103

REVIEW OF RECENT DEVELOPMENTS IN THE FEDERAL AVIATION ADMINISTRATION'S ADVANCED AUTOMATION SYSTEM PROGRAM

(103–60)

HEARING

BEFORE THE

SUBCOMMITTEE ON AVIATION

OF THE

COMMITTEE ON PUBLIC WORKS AND TRANSPORTATION HOUSE OF REPRESENTATIVES

ONE HUNDRED THIRD CONGRESS

SECOND SESSION

APRIL 13, 1994

Printed for the use of the Committee on Public Works and Transportation

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ADDITIONS TO THE RECORD

U.S. House of Representatives
COMMITTEE ON PUBLIC WORKS AND TRANSPORTATION
SUITE 2165 RAYBURN HOUSE OFFICE BUILDING
WASHINGTON DC 20515
(202) 225-4472

MEMORANDUM

TO: Members of the Subcommittee on Aviation

FROM: Committee's Aviation Staff

DATE: April 11, 1994

RE: **SUMMARY OF SUBJECT MATTER** for Aviation Subcommittee hearing on the **REVIEW OF RECENT DEVELOPMENTS IN THE FEDERAL AVIATION ADMINISTRATION'S ADVANCED AUTOMATION SYSTEM PROGRAM.** April 13, 1994.

The Subcommittee will receive testimony on the continuing problems associated with the Federal Aviation Administration Advanced Automation System (AAS) program. Hearings held in March 1993 reviewed problems in the program and what the FAA and its contractor, IBM Federal Systems Corporation, were doing to rectify those problems. Much has transpired since those hearings, hardly any of which could be deemed good news. In fact, the program has all the appearances of being in worse trouble than it was a year ago, particularly with regard to the potential cost of the program and when the system can be expected to be operating.

I. THE ADVANCED AUTOMATION SYSTEM

Before describing the problems of the AAS program, this summary will briefly describe what the program is and what it is supposed to accomplish. For a more detailed discussion of the overall air traffic control modernization effort, known as the Capital Investment Plan, see the Summary of Subject Matter for the Subcommittee hearing held on March 10, 1993 (Committee Publication 103-8); pp. v-xv. The Advanced Automation System is expected to be the centerpiece of the air traffic control modernization program. Its purpose is to replace the computer hardware, software, displays, workstations and related equipment that controllers use to observe, guide, and separate air traffic.

The radar displays and work stations used by controllers were designed in the late 1960s and deployed in the early 1970s. The technology is antiquated and has been surpassed by multiple generations of data processing technology advancements and capabilities. The mainframe enroute center computer, called the Host computer, is relatively modern IBM equipment. It was deployed to the enroute centers in the mid-1980s, and it will become integrated into the Advanced Automation System. The software that processes the air traffic data and converts that data into the information displayed before the controllers is largely old software (early 1970s vintage) that has received numerous updates, changes, and fixes over the years, and is generally viewed as a patchwork that is difficult to maintain and not easy to modify.

AAS will deliver new software, new workstations and displays. The mainframe IBM Host computers in place at the centers will be kept in place, but will be augmented with additional processing power and capability at the individual workstation. (However, some observers note that the approach being taken with AAS, while certainly more advanced than what is in place today, has itself been overtaken by more advanced and superior approaches, particularly with respect to the computer architecture of the system, which limits its ability to further upgrade and modernize as new technology comes along.)

The AAS program is no small undertaking. It has been described as the largest civilian computer development and procurement ever. FAA, the Federal System Company, and support contractors employ a small army of people dedicated to AAS. FAA has 137 personnel of its own and another 356 support contractor personnel devoted full time to the AAS program; FSC has 1,499 personnel dedicated to the project; and its various support contractors add another 1,125 personnel for a combined total of 3,117.

The Advanced Automation System consists of a series of separate systems and future software upgrades. The major programs of AAS are the following:

Peripheral Adapter Module Replacement Item (PAMRI)

This part of the program has been largely accomplished without problems. PAMRI is a computer that processes communications between radars and weather systems, and the enroute centers. It provides more capacity, higher reliability, and more rapid transmission of radar data into the enroute facilities than what it replaced.

Initial Sector Suite System (ISSS)

ISSS is expected to be the main part of the program and represents the new software package for the enroute centers and the new controller workstations. These will replace the existing round monochrome green displays with new high resolution 20 inch color displays of radar data and other information. These new workstations are to feature touch screen features and windows capabilities. ISSS is the aspect of the program that has encountered the most problems in its development.

Terminal Advanced Automation System (TAAS)

TAAS is planned to provide new controller workstations at terminal radar approach control facilities (TRACONs) similar to those being provided at the enroute centers. This is a program that is now contemplated to follow on the heels of ISSS in the late 1990s.

Tower Control Computer Complex (TCCC)

TCCC is planned to upgrade hardware and software at major airport control towers beginning in the late 1990s. This phase will automate much of the display and manipulation of aircraft data that is now done manually by controllers.

Area Control Computer Complex (ACCC)

ACCC is planned to provide new software capabilities around the turn of the century. The existing mainframe Host computer would also be replaced with a new mainframe at this point. ACCC would also be implemented in the late 1990s.

Automated En Route Air Traffic Control (AERA)

AERA is expected to be an even more advanced software system that will enable the computers to make recommendations and decisions on the most efficient routings and conflict resolutions for particular flights. It is also expected to enable controllers to see potential air traffic conflicts far in advance, so that the most efficient rerouting can be made.

II. DEVELOPMENTS IN LATE 1992 AND SUBSEQUENT PROGRAM CHANGES

This summary will not detail the technical problems the AAS program encountered up until late 1992. For greater background on those problems, again, we recommend your review of the published hearing volume (103-8) from last March, particularly the Summary of Subject Matter printed in the front. In short, the problems were:

- Continual changes by FAA in the requirement of the system;
- Schedule slippages due to software development difficulties; and
- Poor control of cost escalation.

The hearings, 13 months ago, indicated that the source of these problems was poor and ineffective management of the program on the part of FAA and IBM.

The problems fully manifested themselves, in the fall of 1992, when there was failure of a major testing regimen by IBM that meant a further 14 month delay in the program. This caught the top management at FAA and DOT by surprise, since they believed at the time that the program was in relatively good shape. In December 1992, the FAA notified IBM through a cure letter that unless contract performance was improved, the FAA would consider terminating the contract with IBM. In federal contracting parlance, a 'cure letter' is an indication of great dissatisfaction.

After receipt of the cure letter, the FAA and IBM set out to reach an agreement on how to 'cure' or fix the program. In the Subcommittee hearings in March 1993, the Acting Administrator and the President of the IBM Federal Systems Company outlined what would be done to put the program on a track to success. Among the changes were:

- A new commitment by the highest levels of the agency and company to personally oversee the management of the program;

- Making the program manager directly accountable to the Administrator and giving the manager responsibility for cost and schedule changes in the program;

- A freezing of program requirements and specifications so that new features would not be added to the design;

- Adherence to a more structured software testing regimen by IBM; and

- A replacement of IBM's top management of the program.

Further, the agency committed to providing the Subcommittee with periodic progress reports on progress in the program. At the time of the hearing, FAA and IBM announced that the program would be delayed another 14 months from August 1995 to October 1996, the estimated date for delivery of the Initial Sector Suite System at the Seattle en-route center (the first center to receive the new equipment).

A year later, in hindsight, these commitments, management initiatives, and program changes were either hollow and illusionary, or simply not enough to fix the program. Today, it is estimated that the program is further away from completion than it was a year ago. A year ago, it was estimated first delivery would take place in 3-1/2 years, or October 1996. Today, delivery is most likely to take place a little more than 4 years from now, or June 1998.

III. DEVELOPMENTS SINCE THE 1993 SUBCOMMITTEE HEARING

Subsequent to the March 1993 hearing, there was a sense in the Congress, FAA and DOT, IBM, and the aviation community that the management steps and program changes described above were sufficient to correct the problems and to get the program moving toward completion. The reports from the FAA Acting Administrator and, subsequently, from the Administrator to the Subcommittee indicated that milestones and checkpoints were being met, or even exceeded in some cases.

However, beginning late in the summer of 1993, FAA and DOT leadership, again, became concerned because it was becoming apparent that they had seriously underestimated the cost of the program. At the time of the hearings, FAA leadership estimated to the Subcommittee that the cost of the AAS program could grow by $235 million over the then estimated cost of $4.703 billion. In fact, testimony by the FAA Acting Administrator indicated that there might be no cost increase because incentive fees to IBM would be reduced due to poor performance.

Apparently, FAA's top leadership did not fully understand how the AAS program office had estimated the $235 million cost overrun. Actually, the AAS program office was assuming a $707 million cost increase due to program and contractual changes over the past four years that had not been incorporated into the contract, as well as the costs of the 'cure'. This figure was reduced to $235 million through a variety of offsets from reserve funds already appropriated and assumptions about the project coming in at a lower cost than the ceiling in the contract. Also, there was a $93 million accounting error in the calculations leading to the $235 million estimate.

By early fall, the offsets had evaporated, the accounting error had been corrected, and the forecasted costs of the program had further increased. As a result, the estimated total program costs increased from $4.703 million in the spring of 1993 to $5.894 in December 1993 (an additional $1.240 billion to complete the program).

Additional costs of this magnitude set off alarm bells in DOT and FAA leadership, not just because of their sheer magnitude, but also because to absorb them would mean significant cuts in other important agency programs and activities.

The situation came to a head last November, when the AAS Program Office proposed a renegotiated contract with IBM to DOT and FAA leaders that reflected these additional costs.

At the same time these cost increases were becoming understood, DOT and FAA leadership also began to question whether the technical aspects of the program were achievable and whether even the new schedule (with the 14 month delay to October 1996, for Seattle implementation) was achievable. There was an increasing sense that the software development problems were not being resolved at the same time new ones continued to crop up. Last spring and summer, the AAS program office expected software problems to be in retreat by last fall. Instead, software problems continued to mount, calling into question whether the program was making technical progress or was just churning in place.

On December 13, Administrator Hinson wrote the Subcommittee about the $1.2 billion in additional costs, and advised the Subcommittee that he felt a "...need to be assured that the AAS program is technically sound and will provide the benefits necessary to justify the costs of its completion." This letter came in stark contrast to periodic reports the Subcommittee had previously received from the Administrator that milestones were being met and "...that the system is operating on a stable basis."

The Administrator announced a number of actions. Among them were:

- A review by Deputy Administrator Linda Daschle and Chief Counsel Mark Gerchick to asses the validity of the cost and schedule estimates; and

- An outside, independent review to assess the organizational, management, and financial concerns raised by the AAS program, and to recommend "realistic" solutions. Subsequently, the CNA Corporation (formerly, Center for Naval Analyses) was tasked to undertake this assessment. The FAA Administrator will discuss the findings and recommendations of CNA at the hearing.

Sale of IBM Federal Systems Company to Loral Corporation

In the fall of 1993, as part of a general restructuring of IBM, the company made it known that it is was open to bids to acquire the Federal Systems Company, the division of IBM that does work on AAS, as well as work for the Defense Department. On the very day that Administrator Hinson announced the cost and technical problems with the program, IBM and Loral announced the sale of the Federal Systems Company to Loral for $1.575 billion in cash. While IBM had received a higher bid, Loral's bid had no contingencies or conditions that made the closing of the transaction uncertain.

Media reports on the transaction, because of the FAA announcement calling the program into question, speculated that Loral may not have known what it was getting into in purchasing the company with no way to back out. Loral has stated it was fully aware of what it was buying.

The purchase by Loral also raises further complicating issues about how the program will be managed and structured in the future by Loral, the level of commitment by Loral to the program, and FAA's legal and contractual relationship with Loral. Concerns about these issues have been ameliorated by public and private statements by Loral executives that the company is committed to the program and intends to manage the program more effectively.

However, FAA still has serious concerns as expressed in the report of the Deputy Administrator:

> "Loral Corporation's acquisition of IBM Federal Systems Company, announced in late 1993, could have implications for cost and schedule of the AAS program, although novation of the IBM contract has not occurred to date. Short-term productivity could be disrupted by any transition. The long-term impacts of the acquisition are uncertain."

Further, the DOT Inspector General stated in a March report:

> "The sale of IBM Federal Systems Company to the Loral Corporation may have an adverse impact on the AAS schedule. Loral is a major defense electronics firm and, until now, has not been involved with major software development projects for air traffic

> control system. Loral will need time to grasp the status of the project along with the task they face and to implement their own management style. Also, while some IBM personnel will remain with AAS, others may choose to retire or seek other opportunities, therefore leaving less personnel with knowledge about the project. In addition, Loral may assign new people with no knowledge of the program, thus diluting the AAS specific knowledge and experience on the project team."

IV. DEPUTY ADMINISTRATOR DASCHLE'S AAS STATUS REPORT

One of the FAA Administrator's actions last December regarding the cost and schedule problems of the program was to task the Deputy Administrator and Chief Counsel to conduct a review of the costs and schedule to complete the program and determine what could be realistically expected if the program stayed on its present course. FAA leadership, having just experienced $1.2 billion in cost growth to the program in a matter of a few months, based on faulty assumptions, wanted an assessment from outside of the program office. If major changes to the program were warranted, it was first thought to be necessary to have a picture of what not changing the program would entail.

In early March, the Daschle Report was submitted and came to the conclusion that if the program continued on its present course, not only would there be the previously estimated $1.2 billion in additional costs, but there would likely be at least another $1 billion on top of that, in addition to a likely further schedule slip of 20 months. The schedule slip would have the first ISSS delivery likely to be ready for implementation to the Seattle Center in mid-1998 instead of late 1996.

(Recall that a year ago, the delivery date was summer, 1995.)

The Daschle Report methodology examined three scenarios for completing the program, each associated with different probabilities of success. (A 20% probability of success; 50%; and 80%.) To the extent possible, risks associated with costs and schedule were quantified based on past FAA and IBM performance, and assessments of future performances. The following table summarized the Daschle Report findings and compares them to earlier estimates and funds expended to date.

