. Because of this change in requirements, an estimated additional \$100 million in funds will be required for the redesigned TAAS component. Also, additional software to satisfy changes in requirements to ISSS is estimated to cost another \$100 million.

#### AAS' Problems Are Not Due to Inadequate Funding or Government Procurement Rules

We have been reviewing and reporting on AAS since the mid-1980s. It is our view that the AAS problems are not the result of inadequate funding and federal procurement rules--as contended by some proponents of an air traffic control corporation. Studies of AAS by the Volpe Center and the Department of Transportation's Office of Inspector General have not cited these issues as causes of the AAS problems.

FAA has received from the Congress most of the funding requested for AAS. To date, the administration has requested over \$2.9 billion for AAS and has received about \$2.6 billion in appropriations. Like other Facilities and Equipment (F&E)

projects, AAS did not receive full funding because of development problems, schedule slippage, and unresolved requirements. For example, the Committees on Appropriations denied funding for limited production of ISSS consoles because of the problems with ISSS software development. The Congress also reduced some funding for other components because of problems affecting the system and because FAA's consolidation plan had not been issued.

We do not believe that federal procurement rules have caused the AAS' problems. FAA awarded the AAS development and production contract to IBM in 1988. Those sections of the federal acquisition regulations dealing with activities up to awarding of the contract--such as soliciting, receiving, and negotiating bids--have not caused cost increases or schedule slippage since that time. The regulations also stress oversight of contracts. As previously stated, we believe that inadequate oversight of the contractor has been a cause of AAS' problems.

AAS' PROBLEMS AND RECENT DEVELOPMENTS WILL  
HAVE MAJOR IMPLICATIONS

AAS problems and recent developments affecting the system will have important implications. These implications include (1) delaying the bulk of the system's benefits to users, (2) acquiring additional automated systems to enhance air traffic control facilities because of the reduced scope of AAS, (3) financing the high annual cost to complete the system in coming years, (4) acquiring additional equipment to maintain current en-route facilities in operation if major delays become a reality, and (5) exposing FAA to the risk of additional costs to fix the system if the agency follows the current plan to accept part of ISSS before some critical operational requirements are met.

## Bulk of AAS' Benefits to Users Have Been Delayed

The bulk of benefits to users have been delayed because of the schedule problems that have affected the AAS program. These benefits are expected mostly from the new automated capability, AERA, which was previously scheduled for implementation as part of ACCC. AERA is expected to allow controllers to grant users direct, reliable, and conflict-free routes between departure and arrival airports. AERA would make this possible by processing flight plan information and detecting and resolving potential conflicts between aircraft flying in the en-route environment. An April 1993 report done by the Volpe Center at the request of the House and Senate Committees on Appropriations estimated that more than \$1 billion in benefits to air carriers over a three-year period would result from the ACCC/AERA implementation.<sup>8</sup> FAA estimates that the total cost of developing and implementing AERA would be about \$240 million, of which over \$30 million has already been obligated. However, the AAS Task Force estimated that the cost of AERA would range from \$244 million to \$551 million, with a most likely cost of \$367 million.

Although FAA is planning to provide benefits to users by implementing a preliminary version of AERA earlier than planned, the agency will not be able to provide the full benefits of AERA until ACCC, or an upgraded version of ISSS, is in place. As defined in its 1993 Automation Strategic Plan, FAA is currently proposing to implement AERA incrementally so that user benefits can be provided earlier than previously planned. AERA would be implemented in three phases: early AERA, introductory AERA, and full AERA. According to a senior FAA official, early AERA is expected to provide users with between one-third and one-half of

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<sup>8</sup>Advanced Automation System Benefit-Cost Study, Volpe National Transportation Systems Center, Research and Special Programs Administration, Apr. 15, 1993.

the benefits that would be provided by introductory AERA. The introductory and full versions of AERA have the potential to provide the same benefits to users because the only difference between them is that the latter is fully automated.

By late 1995, early AERA is scheduled for installation at current en-route facilities to support traffic management supervisors and coordinators.<sup>9</sup> At this stage, early AERA would have only an automated capability to detect conflicts between aircraft. It would be upgraded to include an initial conflict-resolution aid by late 1996 and an enhanced conflict-resolution capability by late 1997. Also, by late 1997, early AERA, with automated problem detection and resolution aids, is scheduled for installation in ISSS to support en-route air traffic controllers. The introductory and full versions of AERA are scheduled for implementation starting in 1999 and 2000, respectively, when upgrades to ISSS are installed. The AAS Task Force contends that implementation of early AERA may be extended by almost a year. Similarly, because the introductory and full versions of AERA depend on ISSS software, which is expected to experience a 20-month delay, their implementation may be delayed by the same amount of time.