COMPARATIVE COST PROJECTIONS 14
ADVANCED AUTOMATION SYSTEM
COMPONENT PROGRAMS ($ MILLIONS)

AAS Program Element	Costs to Date	March '93 Estimate at Time of Subcommittee Hearing	Nov. '93 Estimate	March '93 Daschle Report Most Likely Estimate
Enroute				
Peripheral Adaptor Module Replacement Item (PAMRI)	46	46	46	46
Initial Sector Suite System (ISSS)	350	450	741	900
Area Control Computer Complex (ACCC)	17	244 includes AERA also	647	1,043
Automated Enroute Air Traffic Control (AERA)	32	---	238	367
Air Route Traffic Control Center (ARTCC) Modernization	348	414	414	414
En Route Subtotal	794	1,154	2,086	2,770
Terminal				
Terminal Advanced Automation System (TAAS)	127	460	537	654
Tower				
Tower Control Computer Complex (TCCC)	37	424	318	447
Ancillary and Other	1,333	2,666	2,993	3,077
GRAND TOTAL	2,290	4,704	5,933	6,948

Among the other findings in the Daschle Report regarding the AAS program were the following:

- Under the current plan, the FAA would accept an ISSS system in September of this year when it would not be fully developed and could not meet some critical operational requirements. The necessary further development could add significant costs to the program.

- Despite promises and management changes made a year ago, the system's specifications and requirements are still being modified, with a number of important design issues remaining open.

- "Software volatility" remains high, indicating that the software development is not maturing. On the average, every line of software has to be rewritten once, a 100% volatility rate. A "normal" volatility rate is 40%.

- The amount of software code that still needs to be completed is high.

- Program Trouble Reports, which identify problems in the software, remain high and have not begun decreasing as expected. If the current trend continues, over 3,000 reports would remain unresolved in September 1994, the goal for FAA to accept the system for final testing.

- The cost of IBM delivering a line of software code has ranged from 40-80% above average industry costs of code development, indicating poor coding capability or efficiency.

- A major function of the system, known as "continuous operations," has not been fully conceptualized or defined. "Continuous operations" is a backup system that would enable the system to function and then return to normal, when the primary system had a planned or unplanned outage. Costs associated with this function could be as high as $300 million.

- Another major function, "electronic flight strips," is continuing to be redesigned because the original IBM design was cumbersome to use and created human-computer interface problems. Timely completion of this redesign is key to any scheduled deployment of ISSS.

As a result of the Daschle Report, the FAA Administrator announced the following actions:

- Replacing senior FAA management responsible for the AAS program. (A new program manager began work on April 4.)

- A "high level" analysis to revalidate the program's requirements and determine the benefits from meeting those requirements.

- Discontinuing funding for work on the Area Control Computer Complex (ACCC), at least until the requirements review is completed.

- Continuing to meet with Loral to improve program performance, restructure the program, and secure Loral's commitment to meeting schedule and cost.

V. REPORT BY THE DOT INSPECTOR GENERAL

Also issued in early March was the first in a series of reports by the Inspector General of the Department of Transportation regarding the management of the AAS contract. Based on Defense Contract Auditing Agency audits (DCAA is responsible for conducting accounting-type audits of companies that have government procurement contracts), the Inspector General found that IBM's cost estimating system could not be relied upon to accurately establish current, accurate, and complete cost or pricing data for good contract management and auditing purposes. The IG concluded that this would likely result in a significantly higher cost for the program.

Further, the IG found that the FAA has not provided adequate technical assistance to the DCAA to enable the DCAA "...to reach definitive conclusions on the acceptability of IBM's judgmental methods and assumptions for proposing cost." The IG found that FAA rarely provided responses to technical inquiries by the DCAA, even after repeated requests, and that DCAA had to obtain the information it needed through cumbersome roundabout channels because of uncooperativeness by

FAA officials.

VI. ISSUES AND QUESTIONS BEFORE THE FAA AND CONGRESS

Beyond what appears to be the herculean task of making changes at FAA and the Federal System Company to see that this program becomes effectively managed, the FAA and Congress will have to make some very difficult choices and decisions about this program in the near future. All options are risky, fraught with uncertainty, and extremely costly if mistaken choices are made.

Among the issues are:

- **Should the FAA simply terminate the current AAS contract, walk away from its investment of $2.3 billion to date, and start over?** Walking away from a decade of work and a $2.3 billion of investment is inherently difficult to do, if one thinks the program can eventually be successfully completed. It could also take years to put out a new request for proposals, analyze bids, and brings on a new contractor. Termination of the contract could also invite a legal morass with the existing contractor that could be costly and time consuming. On the other hand, FAA did threaten to cancel the contract for poor performance 15 months ago, and now has even bigger problems on its hands than it did when it was considering that step.

- **Should the FAA decide to pursue a different technological course?**

As mentioned earlier, a number of observers believe that the technological approach now being developed is relatively antiquated, even though it was selected just five years ago. Current thinking about how large automated systems should be designed would indicate that there should be much more "open architecture" than is found in the current AAS design. "Open architecture" means a design that permits components of the system to be readily changed or upgraded as new technological innovation comes along. Apparently, the current AAS design is relatively closed, meaning it has little ability to incorporate future upgrades and changes. There is increasing thinking that, even if the AAS is eventually successfully designed and built based on the current approach, it would not be a successful procurement because it would only have purchased a technological approach that the automation and computer world have now abandoned for better design approaches.

- **Should the FAA abandon, at least for now, some of individual components of the Advanced Automation System, such as Advanced Computer Control Complex (ACCC) or the Tower Computer Control Corporation (TCCC)?** Relatively little money has been spent on these projects yet, so not much investment would be lost. Again, there is a growing consensus that these components should be recast anyway, from technological standpoint, as the current approach suffers from the same deficiencies discussed in the previous bullet.

- **Should the FAA re-contract with other companies to carry out the non-ISSS aspects of the AAS program?** The AAS contract contemplates that original software will be developed for the system. Other companies in the air traffic control equipment business have already developed and delivered advanced air traffic control systems to other countries and the Defense Department. The software used in these systems may not be powerful enough to handle the workloads of enroute centers, but it may meet the need of towers and smaller approach control facilities. The argument had been made that, for these facilities, FAA should purchase this current off-the-shelf technology and should abandon its efforts to invest in or design its own technology.

- **Should the FAA bring in other contractors to help the Federal Systems Company complete the ISSS program?** This could bring technical and management capabilities so far found lacking in the current contractor, and enhance the agency's ability to deploy the ISSS earlier than now expected, and at less cost. However, it also could lead to a major contract dispute with Loral that could slow the process down. Such as step could also further complicate management of the program by FAA.

- **If the FAA decides the answer to all these questions is 'no', what other capital development and air traffic control modernization efforts will it abandon or forego?** The size of the additional costs for AAS are 15-20% of the total Capital Investment Plan budget for the balance of this century. Budget agreements by the President and Congress have largely frozen budgetary accounts, such as FAA's Facilities and Equipment account, for the foreseeable future. Cost growth of the size now identified for the AAS program would have to be accommodated by significantly cutting back or eliminating other initiatives in order to keep the AAS program going in its present configuration.

VII. ANTICIPATED WITNESSES

- FAA Administrator David Hinson
- FAA Deputy Administrator Linda Daschle
- Representatives from the following organizations:
  - Loral Corporation
  - Hughes Aircraft
  - Raytheon Corporation
  - BDM International
  - Unisys Corporation
  - General Accounting Office

REVIEW OF RECENT DEVELOPMENTS IN THE FEDERAL AVIATION ADMINISTRATION'S ADVANCED AUTOMATION SYSTEM PROGRAM

WEDNESDAY, APRIL 13, 1994

HOUSE OF REPRESENTATIVES,
COMMITTEE ON PUBLIC WORKS AND TRANSPORTATION,
SUBCOMMITTEE ON AVIATION,
Washington, DC.

The subcommittee met, pursuant to call, at 9:35 a.m., in room 2167, Rayburn House Office Building, Hon. James L. Oberstar (chairman of the subcommittee) presiding.

Mr. OBERSTAR. The Subcommittee on Aviation will please come to order.

As air travelers fly from origin to destination, few are aware of the highly complex network of high-tech computer, weather tracking and communication systems that guide the aircraft flawlessly and safely from takeoff to landing. Nor are they aware of the thousands of dedicated and highly competent professionals behind the airway system who operate that complex network of technology.

Fewer still are aware that the FAA operates an air navigation and control system far more complex and far more sophisticated than the system NASA uses to manage manned space flights and, of course, manages millions more people in the course of a year than does NASA with its manned space flight program.

Much of that technology, however, was developed in the fifties, installed in the sixties and seventies, somewhat upgraded in the eighties, and much of it is now outmoded in the nineties. Rapid growth in aviation has put enormous pressure on the system, which the technology cannot continue to sustain.

In the early 1980s, FAA began designing and engineering replacement technology leading up to award of a multi-billion dollar contract to IBM in 1988, for what we now know as the Advanced Automation System.

Consisting of five major interrelated complements, AAS was to be operational in stages, beginning with a prediction in 1989 of operational status in 1993. Realistic current evaluations today indicate 1997 as the earliest date for deployment of the Initial Detector Suite System at Seattle.

Question. Was the contract too ambitious and therefore doomed from the outset or did it somehow flounder along the way? Was the procurement process flawed or was the management of it flawed? Is it worth continuing or should the $2.3 billion already spent be scrapped and written off?

Those are just some of the questions that have arisen along the way, others that we will explore in the course of today's hearing.

The truth, as is the case with most highly complex policy issues, is somewhere in the middle.

Today, the subcommittee meets again to review recent developments in the Federal Aviation Administration's Advanced Automation System program. A little over a year ago, the subcommittee had a similar hearing in which a variety of management changes were announced, all aimed at getting the troubled program back on track. That hearing was preceded by weeks of intensive meetings by the subcommittee members and staff, a visit to the IBM–FAA Demonstration Center up at Germantown, a day-long review of all the technology, and a discussion with the IBM personnel and the FAA people installing it.

In between, we had management updates, discussions, and meetings with the responsible FAA personnel. It now appears that the steps we were told would be taken were either illusionary or simply not matched to the scope of the problem and the complexity.

In the fall of 1992, the program had failed to pass a major testing regime, causing a major delay in the delivery of the system from 1995 into 1996. This failure was of such far-reaching consequence that the FAA at that time seriously considered terminating its contractor, IBM, and its Federal Systems Division or company that was operating the program.

Subsequently, FAA backed away from that threat and a number of management changes were instituted. Testimony last year at our hearing by both IBM and FAA provided believable assurances that the Agency and IBM both understood what needed to be done to this important program.

Without repeating all of last year's testimony, it appeared that the major program management changes needed were being made and that high-level constant attention to the program was needed and was going to be made, and that such changes were in place, all except for the appointment of an administrator, which took some eight months.

Particularly, we noted the need to shut off constant and never-ending or at least seemingly never-ending changes to system design and requirements.

I recall saying in the hearing a year ago that at some point we need to nail these people's shoes in place to keep them from making more changes. While we were given a certain comfort level by FAA statements a year ago, we again have clear indications that there has been an unraveling of the good intentions and assurances. Goals have not been met.

More PTRs, or program trouble reports, have been opened than have been closed. Software volatility is running at 100 percent, as noted in Deputy Administrator Linda Daschle's report, meaning that every line of code written has to be rewritten at least once.

The original contract anticipated at least a 40 percent rewrite. Still outstanding as of last month were 525 changes affecting 655,000 lines of computer code.

Late last year, it became apparent that the program was in deep trouble, particularly from the standpoint of cost control and delivery schedule.

A welcome change has been the entry on the scene of Administrator David Hinson, a strong and a firm hand at the helm of this agency and this program. He shared with me and with other members of the subcommittee and our staff his concerns, fears about the program, I would say, and frankly I was surprised because the subcommittee had been receiving, as promised, periodic reports signed by the administrator about the program's progress.

These reports told us that milestones were being met. That is, the technical success was being achieved. We read those reports, and analyzed them. We talked to people; we believed them. They weren't true.

In retrospect, there has been a great deal of self-delusion by both IBM and FAA. That has ended up misleading a lot of people within the Agency, within IBM, within this committee, and in the public generally, about what has been going on in this program.

Last December, Administrator Hinson announced a finding that substantial cost escalation would be required to complete the program. He also expressed a lack of confidence whether the program could achieve its technical goals. He then appointed a Deputy Administrator, Linda Daschle, to lead an internal review to develop an objective analysis of likely costs and a schedule to complete the program.

He contracted with the Center for Naval Analysis Corporation for an outside independent review of whether the program needed to be redirected from a technological and management standpoint.

At the same time, IBM sold its Federal Systems Company to Loral Corporation, which further complicated matters and raised questions of a legal and management standpoint. I want to emphasize, we are not here on a witch-hunt or finger-pointing hunt.

We are not here to fix or find blame, but I do think it is important that when the finger is pointed at FAA that the public ought to understand that this was not the mom-and-pop store computer company running the corporation side of this operation. This was one of the world's biggest corporations, IBM, and they failed.

Ms. Daschle's report was completed in March and concluded that the program is likely to cost close to $7 billion instead of the original $4.7 billion budgeted and that would not be initially delivered until 1999 if the program continued on its present course.

To his credit, upon release of the report, Administrator Hinson said those findings are unacceptable. In today's budget climate, coupled with the frustration Congress has over high-priced technology that does not achieve its objectives, all I can say is you better believe it is unacceptable.

A consensus is developing that aspects of the program have to be reconstructed or recast because technology advancements have passed the program by, in some respects.

There are companies, and we will hear from them today, which are delivering advanced automation air traffic control systems to other countries, beyond what we have in place today.

I have some very personal embarrassment over all of this, because on several occasions I have told our allies in aviation in Europe where the air traffic control system is generations behind what we have today that they ought to just simply buy what the

U.S. is buying; take the approach the FAA has taken on air traffic control, take our contract, buy it, put it in place.

We are developing the most advanced system in the whole world. I can't say that today, especially in light of recent developments in FAA's program and the fact that other companies, U.S. companies, I am happy to say, are delivering advanced systems to Canada, Norway, Taiwan, and even to the FAA in the terminal area elsewhere in the United States.

I know the administrator and his team are working hard. They spent a great deal of time on this subject, and productively. But this is a very complex issue to digest.

The Daschle report alone is about an inch thick and very dense and condensed writing. I believe we need bold and decisive decisions. They have to be made soon. Some of the elements are in place.

I think specifically and above all we need an administrator who is going to take charge of this thing and run it and run it decisively and have the authority to make decisions and make them stick and not let this program be subject to more lawsuits and challenges in court.

Lawyers aren't going to settle this thing. That Reminds me of Fiorello LaGuardia, designing what is now known as LGA, LaGuardia National Airport. He called a meeting and invited all those with anything to say about the airport to be present: "Bring your engineers, designers, contractors, but leave the lawyers at home. Lawyers are not wanted. They will only confuse the situation," he wrote.

Well, we need some smart technicians and some tough and able administrators. We have one of the best sitting in front of us, if he will just take hold of this thing and make it work. Otherwise, the most precious commodity in this town, credibility, will tumble to an all-time low and that will be disastrous for this program and disastrous for the future of air travel.

Now having been said, I welcome today's witnesses, and I welcome my colleague, Mr. Clinger.

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

You have very, very thoroughly reviewed the long and woeful history which brings us to this hearing, so my statement will be very brief. But as you said, the subcommittee is unfortunately too well acquainted with the broken promises associated with the advanced automation system.

It is overdue. It is overbudget, and most frustrating of all, there really is no clear solution in sight as we all sit here this morning. To me, AAS evokes the worst sort of waste and mismanagement that many cynics continue to hold against the Federal Government. It is sad to say, but in this case, I think the cynicism is well deserved.

It is my view as you said, Mr. Chairman, that no good is going to be served by expending time or energy trying to fix blame or determine who is at fault. Since the contract was signed, those many years ago, 1988, several of the key players in both government and industry have changed. The most recent being this administration's new management team and Loral's acquisition of IBM's Federal Systems Division.

The one constant it seems to me that has persisted throughout this sorry saga has been the failure of the procurement system, which has been relied upon by the FAA and the Federal Government. That is an area that I think certainly deserves very close scrutiny.

Mr. Chairman, we have an opportunity here with our new administrator, Mr. Hinson, and with a new prime contractor, to do more than just fix the AAS system, and that is the whole controversy over procurement and procurement reform, which is presently moving to the top of the priority list from the government's point of view.

From my vantage point as a Ranking Member on both Aviation and the Government Operations Committee, I think I have a perspective that perhaps is somewhat unique in terms of looking at this procurement issue.

From aviation experts, I hear complaints about the government procurement procedures that must be followed and the oversight from GSA that must be endured. However, the procurement experts point to a continuing history of poor program management by government agencies on major system acquisition, across government. They also argue that GSA does not provide necessary leadership and oversight in the process.

So in the context of the problems with the AAS program, which we are looking at this morning, I understand that FAA recently told GSA that procurement process is not the issue, but rather management. I would be very interested in hearing the perspective of the witnesses on this question.

Mr. Chairman, we must upgrade the existing air traffic control system. Government, the traveling public and air carriers cannot afford to scrap the current development effort and start all over again. I think we have passed that point. It would take far too long to rebid the contract and expect a subsequent contracter to provide a finished product in less time than finishing AAS.

Much of the basic development has been completed and a considerable portion of the software written. In my view it is usable, but again I think we need to hear the witnesses this morning. The only option I believe is to simplify the remaining portions of AAS in the most rational manner possible, build and test on a concurrent basis, get it into the field, and add upgrades as they become available.

So I welcome Mr. Hinson before the committee and the other witnesses and look forward to today's testimony.

Thank you, Mr. Chairman.

Mr. OBERSTAR. Thank you very much, Mr. Clinger.

I would like to publicly acknowledge your participation and thank you for it in every aspect of the subcommittee's ongoing inquiry into this area. You devoted a great deal of time, energy, insight and thought to this process as we have gone along. It has been a partnership and I appreciate that very much.

The chairman of the full committee is with us this morning. We greatly appreciate the presence of our chairman, Mr. Mineta, the former chair of the subcommittee, who has taken a very deep interest in the AAS program. I am pleased to recognize Mr. Mineta.

The CHAIR. Thank you, Mr. Chairman.

I just want to thank you very much for your work at trying to keep on top of this whole thing. I am not a happy camper when it comes to discussing this subject matter, and so I am really pleased that you and Mr. Clinger are taking this time to hold these hearings. It will be an important contribution to Congress' thinking, decision-making on this program and future policy choices.

I can recall very vividly from the early days when I was chairing the Aviation Subcommittee and meeting with then-FAA Administrator Lynn Helms, starting the discussion about outlining this whole concept about what the future of our air traffic control system should be.

It came on the heels of the August 3, 1981, PATCO strike and the release of some, what, 8,000, 10,000, or 11,000 air traffic controllers and the question of how do we want that future configuration to look? So slowly this advanced, what we now know as the Advanced Automation System program evolved. That kind of program inception, what we now see, has reached a point in terms of cost increases and schedule slippage where some critical decisions about how to proceed in the future again have to be made.

These critical decisions must go beyond simply changing the program manager or receiving a new, fresh commitment about better program management, though these are certainly important. What is needed in the near future again are critical decisions about reconfiguring or recasting this program.

From discussions I have had, it has become apparent that the FAA may well need to step back from trying to invent and design the system it needs and turn to the greatest extent possible to off-the-shelf technologies. I remember when I first took over the Subcommittee on Aviation, coming from Silicon Valley and the high-tech area, going around the country and looking at facilities, asking what are these vacuum tubes in these machines. I got the feeling that FAA always felt, well, there is new technology just coming around the corner, so let's wait for it. We will have the latest and the best.

But they never bought anything. They kept saying, "Yes, let's wait for that next best thing coming around the corner." So I finally insisted that we just take a camera picture in time and move ahead with the then-existing technology. Well, it looks like with the AAS it was always trying to incorporate whatever was the latest into the design at that time, and that decision, that day, would then ripple and have its effect on the whole program.

So it appears that technology development is occurring in the commercial sector at a pace that exceeds FAA's development process. We now need to take advantage of that so that the costs and risks are minimized.

On the other hand, this programming has now been going on for a long, long time. We have spent billions of dollars. Many of you in this room are—we have, what, maybe 3,000 people who have been employed either by contract or within the FAA as part of this program. One of the things I have always felt about government, having run my own business, is that there are no penalties when government screws up, and this one is no different.

Frankly, I have just come to the end of the string in terms of patience about this program, and so it seems to me that what is important at this time is to reestablish some credibility, whether that is with us in the Congress, FAA, all of you as contractors who are involved on this, or want to be contractors in future FAA procurement.

We have lost a great deal of credibility. I am including myself on this. I don't like to see something like this happening as those of you in the Navy would say, on my watch. So the people involved are going to have to come through with bold, innovative thinking and decision-making about the future of this program.

Frankly, those decisions should come sooner rather than later. I want to thank Administrator Hinson and Deputy Administrator Daschle for the work to date. I believe that they have charted a course for us through their analyses to make sure that the necessary steps are taken. I think they have approached this difficult task with an objective eye.

The first step is to try to make sure that there is a healing process that goes on in this program to make sure that we truly know all of its failings. I think they have done this in good conscience. They have done this as expeditiously as they could, given when a lot of these issues surfaced.

So at this juncture, I want to thank the messengers, not shoot them, yet. So, Mr. Chairman and Mr. Clinger, I want to thank you for staying on top of this. I think it is very, very important given the size of this contract, the future implications in terms of the safety of the air traffic system, the confidence that people have in using the system, that we keep a very careful eye on this whole process. I intend to

So to that extent, I again want to thank you, Mr. Oberstar and Mr. Clinger, so we can go on with the job.

Thank you very much.

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

Other Members?

Mr. Duncan.

Mr. DUNCAN. Thank you, Mr. Chairman.

I, too, want to second the remarks of the chairman of the full committee and thank you for calling these hearings.

As you know, I participated along with you 13 months ago in the hearings that were held at that time, and I can tell you this, I think there is a substantial majority of people in this country today who are really beginning to wonder whether the Federal Government can do anything in an economic or efficient way. And when they review the history of a program such as this, that really lends credence to or support to that belief that is becoming so widespread.

I want to second the remarks of the chairman of the full committee when he said that one of the very serious problems that we have in government today is that, as he put it, when somebody in government screws up, there are no penalties.

We need to look at that in these hearings as to whether or not anybody has really been held accountable in all the screw-ups or the mistakes that have been made in regard to this program.

As the Ranking Member, Mr. Clinger, just said, there have been problems across the government in the acquisition of major systems and certainly that has been true in this case. Thirteen months ago, we were told that in 1983, the original cost estimate for this program was $2.5 billion.

At that time, Administrator Del Balzo estimated that the cost was going to be $5.1 billion. Now we have got estimates of $5.9 billion, $800 million higher than the estimate 13 months ago, but we have the Daschle report which estimates costs of $6.9 billion, $1 billion difference.

Why is that? A billion dollars may not be much to the Federal Government, but where I come from in east Tennessee, a billion dollars is a lot of money. I can tell you this: This is fast becoming known with all of the mismanagement and cost overruns and the total ridiculous expenditures that have been made on this, this is fast becoming known as one of the worst deals the Federal Government has ever gotten into, and that is really saying a lot to say that.

So I think it is a program that we need to stay on top of, that we need to look at frequently, and we need to particularly find out who messed up and what is being done to hold people accountable.

Was it IBM? Seems that IBM has made exorbitant profits on this so far, and then when they run into problems, they sell out for $1.5 billion. I think that needs to be looked into.

There are many questions that need to be asked about this program and I thank you for calling these hearings and I am glad that we are going to have the opportunity to look very closely at this. I think it needs to be looked at very closely.

Thank you.

Mr. OBERSTAR. Thank you, Mr. Duncan.

Mr. Inhofe.

Mr. INHOFE. Thank you, Mr. Chairman.

I am the Ranking Member on the Investigation and Oversight Committee and we are having meetings now, so I regretfully won't be able to be here for the entire meeting. However, I will be here for your presentation.

Let me just say, I think everything has been said. I am more concerned about where we go from here than who is responsible in the past. We want to look from this point forward, where we are going to go and how we are going to get this thing done.

As the one at this table who has used and will be using this system probably more than anybody else or all the rest of them collectively, I also have a selfish concern in getting this system on board the way it was intended to be. I want to make this as a public statement. I would have to say, Mr. Administrator, that you are, if not the—I think you are the best appointment that has been made by this administration.

With your background in general aviation, commercial aviation, as a tough administrator, I have no doubt that you are uniquely qualified, you are the right guy at the right place and backed up by Linda Daschle, I have every confidence it is going to happen. So I look forward to these hearings and the completion of this program.

Mr. OBERSTAR. Mr. Sangmeister.

Mr. SANGMEISTER. Thank you, Mr. Chairman.

Generally, I would agree with the remarks that were made by the chairman and the Ranking Member, but one thing I do not agree with and that is the statement by both of you that there should be no sense in fixing any blame here. I think if we fix some of the blame that has happened, we may be able to get the results that we are looking for here.

This is unquestionably probably merging into the biggest boondoggle the Federal Government has seen. You know who is going to get the blame when the media gets done with this hearing? It is going to be the Congress that gets the blame.

I don't think we deserve it. Maybe there should have been better oversight, I don't know, but we need to get on with it. Because once again when the media gets done reporting this, our great favorable percentage rate of 29 percent will be down to 20 percent and falling.

I hate to see the responsibility of this fall on the Congress, but I tell you that is where it is going to be, and therefore I do commend the chairman for getting these hearings under way.

Let's get to the bottom and find out what this is all about. But I think we need to fix blame, not look it aside.

Mr. OBERSTAR. I thank the gentleman.

Are there others who have comments?

Mr. Ewing.

Mr. EWING. Thank you, Mr. Chairman.

I just say very simply I would agree with most of the speakers here today and congratulate you for holding the hearings. I don't think there is anything that irritates my constituents more than bureaucratic foul up. And you know we can have that in government and we can have it in the private sector. Nothing makes the people we represent happier than to see us cut through that and get something done in a reasonable and economic fashion.

I think that certainly applies to what we are here today to address.

It is time we got through the bureaucracy both in the private sector and in the government sector, got the Advanced Automation System done and did it effectively and efficiently. I hope that we can do that and I hope these hearings are a step in that direction.

Thank you, Mr. Chairman.

Mr. OBERSTAR. Thank you.

Mr. Collins.

Mr. COLLINS. Thank you, Mr. Chairman.

Mr. Chairman, Mr. Hinson is a pretty good sized fellow, but based on how much you chewed on him already, there is not much left there for the rest of us concerning the AAS.

I would like to take just a moment. I have drafted a letter to Mr. Hinson regarding other systems and problems with other systems and this—these are problems that I catalog after visiting with the Atlanta Hartsfield Airport, and also visiting the Hampton Center.

These are problems that exist with equipment that has been in place for quite some time, that is still not up and operating.

I would like to personally give you this this morning. I would like to have a response from you on each of these items.

Mr. Chairman and Ranking Member, I think it might be a good idea for this committee sometime in the near future maybe to hold a hearing and have some of our air traffic control people come in who have personal witnesses and views on some of the problems that exist in some of our towers and centers and hear from them. I think it would be very important to this committee and also an opportunity to give them to express their concerns because they are charged with the safety that the FAA is responsible for.

Thank you, Mr. Chairman.

Mr. OBERSTAR. I thank the gentleman for those suggestions.

[The information received follows:]

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April 13, 1994

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OFFICE OF THE ADMINISTRATOR

The Honorable David R. Hinson
Administrator
Federal Aviation Administration
Washington, D. C. 20591

Dear Administrator Hinson:

Recently, while in my Congressional District in Georgia, I took the opportunity to spend some time with air traffic controllers at the Hartsfield Atlanta International Airport tower as well as the Hampton Center. I had been to these facilities previously, and have spent considerable time in Washington listening to contollers' concerns. As you know, the House Aviation Subcommittee, of which I am a member, touched on some of the controller issues in recent hearings on the Federal Aviation Administration's budget. I am becoming increasingly and seriously concerned over a lack of action on these issues.