#### Additional Automated Systems Will Have to Be Acquired

Because of the reduction in the scope of the system as a result of FAA's limited consolidation and strategic automation

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<sup>9</sup>The traffic management system includes traffic management supervisors and coordinators who are in charge of balancing air traffic demand with system capacity to ensure maximum efficiency in the use of the National Airspace System. In the current system, while air traffic control focuses on the tactical control of aircraft at the local level, traffic management focuses on the strategic management of aircraft flows at the local, regional, and national level. In its vision of the future, FAA proposes an air traffic management system including air traffic control and air traffic flow management components.

plans, the agency will have to acquire additional automated systems to support facilities that were supposed to be equipped with AAS.

As indicated in FAA's Strategic Automation Plan, the agency has decided to delete traffic management and oceanic requirements from the ACCC component and evolve both the air traffic flow management system and the oceanic air traffic control system as stand-alone systems. As a result, FAA will have to procure air traffic flow management systems to support traffic management functions at en-route facilities. Similarly, the agency will have to acquire automation systems to support its oceanic air traffic control facilities. Also, because of the decision to limit consolidation, the agency is planning to procure about 170 automated systems, at a cost of about \$350 million, to support the terminal facilities that will not be consolidated under AAS. Finally, because FAA now plans to equip only 150 tower facilities with TCCC, instead of 258 as previously planned, the agency may be required to procure additional tower equipment to enhance non-AAS equipped towers in coming years. (See Appendixes I and II, which depict the scope of AAS under the full and limited consolidation proposals.)

#### Completing the System Will Impose Major Demands on FAA Budgets

Unless development costs or the scope of AAS is further reduced, the cost to complete the system will impose major demands on upcoming FAA budgets. FAA currently estimates that the total cost of the system will be \$5.9 billion. Through this fiscal year, the Congress has appropriated about \$2.6 billion.

Under the \$5.9 billion estimate, the annual budget for AAS is scheduled to grow from about \$500 million in fiscal year 1995 to over \$700 million from fiscal year 1996 through fiscal year 1998. When the AAS Task Force cost estimate is factored in, the

budget for AAS grows by another \$1 billion from fiscal year 1999 to fiscal year 2001. If the cost or the scope of AAS is not reduced or the Congress does not increase the F&E authorization and appropriation, the high annual funding levels for AAS could crowd out other modernization projects.

#### Further Delays May Require Procuring New Equipment to Support the Current System

If the 20-month schedule delay projected by the AAS Task Force becomes a reality, the agency may need to initiate a \$60 million interim project to replace existing display channel equipment, which drives controllers' current radar scopes, at the en-route air traffic control facilities. This equipment will be in service longer than originally planned. FAA has stated that this equipment has had reliability problems in recent years. Also, FAA projects that limitations in the existing display channel equipment can constrain the capacity of some en-route centers to add radar displays for controllers. FAA contends that replacing this equipment will allow for the addition of up to 90 radar displays. New equipment is also expected to increase the reliability, maintainability, and availability of the system, thereby reducing the costs associated with repairs and enhancing safety by decreasing the probability of system failures.

#### FAA May Be Exposed to Additional Costs by Accepting ISSS in Increments

FAA currently plans to develop and test ISSS capabilities incrementally. Major hardware and software increments--called block updates--are scheduled to be incorporated after completion and acceptance of the basic ISSS. The block update approach was introduced because the system being developed needed additional capabilities to operate successfully at the first ISSS site, Seattle, and waiting for these additional capabilities to be

fully developed and tested would cause first-site implementation to slip.

Developing and testing a system as large and complex as ISSS in increments is both reasonable and prudent. Collectively, these increments build toward the delivery of a system capable of satisfying the full range of the requirements for ISSS. However, accepting a system before some key features are fully tested introduces the potential for cost increases to FAA. This is because the agency would be buying a partially developed system that may not meet all critical operational requirements. For example, FAA's current plan anticipates accepting the ISSS hardware and software through the first block update following testing scheduled for completion by November 1994. Under this schedule, key functions--such as continuous operations--would not have undergone testing by the time the first increment of ISSS is accepted. As the AAS Task Force stated, once the government has formally accepted the system, it becomes considerably more difficult to require IBM to bear the responsibility for system performance. Necessary corrections to achieve needed performance are likely to entail additional costs to FAA.