Listed below are a number of matters which I have catalogued from these discussions. I recognize the response to most is a lack of funding. However, you are responsible for the air traffic control system, and signficant funds are made available to meet these needs. Some of these situations defy logic to someone who is relatively new to this arena. It is for that reason I would greatly appreciate your comments on where these matters stand, why they have taken so long, and when can they be expected to be resolved.

<u>TRAFFIC COLLISION AVIODANCE SYSTEMS (TCAS)</u>

There have been several recently reported near-misses due to malfunctioning TCASs. On February 25th, two aircraft came within 1/2 mile and 100 feet of each other, and the inbound pilot stated he believes they would have collided had he not happened to have had the other aircraft in sight at the time. This near-miss was due to a TCAS warning to the departing pilot to climb to avoid an aircraft below him. There was no such aircraft. What would have happened if the weather had prevented the pilot from seeing the other aircraft? I recognize that the TCAS equipment has a long history. However, I hope it does not take a major collision and loss of lives to get this situation corrected.

Honorable David Hinson
Page Two

AIRPORT SURVEILLANCE RADAR (ASR-9)
Atlanta Hartsfield

This system has been partially installed on the field for two years but has not been used. Several UCR's (Unsatisfactory Condition Reports) have been filed on the current radar system dating back to 1986. The radar coverage in many areas utilizing the current ASR-7 radar is poor or nonexistent. The ASR-9 has been hailed as the answer to the equipment problems. However, it has been and is still plagued with problems. What is needed is a fully functional and safe radar system in place as soon as possible. Unfortunately, it appears that FAA still has much work to do to ensure that all of the bugs are out of this system and it is fully operational without any performance limitations.

AIRPORT SURVEILLANCE RADAR (ASR-9)
Gwinnett County

The radar coverage has been notoriously bad to the NE of Atlanta. This site could also provide coverage for several airports that are currently being worked nonradar. This radar site is also needed for the increase in traffic expected for the 1996 Olympics as well as for the Gwinnett County Airport (Briscoe Field). However, all of the above mentioned concerns surrounding the reliability of the ASR-9 system still exist.

INSTRUMENT LANDING SYSTEM (ILS)
Runway 9R Atlanta Hartsfield

This is one of the oldest Instrument Landing Systems in the nation. There are only two in existence. The Depot does not support this system anymore so they cannot get parts to fix it if it fails. Most amazing is that this is the system that pilots use when the weather is at its worst, and they count on this system to land them without ever seeing the runway. There are two newer and still supported systems on the airport scheduled to be replaced before this one. Why is the oldest not being replaced first?

AIRPORT SURFACE DETECTION EQUIPMENT (ASDE 3)
Atlanta Hartsfield

The ASDE3 is installed but not commissioned. There are several technical problems that must be solved before it can be commissioned properly. The FAA, however, has already commissioned a site at Seattle, yet the system does not meet FAA's Requirements Order. A solution to this problem must be found.

TERMINAL DOPPLER WEATHER RADAR (TDWR)
Atlanta, Hartsfield

The TDWR system at Atlanta has been installed for over a year. However, it too has not been commissioned due to a lack of parts and other problems.

INFORMATION DISPLAY SYSTEM (IDS 4)
Atlanta Hartsfield

This equipment is on site at the airport, which would make vital safety and other related information instantaneously available to the controller, replacing old cumbersome paper binders and flip charts. However, FAA has stated it does not have the funds to program the equipment or train the controllers to use it. So thousands of dollars of hardware are sitting unused.

COMPENSATION

Hundreds of air traffic controllers have expressed their concern over the level of compensation of air traffic controllers, delayed pay raises (COLAs), or no pay raises, and changes in benefits in promised retirement programs. A recent GAO study shows that controllers are 28% behind their private sector counterparts in terms of compensation and benefits in aviation-related professions. H.R. 2663 would address some of these problems by providing (1) a 25% pay differential for working Saturdays, and (2) an increase in the operational differential from 5% to 15%. I would appreciate your assessment of this legislation as well as the GAO report.

In closing, I want to say I have the greatest respect for the hard-working professionals of the FAA, but I know you agree that we must provide them with the tools to do the work expected, in order to maintain the highest levels of safety for the traveling public.

Sincerely,

Mac Collins

MAC COLLINS

MC:brm

U.S. Department of Transportation
Federal Aviation Administration

Office of the Administrator

800 Independence Ave., SW.
Washington, DC 20591

JUL 8 1994

The Honorable Michael A. "Mac" Collins
Subcommittee on Transportation
Committee on Appropriations
House of Representatives
Washington, DC 20515

Dear Congressman Collins:

Thank you for your letter concerning your visit to the William B. Hartsfield Atlanta International Airport (ATL) and the Federal Aviation Administration's (FAA) en route facility at Hampton. I apologize for the time it has taken to respond to your letter. We are working to solve the equipment problems you have raised.

We recently issued modifications to the traffic collision avoidance system software, and we believe the unnecessary advisory problem will be eliminated through this modification.

The airport surveillance radar (ASR-9) transmitter problem has been corrected, and the ATL radar is scheduled to begin operational testing in July. Regarding the Gwinnett County Airport radar, the FAA received congressional reprogramming approval in fiscal year 1992 to procure additional ASR-9's. A second radar for ATL is scheduled for delivery in October 1995 and will be commissioned during February 1996 before the 1996 Olympics.

The instrument landing system (ILS) located at ATL on runway 9R is scheduled to be replaced in July 1995. We do not consider maintenance of this system to be a major concern at this time because most of the parts used are similar to an ILS that is currently supported by the Depot.

There were technical issues identified during testing of the airport surface detection equipment (ASDE-3). The required hardware and software changes are currently being incorporated into all ASDE-3 systems. The ASDE-3 experiences the same naturally occurring radar phenomena "multipath targets" as do all radar systems. The FAA is exploring alternative solutions to solve the "multipath targets" on the ASDE-3 system display. The airport movement area safety system (AMASS) is recommended as a solution for the problem. The AMASS is expected to be available in limited quantities by the fall of 1996 with additional units available in the spring of 1997. At certain airports, the multipath effects do not cause operational problems, and we plan to commission the ASDE-3's at those locations promptly. We will continue to work with the employees at ATL to agree on operational scenarios in which the ASDE-3 can be used safely.

Following the change out of some upgraded components, we expect the ATL terminal doppler weather radar to be in operation by the end of the summer.

All the equipment for the information display system (IDS) for ATL has not been purchased. Only the information display unit is on site. We must still purchase interface cards, install the IDS, provide training for both air traffic and airway facilities personnel, and purchase 17-inch displays instead of 14-inch displays as requested by tower personnel. We may have to modify the consoles to accommodate the 17-inch displays. We are attempting to identify funding to complete this project as soon as possible.

Currently, the FAA does not have a problem attracting or retaining controllers. We have a register of people who have applied for controller positions, over 4,000 former controllers have applied to be rehired, and our attrition rate is as low as it has ever been. We believe these are reasons why we should not extend the premium pay or increase the operational differential.

We are available to provide additional information on these or any other issues that you may have. Again, thank you for your concern and we look forward to working with you to improve and maintain the safest and most efficient air traffic control system.

Sincerely,

David Hinson

David R. Hinson
Administrator

Mr. OBERSTAR. Mr. Kim.

Mr. KIM. Thank you, Mr. Chairman.

I thank Mr. Hinson and Ms. Daschle. I know it is not easy to appear before Congress and try to justify the problems you have. That is why I really appreciate it. Nevertheless, I can not understand why we have ended up with such a chaotic mismanagement situation.

If the FAA was a private business, it would be bankrupt long ago. I think this very example of failing to effectively manage this program is in my opinion a strong signal in favor of privatization. There is no question that FAA has been less than forthcoming to Congress on these problems. And that has simply dug a deeper, deeper hole for us to try to get out of.

I cannot accept it. I do not accept the view that we have too much invested and therefore cannot back away now. Well, last year we canceled the Supercollider after we spent billions of dollars; thus I do not see why we should not cancel the AAS and start all over.

I have—we have no reasonable or reliable schedule or cost estimate for completion of this program. I don't understand why we should continue to support this.

I don't know who is responsible, but whoever it is, in my opinion, should be disciplined. If it were Members of Congress, well then, they should also be disciplined. And again I cannot support the position to just continue on.

Thank you very much again and I appreciate your appearance.

Mr. OBERSTAR. Mr. Horn.

Mr. HORN. Thank you, Mr. Chairman.

I agree with what the leadership on both sides of the aisle on this committee have said. I think there is a lot of wisdom in their comments. I would simply add to it my own experience as a university president. I learned long ago that after volunteering to be the first to establish a new system, that you should always volunteer to be the second after you have let somebody else establish the first new system.

But since there is talk and some of us are very favorable to that, the FAA having the rights of a government corporation to give it more flexibility, I do hope, Mr. Chairman, that there can be a joint staff study of the FAA and the committee staff in both parties to see what if anything might have been better if you had had the flexibility in, one, the decision-making and initiating the contract, and under the implementation of the contract.

I for one would also like to know is there something we can learn from what the Germans and the Swiss control systems are already doing that we might implement this in some incremental way? We face the problem of how do you salvage something.

I went with the chairman to look at the project about a year ago, I think it was, and this last weekend I spent an hour or two in the Los Angeles international airport control tower.

It is true as the chairman noted that we have almost a post-it system as we move slips around and we had great hopes in this. I think all of us, and I would hope we could look at what is already being done by some of the private control towers here, delta I believe among others, and the foreign experience and see if we can't get something on board and not try to do everything at once, but salvage what we can now and solve this in an incremental way.

Mr. OBERSTAR. I would suggest that the administrator not bite on the bait about corporatizing.

The gentleman from Michigan, Mr. Ehlers.

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

Just a few brief comments so that we can get to the testimony. I certainly sympathize with the problem because I have been heavily involved in computers in the past.

In fact, Mr. Horn, I was the first on my last project and it went very well, I am pleased to say. So it is not always dangerous to be first. But it is a very difficult and very complex area.

I do want to add to the comments made by Mr. Sangmeister and others. I think it is important to affix blame. I know it is not your first priority and I appreciate that, but I think we really do have to find out what went wrong here, if necessary, heads should roll, but that is not the main purpose of finding out what has wrong. We don't want to duplicate this either in your agency or some other agency. We do, in fact, want to find out what is wrong.

The other comment I would make, and I hope either you or some of the other witnesses can address this. There has been a real revolution in air traffic control within the cockpits in the past decade, in terms of the automation of the flight control computers and so forth.

We obviously have not had the same revolution in the towers or in the air traffic control centers. One thing I would like to have you or some of the witnesses address is whether or not we are off on the wrong track by trying to modernize the air traffic control system, but rather should be developing an interactive system that communicates directly with the air traffic—or pardon me, the computers in the cockpits, and therefore eliminates a lot of the chatter that goes back and forth.

I used to fly myself and I still enjoy when the pilot puts it on Channel Nine on the airliner, I sit and listen to the chatter, and so much of that can be transmitted much more efficiently, rapidly and effectively from computer to computer, and displayed on the screen in the cockpit.

So I hope either you or one of the others will answer that question of whether we in fact do not even—not only have we had trouble implementing it, but we are going on off the wrong track given what has developed in cockpit technology and some of the other things that can be done.

Thank you, Mr. Chairman.

Mr. OBERSTAR. If AAS gets fixed, much of what the gentleman is saying will be done. Voice switching and the automatic communication from ground to air by computer will take place, and then much of that is in place already, the software written, the hardware in place and available for it.

Before I recognize the administrator, two other colleagues, Mr. Costello.

Mr. COSTELLO. Mr. Chairman, in the interest of time, I would ask unanimous consent that my statement be entered into the record.

Mr. OBERSTAR. Thank you. Without objection, so ordered.

[Mr. Costello's prepared statement follows:]

JERRY F. COSTELLO
12TH DISTRICT, ILLINOIS

PLEASE RESPOND TO THE OFFICE CHECKED BELOW:

COMMITTEES:
BUDGET
PUBLIC WORKS AND TRANSPORTATION
SCIENCE, SPACE, AND TECHNOLOGY
(ON LEAVE)

Congress of the United States
House of Representatives
Washington, DC 20515-1312

OPENING STATEMENT

HONORABLE JERRY F. COSTELLO

SUBCOMMITTEE ON AVIATION

COMMITTEE ON PUBLIC WORKS AND TRANSPORTATION

HEARING TO REVIEW RECENT DEVELOPMENTS IN THE IN FAA's ADVANCED AUTOMATION SYSTEM PROGRAM

April 13, 1994

Mr. Chairman, I would like to thank you for calling the hearing today to discuss and analyze the delays and other problems with the FAA's Advanced Automation System. I believe it is critical that we, as a Subcommittee, look at what caused these problems to occur and study what has been done to remedy these problems. In addition, we must evaluate the FAA's management of the program to determine whether the problems can be resolved with as little increased costs and time delays.

I would like to welcome the panelists who have assembled to discuss this issue. I look forward to hearing your testimony and suggestions on how to improve the program. It is important that the Subcommittee be accurately informed on all aspects of the AAS system so we can make what will be very difficult decisions about the future of the program.

Among the issues I would like to hear about is the impact of terminating the program and losing the $2.3 billion invested to

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date. Is there a better way to provide the advanced technology to the air traffic controllers as necessary? Also, should the FAA re-contract out portions of the AAS contract to other companies? While we cannot be assured that these companies are better equipped than the current contractor, there may be no other alternative.

Again, Mr. Chairman, thank you for calling today's hearing.

Mr. OBERSTAR. Mr. Valentine. Fine.

The question is not in this hearing or for our purposes advancing the program, finding out who went wrong, but what went wrong, what systems failed us, what strategy failed in this process, and how best to fix it.

Clearly there is no fix, I say to my colleagues, and Mr. Clinger and I agree on this, more important than having an administrator in place who can from start to finish stay with a program and see to it that personnel and the programs and policies adopted are carried out, carried out the way they were intended.

You can't have an agency of this significance, a $8 billion a year program, that goes month after month after month without an administrator.

We changed administrators. They have lasted an average of 18 months in the last 10 years. No corporation could run properly if it changed its leadership that often. Change them often as you change night shirts, for goodness sakes.

At any rate, before more frustration boils over, Mr. Hinson, having been properly instructed and appropriately informed by more colleagues than ordinarily show up for a complete hearing, welcome.

TESTIMONY OF DAVID R. HINSON, ADMINISTRATOR, FEDERAL AVIATION ADMINISTRATION

Mr. HINSON. Thank you, Mr. Chairman.

Mr. Chairman and distinguished members of the committee, I have a brief opening statement I would like to read with your consent.

Mr. OBERSTAR. Proceed as you wish, Mr. Hinson.

Mr. HINSON. I appreciate the opportunity to appear before you today to bring you up to date on the status of my efforts to shape the advanced automation system, the AAS system, in a way that meets the critical needs of our air transportation system and ensures that the taxpayers receive value for their investment.

I have already made several basic changes to the AAS structure, and I am committed to making other changes necessary to get this program on track.

Mr. OBERSTAR. Mr. Hinson, would you please pull the microphone a little closer?

Mr. HINSON. Is that better?

Mr. OBERSTAR. That is it. That is fine.

Mr. HINSON. At the outset, though, I would like to emphasize that even with the problems that we have seen in the AAS program, our air traffic control system continues to afford the Nation's air travelers the safest air transportation in the world.

This subcommittee is well aware of the troubled history of the AAS program, which was conceived more than a decade ago as a way of meeting projected demands on our aging air traffic control system. Employing state-of-the-art technology and using automation to perform many air traffic control-related tasks, AAS is intended to accommodate increased air traffic in a more cost beneficial way and to provide greater efficiencies and safety in our air transportation system.

The underlying need for air traffic control modernization has not changed.

When I came to the FAA, I knew that a big part of this job would be to understand what was really occurring with AAS, and to see that the program was brought under control. I began my review of the program shortly after taking office. I learned within a few months that the cost projections for this program, that were presented to you and this committee late in 1992, were flawed, and that a likely corresponding schedule impact would occur.

I notified you and other congressional committees of that finding, and outlined for you a series of steps I was immediately taking to bring the program under control.

I am dissatisfied with the execution of this program. However, I am less interested in affixing blame for the poor showings than I am with shaping and managing a program that will accomplish what we need, and do so in a timely and financially and fiscally responsible way.

Last December, I described for you the plan for doing just that. Let me take a few moments now to outline where we stand in this effort.

My first action was to charter a 45-day review of the financial and schedule status of the AAS program under the direction of the deputy administrator and chief counsel, to further identify risks to program completion and cost. That intensive review is complete.

In brief, the review shows the potential for both cost increases and program slippage. It reflects a range of costs from $6.5 billion to $7.3 billion, for completion of the program, and slippage of implementation dates for the Initial Sector Suite System, or ISSS, from 9 to 31 months.

Let me restate that because that sounds like it was going to go from 9 months to 31. The range is late by 9 to 31, depending upon the assumptions. A particular area of risk identified in the report was to excess testing while simultaneously developing critical functions for AAS.

The critical analysis performed by this group points out that the AAS program, if unchanged, would pose uncertain cost and schedule increases that are unacceptable.

This conclusion reinforces the criticality of work efforts now under way. An assessment of technical and managerial issues of AAS by the Center for Naval Analysis, or CNA, and an AAS requirements revalidation group comprised primarily of in-house technical staff.

I tasked CNA with conducting an independent 90-day review to assess the organizational, management, and financial concerns associated with the AAS program. As part of this process, CNA will provide me with recommendations on realistic solutions to the problems that you have previously outlined and have plagued the program.

I wanted that unvarnished look from an outside group with experience in large scale software development systems to provide me with options for the future direction of our automation efforts. Although they recently updated me on their efforts, their report is not yet finalized.

I can assure you they are deeply involved in our review of the program, and that their recommendations will be important to me in this process.

On a separate track, I chartered a group within the FAA, which includes representatives from DOT, DOD, and CNA, to examine the appropriate operational requirements for AAS, and to scrutinize the previously established system requirements for current validity. Every aspect of the AAS program is on the table for review. They are looking, for example, to determine if there is a demonstrable need for the extremely stringent specifications for system availability that were previously set, given technological advances in the last decade, and whether each program segment of AAS is justified.

Their review is also focusing on determining the benefits provided by particular AAS requirements, as a means of validating their continuing need.

Later this month, I expect final reports from both CNA and the revalidation team. The data that they are providing, along with the information developed in the 54-day review, is being integrated and analyzed by a top level program restructuring team under the direction of a new AAS program director.

This team is examining all options for program restructuring, and is focusing on both short-term and long-term deficiencies within the air traffic control system. The team is assessing, for example, how best to address short-term problems caused by our rapidly aging automation equipment; determining whether currently planned TAAS and TCCC systems are still needed, or whether FAA's terminal and tower automation needs can be satisfied by existing, commercially available systems; and whether it still makes sense to deliver an Initial Sector Suite System that will be supplanted by the Area Control Computer Complex, or ACCC, or whether current technology permits delivery of combined ISSS and ACCC functions.

The program restructuring team will be guided by several fundamental principles. First, any proposed system changes must be determined to yield operational benefits in excess of their cost.

Second, to the extent feasible, high risk activities will be minimized and the use of available off-the-shelf technology will be a preferred option.

Third, we must be able to afford the program changes.

Fourth, realistic funding and implementation schedules must be established and timely implementation of elements of the system that provide high user benefits is favored.

This team will provide me with recommendations and options for a reshaping of the program.

My current plans are to make immediate decisions required to proceed with the program, by the end of May, in cooperation with the Department and OMB. Along the way, as discrete decisions are made on components of the overall program, we will act quickly to effectuate those necessary contract changes.

I am, of course, anxious to put in place the right approach and recognize the difficulties of contract administration until we do so, but, in view of the history of this program, I am insisting that within the agency that we take the time necessary to ensure that we are doing the right thing in the right way.

I have also taken a number of management steps within the Agency to improve the execution of this program. I have changed the AAS management team and designated a new program director. We have increased our on site presence and oversight of the contractor's efforts. Immediately after ACCC was identified as the segment of the AAS program having the greatest potential for additional cost growth, we suspended funding for work on the ACCC part of AAS.

We have instituted a number of steps to more tightly control contract cost and schedule. We have also acted to further concentrate senior management attention on the program. There will be frequent status reviews of the program by the Deputy Administrator and me, and senior-level operating officials within the Agency will ensure that requirements change proposals are necessary and cost effective.

Before closing, Mr. Chairman, I would like to stress that the automation of our air traffic facilities is a top agency priority. I am committed to seeing that we define a workable program, delete unnecessary and unduly costly features, and establish an implementation and funding schedule that we can meet.

It is a difficult challenge given the complexity and enormity of the program, but it is one we must meet. I am confident that the steps I have taken to address the programmatic and funding issues will provide me with the right kind of data to make the right choices.

We will act as expeditiously as we can, and we will keep you and your staff informed of our efforts along the way. I know we all share the common goal of bringing about the critically needed improvements in our air traffic control system, and I appreciate very much the support this subcommittee has provided the FAA in this effort.

That concludes my prepared statement, Mr. Chairman. I am prepared to take your questions.

Mr. OBERSTAR. Thank you very much, Mr. Administrator.

I also want to say at the outset for all my colleagues on the committee that Mr. Hinson has made himself personally available, his staff, and Deputy Administrator Linda Daschle, to the committee, to myself, to Mr. Clinger, to any other Members who are available at times that we were having briefings and to our staff to be responsive all throughout this process.

I commend that openness, that spirit of cooperation. I think that is a prime ingredient in getting things done.

Mr. HINSON. Mr. Chairman, may I add one additional statement before the questions begin?

Mr. OBERSTAR. Certainly.

Mr. HINSON. I think it is important, listening to the comments that have been made this morning and reading the press, to notice one fact I think is very important. There is an aura of enormous cost overrun with this program. The facts are that we have only appropriated $1.4 billion for this program. We have spent between $1.2 and $1.3 billion to date.

The purpose of my review and the work we are doing within the FAA is to make sure that we don't spend $7.3 billion or $6.9 billion. We have that opportunity in front of us.

I am concerned that there is a broad misunderstanding of the fact that we have already spent $6.5 billion or $7.0 billion or some number in between, and that is not the case.

Mr. OBERSTAR. That is quite right. It is very important to note that. I have been at pains to try to explain such, that the estimates of cost overruns, what we are dealing with, and trying to prevent.

Of the $1.4 billion, much of that has been sunk in hardware development that is of such capacity that it can adapt to any software changes that may be needed.

Mr. HINSON. Yes, sir.

Mr. OBERSTAR. The first question I have is when is the acquisition executive that you have identified as crucial to the continuity of this program and completing the changes that you have envisioned, when is that person to be on board? What clearances are needed? Is this one of these that has to go through this whole factor of review by OMB, ethnicity, gender, geography?

Do we have to go through all that process, or do you have the authority to pick the right person and put that person in place and say get to it?

Mr. HINSON. Mr. Chairman, you are referring to our conversations about issues that are important in the AAS program, but they are also important in the overall management of the acquisitions and systems development processes within the Agency.

Mr. OBERSTAR. Exactly.

Mr. HINSON. And I can tell you this morning that on April the 15th, Dr. George Donohue presently with the Rand Corporation in Santa Monica, head of their Air Force program, will be joining the FAA as a special consultant to me, who will be working closely with me and senior FAA officials to evaluate the way in which the Agency is organized relative to major systems acquisitions, systems development, the introduction of new technology, and in short the way we go about managing these processes for the air traffic control system.

Dr. Donohue has a distinguished background. So I am optimistic that he will bring some new insights, some new views, and certainly some new intelligence to the Agency. And I am looking forward to working with him.

I would expect that we will spend 60 to 90 days together so he can understand how the Agency works and we will sit down and decide how to go from there.

Mr. OBERSTAR. That will be a temporary appointment?

Mr. HINSON. Well, I am optimistic that it will evolve into a permanent appointment.

Mr. OBERSTAR. Thank you.

You have said that a 20-month schedule slippage and a 6.9 billion dollar program cost estimate to completion are unavoidable. And of course we agree with that. What is acceptable from your standpoint? And behind that, I have the concern that Loral or other corporations may suggest that we do not need to spend as much as may be suggested by the Daschle report.

In fact, we spend less and possibly get in return a lot less in terms of functionality. What I have seen, in some of the changes made, may lead us in that direction, in order to get something on board quicker, do less, get less system, get something that is operational.

Have you determined how much the government can afford to spend on putting in place the major components of the AAS?

Mr. HINSON. Mr. Chairman, let me first answer that question by complimenting my deputy and my chief counsel for the very excellent report they created, pointing out the potential cost increases and schedule problems.

Mr. OBERSTAR. It is my bible.

Mr. HINSON. Thank you.

If we were, in fact, to pursue the program to its end as it has been envisioned and set out, I view that report as an early warning that says to me, look, we ought to investigate looking at this another way and see if there are alternatives that make sense.

It was in that context that I asked that we create an Internal Revalidation Committee within the Agency that includes DOD and CNA personnel, to go back and look at the original requirements for the program that were set in 1987 and 1988, and in view of today's technology, ask whether these are the requirements that we want for the AAS program today.

As I said in my testimony, I expect to receive that report in the very near future, within the next two weeks certainly that report, coupled with CNA's analysis and a whole host of other oversight reports that have been submitted, will all be integrated into a strategy to put the program on track.

I hope that the result is a program that will be fiscally responsible, but I am unable today to tell you what the cost will be. But our objectives certainly will be to try to spend as little as possible to get the best system as possible.

Mr. OBERSTAR. The short form answer is no numbers yet? That has to come. You are going to identify that. You will report back to the committee. We will arrange a forum for Members to receive that report.

Mr. HINSON. Yes, sir.

Mr. OBERSTAR. Who is involved organizationally in the FAA restructuring team? Can you identify the people, the players, the ones we could look to to provide this guidance?

Mr. HINSON. Yes, sir. The acting—let me first tell you that two parties associated with the program are no longer with the agency and one has been reassigned. That is to say, the acting administrator has retired, the senior official in charge of acquisitions has joined the Department of Defense, and the program manager has been reassigned within the Agency.

I have named a new program manager, Mr. Robert Valone, who began this process about a week ago. Mr. Valone brings a distinguished record from NOAA, where he managed two major programs that were in some difficulty. With great skill and hard work he turned those programs around.

I am confident that he brings to the Agency the requisite skills and hard-nosed business sense that is necessary to keep this program on track. You had mentioned earlier, Mr. Chairman, the necessity for nailing shoes to the floor with respect to requirements. Mr. Valone is keenly aware of the problems that changing requirements cause, having found this to be part of the problem he inherited when he went to NOAA. I am confident that he is very sensitive to that problem and will be, shall I say, very forceful.

Mr. OBERSTAR. He is the principal person and others are—

Mr. HINSON. I am sorry, I didn't get to the entire scope of the team. We formed with Mr. Valone's leadership what we call a tiger team, which is comprised of a number of disciplines within the Agency, contracts, legal, finance, technical and so forth. This tiger team working with Mr. Valone has total authority to restructure and reshape this program subject to my approval.

They also have the authority to cross boundaries and departmental lines within the Agency to get the job done.

This is a concept that has been used successfully in other parts of the Federal Government in managing large programs and I am confident that it will be successful here.

Mr. OBERSTAR. How many sign-offs are they going to have to have in order to get things done? I say that because one of the obstacles that you yourself have identified in sheer frustration is the number of people that have to sign off on something within the FAA. Everybody has a veto before a thing can be done, as many as 14 or 15 sign-offs before anything can be accomplished, which takes weeks and maybe months. Are you going to cut through that stuff?

Mr. HINSON. Yes, sir. This committee has the authority to do what is necessary.

Mr. OBERSTAR. I have a number of other questions of some significant detail that I will get to later, such as closed versus open architecture and the Loral role and others, but we do have 11, or had 11 Members, pretty close to that number still; and everybody will have five minutes.

Mr. Clinger.

Mr. CLINGER. Point taken, Mr. Chairman.

Thank you, Mr. Hinson, for your testimony. Following up on this nailing the shoes to the floor metaphor, it seems to me part of the problem here has been that development of components of the system have been outstripped by developing technology.

In other words, the technology has been ahead of the curve and development is always trying to catch up and not quite getting there.