#### CONCLUSIONS AND RECOMMENDATIONS

The coming months will be critical from the standpoint of restructuring FAA's automation program. Several events are on the horizon. First, FAA will have to decide how to satisfy its automation needs, both within and outside the AAS project. This decision will necessarily have to consider user benefits, air traffic control and air traffic flow management requirements, and the implications of funding AAS for other modernization projects. Second, FAA and the contractor plan to begin formal testing of ISSS in June, which should provide insights into whether technical challenges can be met within the current cost and schedule estimates. To gain governmental acceptance of ISSS, IBM

or Loral will have to show that the system can meet FAA's requirements.

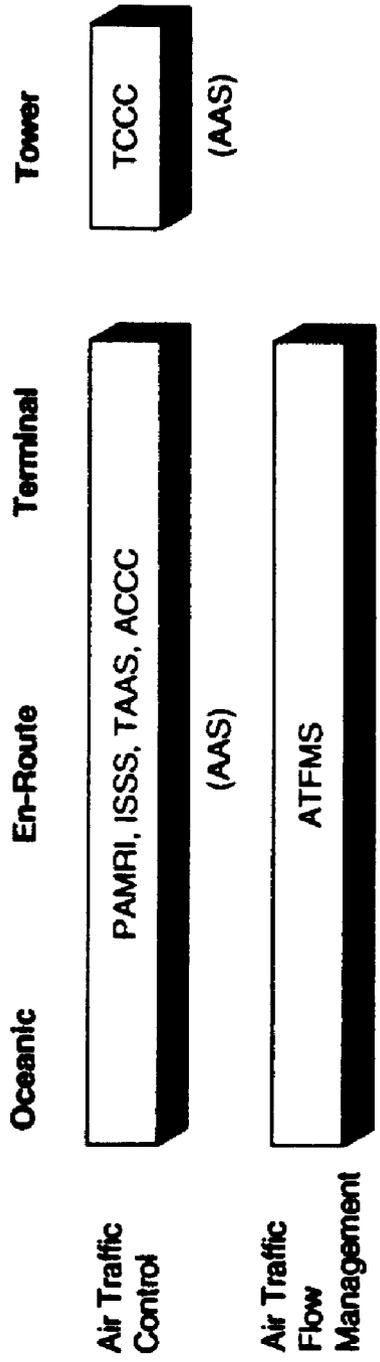
Given the troubled history of AAS, we believe the administration and FAA must make a strong case for continued congressional support of the project. Accordingly, we recommend that the Secretary of Transportation direct the FAA Administrator to

- defer governmental acceptance of ISSS until all critical operational requirements are met and
  
- submit a report to the Congress, before the administration proposes its fiscal year 1996 budget for FAA, that describes a comprehensive automation plan--including timeframes, funding levels, and all interim and long-term actions necessary to satisfy user needs and FAA's air traffic control and management requirements.

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

# Configuration of the Future Air Traffic Management System

## (Under Previously Proposed Full Consolidation)



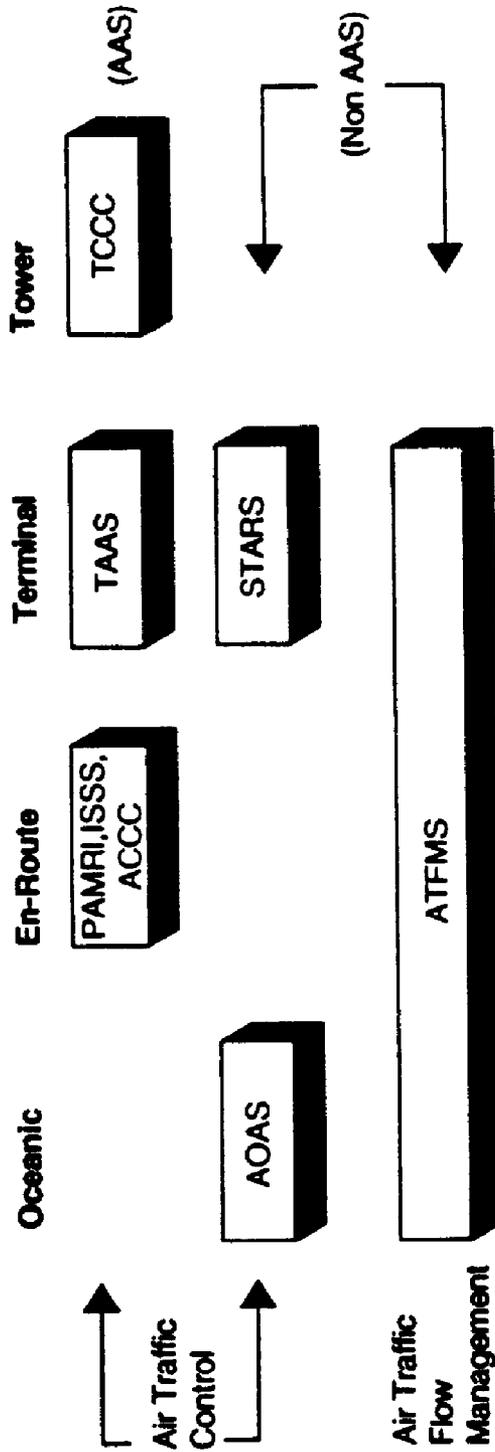
(AAS and Non-AAS)