Is that a fair assessment of part of the problem here, that we had a kind of a rolling target in terms of not just requirements, but also the availability of state-of-the-art technology was changing as you were trying to put these things in place?

Mr. HINSON. Yes, sir. That is exactly correct. In fact, you will probably hear, I would anticipate, in testimony from others that will be appearing before you, that—and we would probably agree that the approach taken in 1987 and 1988 to put this program into place, particularly with respect to the development of the software, would be different if we were starting the process from scratch, and to a large degree has been overtaken by the rapidly changing technology of the computer business, and in particular software development.

Mr. CLINGER. So that perhaps it was not at that time the vision did not contemplate that there would be the need for rather dramatic changes in the process?

Mr. HINSON. No, sir, and I think in five years we will look back at 1994 and see the same technology change. We simply can't see what will be available in 1999 and the year 2000 right now. Nor could we see 1994 from 1988. However, since we have come to this point, we do have an opportunity, and we will consider of course the right strategy, to bring as much of that new technology to bear as possible.

Mr. CLINGER. Flexibility would seem to me to be very key in that, that there is perhaps too much rigidity in the process. One of the criticisms that have been leveled here is that historically FAA was basically the driver of the research and development, that you were setting goals and directing research. That is no longer true and should no longer be true, and really we need to be contemplating the private sector as a much more active player in terms of research. If we are looking at going to off-the-shelf developments, would you agree the FAA should sort of step back from that role that they have previously played in directing research?

Mr. HINSON. Yes, sir. There are two ways to look at that. Well, actually more. But historically the government, and particularly the military and the FAA, have carefully and clearly defined the requirements for the systems they wanted developed to accomplish certain tasks. And the FAA of course is very good at that and can create very specific documents, outlining carefully exactly what is to happen and how it is to happen.

As this particular case points out where software and data processing efforts are concerned, we probably evolved to a point now where the private sector is developing their technology at a rate which makes it very difficult for any agency, not just the FAA, to a real specific degree define the requirements. Because by the time you do that, there is new technology that would cause you to rethink your position.

Said another way, rather than the industry being driven by government requirements, I think we are evolving slowly to a position where the industry, that is the private sector, will drive government decisions. We are really reversing roles as a function of time and technology.

Mr. CLINGER. Well, I think that is the direction I believe we should be moving in this.

I have a question. Mr. Shuster the Ranking Member of the full committee was not able to be here, but he had some questions that he wanted me to pose. I will just pose one of them, and then I would ask to submit two or three others for a written response, if I might.

The specific question that Mr. Shuster asked me to pose is what is FAA's position on the proposal by Database Service Systems, Asti and Conwall, to replace the DCC computer, and do you contemplate when the decision would be made whether or not to accept the proposal that that consortium has made?

Mr. HINSON. I don't know the answer to that question, but I will get it for you and be happy to submit it to you in writing or orally, either way, as immediately following the hearing.

[The following was received from Mr. Hinson:]

The FAA is considering several alternative solutions to the problem of aging Host and Display Channel equipment. The Data Base Server Systems, ASTI, and Conwall alternative was received, however, that system failed to meet FAA requirements.

Mr. CLINGER. As I say, there are two or three others Mr. Shuster asked me to submit. I will submit all four of them for consideration in writing.

Thank you, and my time has expired. I am abiding by the Chairman's stricture to shut up.

[The information received follows:]

Responses to the three additional questions submitted by Mr. Shuster follow:

Question. With the Display Channel Controller (DCC) computers nearly 30 years old, and the Advanced Automation System seriously delayed, are you concerned that FA will not be able to provide safe and reliable Air Traffic Control for the flying public?

Answer. Although the DCC equipment in the en route centers is between 20 and 30 years old, it continues to provide for safe and reliable air traffic control. As is normal for aging equipment, the number of component failures has been increasing, requiring increasing amounts of maintenance activity. However, these systems have considerable redundancy and a completely independent backup system, and safety has never been compromised.

Question. What is the cost to maintain these DCC computers until AAS is ready?

Answer. Current life cycle costs for maintaining the 5 DCC sites are $5.16 million per year.

Question. With a reported $16 million cost for parts per year, it is economically sound to wait an additional 5 to 7 years to replace the DCC computers?

Answer. As mentioned above, the total cost of maintaining the five DCC sites is $5.16 million per year. Included in this amount is $350 thousand for spare parts. We had estimated that the total cost to maintain these systems until the earlier-estimated ISSS implementation date would be $15.5 million over three years. The potential for additional ISSS delays has heightened our concern regarding the cost of longer-term maintainability of the system. We are in the process of examining safe and cost-efficient options that would allow for replacement of worn-out equipment with an interim Display Channel replacement system, if necessary.

Mr. OBERSTAR. Mr. Mineta.

The CHAIR. Thank you very much, Mr. Chairman.

There is some thought about do we have to find a scapegoat? Let me ask about that in this sense. It seems to me as we look back on this thing, we have had consultants on top of consultants on top of consultants. How many more are we going to have, besides those in this room?

Mr. HINSON. I am not aware, Mr. Chairman, that there are any consultants that have been brought to the FAA to address the issue or issues that I am asking Dr. Donohue to work with me to address.

It is true we have had a number of consultants and continue to have a number of consultants, specifically attached to the AAS program, to assist in providing management and oversight. We also have consultants, as you know, who work with us in other aspects of the Agency, technically with the rest of the capital investment program and so forth. But I view AAS as a symptom of another issue and that issue is how and what are the right ways for the Agency to manage the technical and program demands that it faces today and will certainly face in the future with the continued growth of air traffic and aviation? Certainly that is going to happen.

In fact, our forecasts show that domestic air traffic will again double in the next 17 years. That sounds like a long way away, but to overcome the inertia associated with that kind of change, we are going to have to work very hard. We are going to have to run hard to be there.

The CHAIR. If this contract had run on time, I suppose we would have been in a timely way to be able to handle that, without any question. You know, one of the things that really bothered me right from the beginning, and IBM has a very large installation in San Jose, the General Products Division—or it used to be called the General Products Division. It is now called Systems Storage, but I have always wondered why we had, frankly, ended up with IBM?

They are a mainframe computer type. Here we were talking about personal PCs and open architecture. I have always wondered how we did end up with them. But besides that, you know, we had people who were supposed to be, I guess, contract managers or systems integrators, people who we paid 60 to 80 million a year.

What were they doing? Why wasn't someone able to short cut what you discovered, what others have discovered along the way, saying, "Hey, there is something wrong here and it came to a head in December when you called us and said things aren't well?"

What have we been paying these people for? What have we gotten out of the money? You say, sure, we haven't spent 6.Whatever billion. We have only spent 1.1, but what the hell have we gotten for the 1.1 we spent?

Mr. HINSON. Actually, quite a bit, but let me answer your first question. With respect to the oversight consultants and partners that we have in helping us manage the program, one of the tasks that I assigned to CNA was to address that very question.

I asked the same question you did, Mr. Chairman, exactly. Where have those consultants been with respect to adequate oversight? And that begs a lot of questions. Did they provide it and we ignore it? Did they not provide it? Was it something in between?

Are they necessary to continue? Should we still have them? Should we get rid of them and get somebody else? There are a whole host of questions that fall from your premise and I am optimistic that in the CNA analysis, when I receive it, I will be getting information that will sharpen our view of this relationship.

The CHAIR. Let me then turn to, in the design of the system, whatever the design of the system is, who is the customer?

Mr. HINSON. At the most extreme end, the real customer is the airline passenger. The air carrier would, of course, be the next, the airline involved or the airplane involved with would be the next customer back toward the program.

The next customer would be air traffic control system itself, those people who provide and have to use the system to give safe air traffic control. And then back from that would be the Federal Government, representing the taxpayers.

But the real consumer, the real customer, is the airline passenger or the private airplane passenger. Those are the real customers.

The CHAIR. Yet, regardless of whether it is the airline passenger, the aircraft, airline, the air traffic controller, I wonder whether or not in the specifications of this and in the ultimate design of this whether any of that has been kept in mind.

I mean when Mr. Oberstar and I talk about 57 T stroke, we wonder why is it then the air traffic controller has to go through all of that, if they are a customer, why is it that ultimately as you have indicated—and I think you are one of the first to ever say it is—the passenger sitting on that seat somewhere in an airplane that is a customer, no one's ever talked about that person, but everywhere down the line I think there has been—those folks haven't been taken into consideration.

That is why I ask the question, who is the customer on this?

Mr. HINSON. I think you are absolutely correct and I hope that I am bringing that view to the Agency.

The CHAIR. Now, there has been some talk about having the ISSS deployed before FAA acceptance. I am wondering if this is something that is an approach we ought to be undertaking or do we really want to see this thing tested, evaluated, before FAA accepts it for deployment?

Mr. HINSON. Mr. Chairman, there is a test protocol that is established as part of the ongoing relationship with IBM/Loral. That test protocol is on the table, like everything else in our review. I expect to see from our revalidation team and from CNA's analysis recommendations regarding whether or not the planned test protocol for introducing ISSS, for instance, is the most prudent test protocol.

I will be able to tell you that, sir, hopefully toward the end of May, early June.

The CHAIR. In the final analysis, if I could very quickly, and I apologize, Mr. Chairman, but it seems to me we are either going to end up with something that is going to cost this much, and we get this, or we say, no, we intended this and now maybe the cost is going to be this.

Do you have any idea now as to what direction we end up with, less functionality, less what we got for, and still paying, making available the amount of money that is available for you in terms of appropriations and further plans?

Mr. HINSON. Our challenge is to make sure that the original objective of the AAS system, in order to provide all of the capabilities you were discussing, is still available to us when we finish. And hopefully by carefully reevaluating the direction and the requirements that are on the table, plus looking at new technologies that are available, we might, and I underline the word might because I don't know, we might be able to achieve all of the original capabilities desired within reasonable costs. If you were sitting in my shoes you would face these options.

The first option, and the most extreme, is to cancel the program, and that option is still on the table. That is part of the analysis we are doing.

The opposite extreme is, well, it is unfortunate that it costs this much and it is late, but it is what we want and since I got here at this time and wasn't here earlier my recommendation is to make this investment and get everything we wanted and this is the best way to do it. Those are basically the definitive boundaries of options.

As the Chairman stated in his opening remarks, it is probably somewhere in between. I am not sure how it will fallout. But clearly, we would like to have more capability than we started out with for less money than we intended to spend.

I am not sure we can get there, but that is going to be one of our objectives.

The. CHAIR. Thank you very much.

Thank you, Mr. Chairman.

Mr. OBERSTAR. Mr. Ehlers.

Mr. EHLERS. Thank you, Mr. Chairman. Just a few points.

First of all, I think a key factor or very important statement you made was that this program is a symptom. And I really think that is the nub of what we are discussing here, what you need is a different paradigm by which the FAA operates and develops systems such as this. And I know Secretary Pena has talked about creating a separate corporation, Federal corporation, to take on projects of this sort. I don't know if you wish to comment on that or not. If you do, you are welcome to. But I will give you a out if you don't.

Also, the second point I wanted to make, is really a question, in the review you are going through now and the analysis of the problem, are you going all the way back to the beginning and saying perhaps we picked the wrong design parameters to begin with? Because my preliminary experience on projects of this sort is that frequently the problem started before the project really began, before you even hired a contractor.

I am just wondering how far back are you going in your analysis and your review of what the options are that you have at this point?

Mr. HINSON. Congressman, I think you make a good point from this view. First, I think my principal responsibility is to help all parties involved get the program on track and get immediate solutions for immediate problems so that the customers can see the rewards.

Then there should be a lessons-learned opportunity for those of us who are involved in managing a program like this. I would expect that we will go back and try to see what we can learn from the way we went about this. In fact, I would expect that Dr. Donohue, when he starts working with us on the 15th, will want to do that.

For him to be able to be actively involved in leading the effort for a systems development acquisitions and technology, he is going to have to understand where we were and how we got where we are. So I think that will fall out in in any case. I would like to change direction for one minute and answer the question you raised in your opening statement about interactive communications in the cockpit.

The program that is part of AAS has the capability to provide discrete cockpit air traffic control, nonverbal communication. We are presently defining the parameters, for instance, for data link through satellites, so that there will be a standard used by everybody in the world, which will allow aircraft to communicate via satellite to air traffic control, both actively and passively; passively because we want to know where the airplane is so we can put airplanes closer together safely over the ocean to improve the economics for air carriers, and actively if the airplane needs to talk in a verbal sense to air traffic control or anybody else for that matter.

We already have—you might be interested in knowing, we already have passive clearance delivery to scheduled air carriers so that if you go to Washington National today, you will not hear very many clearances being delivered verbally to air carriers. They are all being data linked. So where you are taking us is exactly where we are going.

Mr. EHLERS. I appreciate that. It was my understanding—and you will have to forgive me for any ignorance I display, I am the new kid on the block, only been here a few months—but my understanding that much of that was in the later stages of the project and might possibly be scrubbed and that was one of the concerns I had.

Mr. HINSON. I know of no reason to want to scrub that. In fact I think everybody in the Agency and the community, the aviation community, would view data link communication, passive communication, nonverbal communication, as essential to the future air traffic control environment.

Mr. EHLERS. I wasn't worried about you scrubbing it. I was worried about us scrubbing it, because of the problems that the project has had.

Mr. HINSON. No, sir. I think that is built in. I don't think that is a problem.

Mr. EHLERS. Okay.

If I, Mr. Chairman, may just continue a little bit. Getting back to the point I was making about analyzing the early stages of the project, I am not just interested in analyzing it to find out what went wrong, but it gets back to the basic question that Chairman Mineta was asking you and which you are referring to in your decision of whether or not to cancel the project.

My gut reaction is we should not cancel it, we are too far along, but at the same time if the initial design, project design and the parameters chosen for the system were such that it makes it virtually impossible do it at a reasonable cost, you may have to go back. And so my real question is, are you reviewing those basic decisions at the early stage? Did they make sense, do they still make sense? And is that really the optimum system we are working toward?

Mr. HINSON. Yes, sir, we are. We have a validation—I should call it a revalidation effort under way within the Agency, and I indicated earlier it had members from the Department of Defense and CNA as well. Basically what they did and what they are doing, they have gone back, taken the original program that was delineated and set forth in 1987 and 1988, taken the assumptions for the requirements, and they are challenging those assumptions in view of today's technology.

I am optimistic and hopeful that when we are concluded with that, they will be able to change or alter the existing program in a more cost efficient and effective way if necessary.

Mr. EHLERS. Good. Thank you very much.

Mr. OBERSTAR. The gentleman displays his scientific background in the careful thoughtfulness of his questions. Then we need perhaps another physicist on board this committee to be as insightful as the gentleman has demonstrated himself.

The CHAIR. Mr. Chairman, would you also yield?

Mr. OBERSTAR. Yes.

The CHAIR. Especially because he is from the University of California at Berkeley.

Mr. EHLERS. That is where I learned to fly and go into space very early.

The CHAIR. I didn't think of it in that respect.

Mr. EHLERS. I know you didn't and obviously did I not do that, either.

Mr. OBERSTAR. At the gentleman's question, though, about the background of this and the evolution of this contract, I think it is important to note that, and this is a good point to do it, that in 1986 and 1987, when the final plan for AAS was being written, FAA wrote what the contract specialists called a B specification, one that is frozen in time.

In shorthand or in layman's language, they ordered a three-layer chocolate cake with frosting and specified all the ingredients and how it was to be made. They wrote very detailed specification for technology that did not exist at the time and the FAA was pushing the state of the art. But by the time the contract specifications were written and the bid process had run its course and the appeal had been gone through, revolution was taking place in the computer industry. Forces other than DOD and FAA were driving the state of the art of technology in computers. And the IBM commitment to mainframe technology and to massive systems done all at once instead of systems that were broken down into smaller bits and pieces, dominated and prevailed over this whole process. FAA had bought into the concept and instead of thinking of itself as a customer, it was thinking of itself as the producer of this massive system. And both IBM and FAA became locked in, a sort of intellectual arterial sclerosis set in.

I think that is what we will find is the problem. The Chair, with unanimous consent, will submit to the witness statement—questions from Mr. Valentine, which he would like to receive in writing and answers to which he would like to receive in writing and so would the committee.

Mr. HINSON. Yes, sir.

Mr. OBERSTAR. Without objection, that will be included in the record at this time.

[The information received follows:]

Responses to questions submitted by Mr. Valentine follow:

Question. Since the "cure" letter of late 1992, the scope of the Advanced Automation System (AAS) has decreased tremendously. AAS no longer includes oceanic enroute equipment upgrades, most TRACONs, and small towers. What is the interim Support Plan to address the deterioration already occurring in these areas, and is the FAA looking at new technology to upgrade these areas?

Answer. *Ocean:* Since it became apparent that IBM's delivery of oceanic functionality under the AAS contract was going to be delayed and since the surveillance and flight data processing for Oceanic ATC is significantly different from domestic, a decision was made in 1992 to perform that function separately from the AAS. In the near term, the FAA will replace the existing controller input/output devices and will add air-to-ground and ground-to-ground datalink capability to the existing oceanic automation system to improve controller to pilot communications. For the longer term, the FAA will award an Oceanic Support and Development System

(OSDS) contract which will add further improvements to the existing oceanic automation and replace it with a new design by 1999.

Terminal: Almost all of the Interim Support plan (ISP) activities of the Capital Improvement Plan are complete. Ongoing functional, capacity, and maintenance upgrades to the ARTS IIIA and ARTS IIA systems will assure their viability until 2005. Some of the hardware will be nearing 30 years in service by then, so we are taking steps to begin replacement of that hardware. To address concerns about the service life of the ARTS IIIA Data Entry, and Display Subsystem (DEDS), we are replacing the DEDS power supplies.

Small Towers: The tower automation segment of the AAS, the Tower Computer Control Complex (TCCC), benefits large, high activity towers (level V, level IV, and some level III's) with predominantly commercial air carrier traffic. The smaller (some level III, level II, level I) towers have significantly less activity and a greater mix of general aviation flying under Visual Flight Rules (VFR). Fielding a TCCC at the small towers would have little benefit. Also, the smaller tower automation needs have not been identified as critical and are met by the current levels of automation.

Question. The FAA tends to emphasize procurement over development in its acquisition cycles. Then once a contract is in place the FAA has had to develop equipment which cause delays. What steps has the FAA taken to improve the long range planning of Air Traffic Control system modernization to include anticipating the need to develop technology before applying it?

Answer. We agree that development should be completed prior to production and that mixing a large amount of development into a production contract is a prescription for failure. In the past, it was believed that the government should only prepare a very top level specification and that the production contractors should be allowed to work out the details. However, when these specifications need refinement, contractors will use "change of specification" as a reason for cost overruns. We intend to institute the proper method of procurement where development in the form of engineering models or prototypes are built and tested prior to entering into production. Maximum use will be made of non-developmental, commercially available hardware and software.

Question. Software development and management have been a particular government failing. Typically, the software requirements and design are changing in an almost vicious circle until cost, schedule, or performance issues force a resolution. In AAS, the software volatility is sometimes over 100%, meaning each line of code is changing more than once since creation. What is the FAA doing to manage the technology of software development better?

Answer. The FAA has recognized the significant effect of software management on program costs and schedules. In May 1991 the FAA Acquisition Review Committee, using the OMB A–109 Acquisition process, approved a Mission Need Statement to establish an FAA software focal point and program office. Subsequently, the FAA performed a Phase 1 alternatives analysis and received approval to proceed to the acquisition execution phase on October 4, 1993. The approach the FAA is following for improving the FAA software management process is based upon a model similar to the Software Engineering Institute's (SEI) Capability Maturity Model (CMM).

The mission focus is to ensure that the acquisition and operational support workforce adopt and practice sound software systems management principles. This will be accomplished by: developing software guidebooks and handbooks; providing training and technology transfer; providing software consultation support to projects; providing lessons learned and case tool information; and promoting communication with other organizations.

Since October 1993, we have specifically focused on developing software acquisition guidelines, initiating training classes, and limited software consultation support.

Question. The FAA has struggled to upgrade its older system because new hardware and software are not easily substitutable with old hardware and software. What is the FAA doing to ensure that future acquisitions use "open architecture" and are therefore designed and developed to be easily upgraded?

Answer. The FAA realizes that "Open System Architecture" offers many advantages for the design, development, deployment, and life cycle maintenance of automated air traffic control systems. To this end, the FAA is currently developing an open systems policy that will require the use of open system architecture for system development when such systems are justified. The policy will emphasize the application of recognized standards to achieve the open system goals of portability, interoperability, and extensability. These characteristics will ease the development process and allow timely system upgrading. The open systems order is planned to be published by the end of the year.

Question. There has been some discussion of bringing in outside contractors to shore up the Federal Systems and FAA management efforts. Shouldn't the government be looking long term at interagency coordination, possibly through OSTP, to identify promising software development solutions since these problems are prevalent at all Federal agencies?

Answer. We agree that applying the most competent talent to the job is not only the proper, but the most efficient way of doing business. Using the Office of Science and Technology Policy to identify solutions is an option to meeting this need.

Question. AAS software must be tested to the highest levels to assure that no failures can occur which would cause death or serious injury. However, at present there are no infallible tools which can provide this assurance either for AAS or other flight critical software in commercial aircraft. What research is underway to improve software testing techniques?

Answer. Industry and academia are currently focused on developing adequate tools and techniques that can be utilized to test software reliability. In recognition of this, the FAA has tasked support contractors with the job of researching the various testing techniques currently in use by industry and recommended by academia.

Research efforts have involved reviewing the software reliability testing techniques employed by various contractors that develop software intensive systems for the FAA; attending related IEEE (Institute of Electrical and Electronic Engineers)-sponsored symposiums; and contacting universities that are conducting research in testing for software reliability. Our research has yielded information on techniques that can be used to provide assurances that developmental software is being adequately tested for reliability.

A few of the techniques discovered during our research involve the following: modular development and testing of software units; listing and categorizing the failures found during testing according to the module tested; deriving an exponential curve which exhibits the desired software reliability and availability and plotting the number of failures found during testing against that curve to ensure that the number does not deviate significantly from the derived number on the curve; increasing software testing performed by the contractor and by the FAA to reveal more failures; and correcting the software that causes the failure and retesting the software to provide assurances that failures will not occur again. Increased testing on crucial software that directly affects safety can also provide assurances that life threatening software failures will not occur.

We found that our developmental contractors are utilizing these testing techniques to verify that the software they develop will meet specified reliability requirements. We are continuing to invest time and effort into researching and improving techniques in this area.

As of May 18, IBM has been paid a total of $1,206,795,954.71 under the AAS contract. Of that amount, IBM has, as of April 29, committed a total of $609,338,652 to payment of subcontractors.

Mr. OBERSTAR. The gentleman from Illinois, Mr. Costello.

Mr. COSTELLO. Thank you, Mr. Chairman.

Mr. Hinson, I am more interested in where we go from here. So I wonder if you would indicate for us a time line as to when you will be in a position to make recommendations as far as the future of the AAS program.

You mentioned in your testimony that there are some immediate decisions that will be made by the end of May that you think you will be in a position to make decisions then. You have a team assembled at FAA that will be looking at some both short-term and long-term decisions.

I wonder if you might tell this committee at the end of May what decisions will be made, at least what issues will be addressed at that time, and give us a time line as to when you will be in a position to make a recommendation to either cancel the program or exercise one of the other options.

Mr. HINSON. The first steps in restructuring the program that will take place toward the end of May, are to understand the recommendations of CNA and the revalidation team. Also, we will carefully continue to digest the several reports that you will hear about later in this hearing from the various overseers, such as OMB, the IG, and several other organizations who have input.

The context of our decisions will be evolutionary in the sense that we are not going to have what the Chairman referred to earlier, and what I call the big bang approach, which is to define the entire program in a broad context and say that is it and we can do the whole thing.

I can't specifically anticipate what recommendations will fall out of the path we are going to follow after we go through all the analysis, but we have to do a number of things fairly quickly. We have to get our agreement with a contractor in place.

We have to decide which parts, if not all of the AAS program, are going to continue and under what circumstances. We have to decide whether or not the existing architecture that everybody refers to as quote, not open enough, what architecture we may want, or whether the existing architecture is in fact okay.

We have to decide how the budgetary will impact the rate at which we can continue to make investments in this program. You are not going to be totally happy with my answer, because I am going to be a little bit fuzzy because I really don't know the answer yet. I would hope that after we take the initial steps in late May and early June, we will start to get a fairly clear picture in more precise terms about where we are headed within 60 to 90 days I think that is necessary.

One of the things I am very concerned about is while there is an urgency to get the program on track, I don't want to make a mistake. I don't want to have to come back up here next year and tell you, "Well, we didn't do it." So I am going to err on the side of conservatism and maybe be a little slower than everybody would like to make sure we get it right. But it is evolutionary.

Certainly by late summer or early fall, I will be able to sit down with you or the committee as you choose and give you a pretty good outline.

Mr. COSTELLO. I understand that it is difficult to give a deadline to the team within the FAA reviewing all of the issues. Do they have a deadline? Have you as the Administrator said that this is a pressing problem that we have to address it, and we have a fixed date?

In other words, you have to address these issues, and come up with answers to the problems in mind.

Mr. HINSON. Yes, sir, I have. I have told Mr. Valone and the tiger team my own recommendations, at least on the initial steps we need to take by the end of May.

Mr. COSTELLO. Very good.

Thank you, Mr. Chairman.

Mr. OBERSTAR. Thank you.

Mr. Kim.

Mr. KIM. Thank you, Mr. Chairman.

I do have a couple of simple questions for you. I understand that based upon your testimony this morning, you emphasized your new program director has an extensive background, even teaching in school.

You gave me the impression that perhaps the FAA needs some overhaul in its procurement procedures. But my understanding is that according to the GAO and the GSA, they believe the problem of the AAS has been the result of bad management, not procurement regulations. Would you agree with that?

Mr. HINSON. No, I would not.

Mr. KIM. Can you tell us why you disagree?

Mr. HINSON. Well, I think their views about either/or, that is to say that it is all bad management on the part of the FAA and IBM and no relationship to procurement is not true. I think procurement policies that exist are clearly difficult and have added to the program's problems.

This is not to say that the FAA hasn't managed their part poorly and that IBM has not done their job well either because both of those are true, but it is also true that the procurement system needs a lot of attention and it is part of the problem.

Mr. KIM. Did you talk to GAO or GSA about this particular issue?

Mr. HINSON. No, sir, I have not.

Mr. KIM. My second question is that whether it is procurement regulations or bad management, have we thought of turning over this air traffic control system operation to a government corporation, or perhaps even to private enterprise?

Perhaps you can scale back your operation and give a portion to private enterprise to manage.

Mr. HINSON. This is going to require an adroit answer on my part.

Certainly, Congressman, the procurement process is one of the principal motivators that drove the Airline Commission and the Vice President's NPR effort to suggest that the United States might be better served with the air traffic control in a corporate environment. That is, I think, a fair reflection of their view.

Whether or not a corporate structure would resolve all of the procurement issues is open to debate. It would certainly resolve some. Whether or not the procurement issues can be resolved within the government as it exists, is also open to debate. But clearly a corporate structure provides management of that enterprise, enormous flexibility, to deal with the rate at which technology is changing.

In my opinion, it is this disconnect that is going to continue to cause serious problems.

Mr. KIM. Well, Mr. Chairman, I don't want to debate in today's hearing.

Thank you very much for your answer.

Mr. OBERSTAR. The Chair modestly observes that if that is the case, then we need to corporatise the Defense Department as well.

The gentleman from Illinois, Mr. Sangmeister.

Mr. SANGMEISTER. Thank you, Mr. Chairman.

Mr. Hinson, you stated in your direct testimony that you are going to wait for the results from the Center for Naval Analysis, CNA. You stated that you wanted that unvarnished look from an outside group with experience in large scale software development systems to provide me with options for the future direction of our automation efforts.

I would say to you that with all due respect that when the report comes out, it is not going to be too far off from what our own staff has been able to put together. I think the options are going to be fairly obvious and I think are self-evident. One of them obviously is going to be should the FAA simply terminate the current contract, walk away from its investment, our staff says of $2.3 billion, and start all over.