### ACRONYMS

- AAS Advanced Automation System
- PAMRI Peripheral Adapter Module Replacement Item
- ISSS Initial Sector Suite System
- TAAS Terminal Advanced Automation System
- ACCC Area Control Computer Complex
- TCCC Tower Control Computer Complex
- ATFMS Air Traffic Flow Management System

# Configuration of the Future Air Traffic Management System

## (Under Currently Proposed Limited Consolidation)



**ACRONYMS**

- AAS Advanced Automation System
- PAMRI Peripheral Adapter Module Replacement Item
- ISSS Initial Sector Suite System
- TAAS Terminal Advanced Automation System
- ACCC Area Control Computer Complex
- TCCC Tower Control Computer Complex
- ATFMS Air Traffic Flow Management System\*
- AOAS Advanced Oceanic Automated System
- STARS Stand-Alone Terminal Automated Replacement System

EVOLUTION OF ADVANCED AUTOMATION SYSTEM COST ESTIMATES

Dollars in millions

	FY 1988	FY 1989	FY 1990	FY 1991	FY 1992	FY 1993	FY 1994
Contract cost	1,941.0	1,965.8	2,125.3	2,184.0	2,228.2	2,333.1	3,074.1
Other cost	2,360.6	2,419.1	2,328.4	2,287.6	2,444.7	2,370.3	2,859.3
Total cost	4,301.6	4,384.9	4,453.7	4,471.6	4,672.9	4,703.4	5,933.4

Note: These cost estimates do not include research, development, testing, and evaluation costs, which totaled \$436 million.

Source: FMA.

COMPARISON OF ADVANCED AUTOMATION SYSTEM COST ESTIMATES

Dollars in millions

	FY 1994 and prior years	FY 1995	FY 1996	FY 1997	FY 1998	FY 1999	FY 2000	FY 2001	Total
Prior program office estimate	2,583.5	509.9	600.0	600.0	222.1	70.7	117.3		4,703.4
Current program office estimate	2,583.5	509.9	716.8	701.8	723.4	458.3	239.8		5,933.4
AAS Task Force mid-range estimate	2,583.5	509.9	716.8	701.8	723.4	658.3	539.8	515.0	6,948.4

Note: These cost estimates do not include research, development, testing, and evaluation costs, which totaled \$436 million.

Source: FAA.

RELATED GAO PRODUCTS

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

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

Air Traffic Control: Advanced Automation System Problems Need to Be Addressed (GAO/T-RCED-93-15, Mar. 10, 1993).

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

Transportation Issues (GAO/OCG-93-14TR, Dec. 1992).

Air Traffic Control: Advanced Automation System Still Vulnerable to Cost and Schedule Problems (GAO/RCED-92-264, Sept. 18, 1992).

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

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

Air Traffic Control: Software Problems at Control Centers Need Immediate Attention (GAO/IMTEC-92-1, Dec. 11, 1991).

Air Traffic Control: FAA Can Better Forecast and Prevent Equipment Failures (GAO/RCED-91-179, Aug. 2, 1991).

Air Traffic Control: Status of FAA's Modernization Effort (GAO/RCED-91-132FS, Apr. 15, 1991).

Air Traffic Control: FAA's Advanced Automation System Contract (GAO/IMTEC-91-25, Mar. 5, 1991).

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