As the Administrator, you must have some thoughts about that, because that has probably one of the options that is going to be presented to you by CNA. What are your thoughts on that?

Mr. HINSON. Well, it is an option. I stated it is an option. It is one that is clearly in front of us. It is one that I discussed with CNA when we were trafficking them and writing their task letters and outlining the scope of the work they were to do.

It is, as I am sure you appreciate, a very complicated question. It has legal consequences. It has financial consequences, serious financial consequences, and it is not without other risks as well.

I agree with your statement that once we get the recommendations and everybody's comments, some of the solutions will be fairly obvious. But I think that is just a consequence of everybody doing a lot of homework.

My view is that while cancellation is on the table, it is, as I stated earlier, more likely that we will come out somewhere in between the two extremes, continuing as we are on one hand or canceling on the other.

Mr. SANGMEISTER. One of the other alternatives you are going to have to decide is whether to pursue, as I see the facts here, a different technological course, because apparently the AAS design is relatively closed, meaning it has little ability to incorporate future upgrades or changes.

There is increasing thinking that even if the AAS is eventually successfully designed and built on the current approach, it would be a success—it would not be a successful procurement because it would only purchase the technological approach that the automation and computer world have now abandoned for better design approaches.

I guess the net result of that is the thing is obsolete before we go ahead. What are your thoughts on that?

Mr. HINSON. I agree with what you just said. In fact, that is one of the prime drivers and motivators for me instituting this review with CNA and the internal requirements review, to address that very question.

One could almost say that if we had waited three or four years to start this program, some of the new technologies would have been self-evident. One could further say perhaps that timing of this was just circumstantially unfortunate because technology changed right about the time we locked this program in and started.

Mr. SANGMEISTER. I am computer illiterate, but I tell you that field changes from day to day. I think it is an assumption you are going to have to consider somewhere along the line, how you are going to keep up with this, which means I guess the equipment has to be the type that can be upgraded, for what little I know about that area.

Mr. HINSON. I am not an expert, either, Congressman, in the computer business, but I have learned and been told that if we were to start today, we probably wouldn't use this same language and the same systems that are in the IBM-developed program.

However, they are not totally without the ability to modify and use those in a more open way. That is one of the questions that is on the table with our analysis.

Mr. SANGMEISTER. Another alternative is should the FAA recontract with other companies to carry out the non-ISSS aspects of the AAS programs? In other words, the argument has been made that for these facilities the FAA should purchase this current off-the-shelf technology that is there now, I guess, and abandon its efforts to invest in this own design and its own technology.

So what is wrong with taking the state-of-the-art that is out there? Do we have to swallow a lot of pride to do that?

Mr. HINSON. No. I think that is a real option, and it is one we are certainly addressing and I would expect out of the analysis we are doing that some of that will become very evident. I don't disagree with that at all.

Mr. SANGMEISTER. That is all I have, Mr. Chairman.

Mr. OBERSTAR. We thank the gentleman for those very keen observations.

The gentleman from Florida, Mr. Mica.

Mr. MICA. Mr. Hinson, I know you are fairly new on the job. I am fairly new on the job myself. I have been around about 14 months. Unfortunately, I am already developing an institutional memory.

In fact, you weren't there because of your short tenure, but we went out to Germantown I believe it was, the facility, we sat with the IBM folks, we sat with some of the people with FAA involved in this and others, some of the subcontractors. We heard—now either we were lied to or we were misled about what was taking place and what was going to happen.

I have only been here 14 months. That is last spring. So I am a little bit concerned. I come from the business world, and if you sign a contract with me or one of my businesses and you don't perform, then you pay in the private sector. Right now, the taxpayer is going to end up footing a bill for possibly billions of dollars in delay and all funds that will be outlaid here, and I want to know who is going to pay for this?

IBM still has a contract, but it is going to Loral; is that correct?

Mr. HINSON. Yes, sir.

Mr. MICA. Okay.

Is FAA going to pursue any compensation for losses? I am sorry, is FAA going to pursue any compensation for losses from IBM?

Mr. HINSON. Congressman, I too am from the private sector and I understand exactly what you are saying with respect to entering into a contract. I have learned, however, since I have been here, that it works a little bit differently here.

Mr. MICA. That may not be acceptable.

Mr. HINSON. No, no. I understand.

Mr. MICA. See, these people came to us, they told us that they made corrective measures. That it was on track, tnat we were going forward.

I heard that with these two ears, and now we are saying that there is going to be delays. I read the IG's report here, this little report. It says, Mr. Chairman, IBM has not provided adequate resources and management oversight to proposal preparations.

One of the major problems is this, and I don't want to give IBM all the grief. I want to equally distribute it because the FAA, it sounds like, has been a loose cannon in the whole process.

Then we go on, we identified three areas which could lead to additional schedule delays, and there have two of them. The third one is the sale of IBM Federal Systems Company.

Here we have someone who is charged with a responsibility, told us a year ago they had their act together, that it was going to move forward. Now we are going to have a shell came in selling it off and the taxpayer is literally going to get shafted in this process.

If we don't recover some of our money, now I know IBM hasn't taken one, two, three or four billion dollars. Some of that has gone to subcontractors who, in fact, have performed well. But I think in the normal sense of conducting business, there is some compensation when you don't perform.

Are we going to see that?

Mr. HINSON. Congressman, in the transaction that is ongoing between IBM, Loral and the FAA, I have instructed our chief counsel and all the lawyers and contract personnel working on this to make sure that they preserve all of the FAA's, government's, taxpayers' rights, and that we not sign an agreement, enter into a contract or novate the existing contract until we are satisfied that the obligations we feel are due us have been met.

Beyond That, I really—since we are in the middle of that now, I probably shouldn't say any more.

Mr. OBERSTAR. Well, will the gentleman yield?

Mr. MICA. Mr. Chairman, yes.

Would like very much for the committee and staff to follow up in this matter. I think we have a responsibility to the taxpayer, and I will yield.

Mr. OBERSTAR. I want to elaborate on this point, because the gentleman raises a very important point and one that is of concern to people. I think as the administrator explained before the gentleman came into the hearing, that some people have the impression—not the gentleman because he has been through all this—that $5 billion has been spent and wasted.

In fact, only a $1.2 billion has actually been spent, but much hinges upon what happens from here on forward.

Now, one of the problems is that this contract is a mix of contracts. Some aspects are cost plus and others are fixed price. Because of the very nature of the contract, it has been very difficult to administer.

In hindsight, you know, maybe the whole thing should have been done differently. We are at a point, however, where the next steps are crucial to assure that the gentleman's worst fears are not played out, my worst fears are not played out, that money is wasted.

In shifting of the contract responsibility from IBM to Loral, it is extremely important that any change takes place before novation is completed so that responsibility for costs lies with the initial contractor, IBM, not shifted to Loral after contract is affirmed by FAA, who then can say, "All right, FAA. It is your cost. You pay it".

That is why we are having the hearing at this juncture and that is why this process is going on within FAA.

Mr. MICA. But my purpose in asking the question to Mr. Hinson is that we preserve the right and that we recoup any funds for the taxpayer. I am only here representing the poor guy out there that is busting his buns to pay the tab on this. And, you know, that is my only purpose in this.

I have good friends in IBM, some of my family work for IBM, I come from Binghamton, Triple City, Endicott, New York, the home of IBM, God bless them, I hope they do well. When you sign an obligation with me, a contract with the United States Government, I expect you to pay for it.

How much have they received to date out of the 1.2, 1.3 billion?

Mr. HINSON. The appropriation so far is 1.4, and they have received between 1.2 and 1.3.

Mr. MICA. Now, is that going on to subcontractors or is that IBM direct? Can you get us that information?

Mr. HINSON. Yes, sir, I can. It goes to both. I mean, through IBM.

Mr. MICA. And some subcontractors, I followed the program, and some of them have done well and performed well. I don't want to penalize them. IBM took on this responsibility and now the thing that concerns me is the shell game and the taxpayer getting shafted again as we change order.

What I want to know, too, with Loral, is how many people work for IBM who are now going to Loral when this is sold? And you provide, too, a list to the committee, if you would, sir, every person who is involved in the—was involved in the contract before with IBM, who comes on now. Because those are the same people that told me a year ago what was going to take place, and I want to know who they are and who is participating in that shell game.

[The information received from Mr. Hinson follows:]

With two exceptions, the people who worked for IBM prior to the sale of the Federal Systems Company to Loral were offered jobs with Loral after the sale. The two exceptions were Gerald Ebker, CEO, and John Cantwell, AAS Financial Officer. Today the key IBM/Loral personnel working on the program are: Jack Winters, President, Loral Federal Systems—Air Traffic Control; Robert Sogard, Vice President, AAS Program; H.A. Padinha, Vice President, En Route Systems; Linda Alexander, Director, Terminal Systems; William Bryden, Director, Tower Systems; Tom Willich, Senior Vice President, Business Development & Operations.

Mr. MICA. The other thing is, I would ask the question of a percentage of blame for the delays. How much was FAA and their change orders and their lack of administration and lack of direction, how much were they responsible for the cost and the delays in this, and how much was the contract center because you have to assign some liability.

I do want to move forward, but I want to see what took place in the past and who was responsible. And if you could also provide me and the committee with your best guesstimate of that, I know you have only been there a short time, but I think it is an important matter that we should consider.

[The information received from Mr. Hinson follows:]

There have been a total of 33 months delay recognized which consisted of 19 months in 1990 and 14 months in 1993. The negotiated share of responsibility for the 19 month slip was 26% (5 months) FAA and 74% (14 months) IBM; the share of responsibility for the 14 month slip was 30% (4.2 months) FAA and 70% (9.8 months) IBM.

Mr. MICA. The other thing that concerns me is, I am not sure if really that you or even the Navy systems know what they are doing as far as an audit function here, and overseeing this project.

Has there been any consideration to having an independent audit or systems audit arrangement as we move forward so that someone from the outside who really knows what the heck is going on here can advise us? One, I don't think FAA knows, or the technical in-house people, and two, the worst people in the world to get to look at how to do something right is another government agency.

So has there been any consideration to having a private sector type audit looking at what is going on with the contract as we move along?

Mr. HINSON. We have——

Mr. MICA. If you haven't, it is something to give some thought to.

Mr. HINSON. I appreciate that. I am just trying to think how to answer you so that—the Center for Naval Analysis is a private sector corporation. They have a distinguished record in looking at programs of this nature as an independent third party. So, in essence, I think they did exactly what you are asking. And in fact they put a team together to look at this representing many distinguished scientists and technicians who have been involved in large programs in the private sector.

For instance, one of their members is the former manager of the Lockheed-Scott works who certainly know how to manage large programs. And there are several other people on their consulting group that are looking at what we are doing who have similar credentials. So I am comfortable that CNA is providing us third party—that is the reason I went to CNA, by the way, is because they are a third party, independent, no essential relations to the FAA.

Mr. MICA. That is what has been done to date. My question is prospective, like can we have somebody helping us? Obviously, FAA does not know what they are doing in this. And then if you go beyond—and the problem, too, is the change in management and personnel. Incidentally, speaking of that, how many people at FAA have been fired or dismissed as a result of this fiasco?

Mr. HINSON. Well, we have a new program manager.

Mr. MICA. But the body——

Mr. OBERSTAR. The administrator has answered those questions and I regret the gentleman's time has expired. Other Members are waiting. We will give the gentleman another opportunity, but I want to recognize other Members first.

So we will go to Mr. Laughlin.

Mr. MICA. Thank you.

Mr. LAUGHLIN. Thank you, Mr. Chairman.

The gentleman from New York and Florida, as I understood his statement earlier about IBM, went into an area I intended to go into. And that is, all the benefits of this sale for 1.5 billion plus dollars. Who got those benefits? And which ones did the taxpayers get from this sale?

Mr. HINSON. To the best of my knowledge, the transaction routine—are you talking about between Loral and IBM, Congressman?

Mr. LAUGHLIN. Yes, sir, the sale from IBM to Loral.

Mr. HINSON. As far as everything I can tell, after everything I can read about it, that is an arm's length transaction between two public corporations where one sold a division of one to another company, and assuming that Loral—we successfully conclude our contractual and novation processes, Loral simply becomes the new shareholder in that corporation that still exists.

There is no money going any direction for anything other than from Loral's shareholders to the shareholders of IBM for that company. It has no effect on the government at all that I am aware of.

Mr. LAUGHLIN. Well, it would seem to me it would, and that is where the taxpayers get the shaft, because someone at the FAA made a decision IBM was capable of performing this contract. Isn't that true, Mr. Hinson?

Mr. HINSON. Yes, sir, that is true.

Mr. LAUGHLIN. And your Daschle report indicates that during the period of time IBM was running this contract, that between 40 and—their software code ranged between 40 to 80 percent above the average industry cost for code development.

What benefit was the taxpayer getting by IBM able to sell this contract when they were running their cost coding anywhere from 40 to 80 percent above the average? If they are doing that to your private company, you would haul them into court and you would have diminished their ability to do business for which they were contracting with you in private industry. Yet you come here and tell us it is the way we do business in government.

And that is the reason the taxpayers are fed up with the FAA, the U.S. Congress, and everybody else in Washington, D.C., is because we do business differently. And it would seem to me that as the administrator of the FAA, you ought to see that we go back to doing business the way it ought to be done.

Mr. HINSON. Well, that is exactly what we are trying to do, sir.

Mr. LAUGHLIN. Well, then where does the taxpayer get any benefit from this transfer of over $1.5 billion? Are they getting rid of one sorry contractor and getting another?

Mr. HINSON. I don't believe so.

Mr. LAUGHLIN. Well, we are sitting here talking about dollars, and I don't understand any of the computers, I don't understand any of the engineering, but I understand that we got a system that is out of whack and one company is able to derive $1.5 billion for doing a poor job.

And I wonder where the penalty is. Where has IBM been penalized? Has the Daschle report been sent to the Department of Defense, the Department of Agriculture, any of the other—Transportation Department, to say that IBM routinely and customarily runs their costs 40 to 80 percent above what the average cost is?

You know, at some point, IBM, if they have done what your Daschle report says, needs to be penalized and be told you can't do business with this customer called the U.S. Government. Do you agree with that?

Mr. HINSON. Let me make two comments. First, about the first part of your statement, Loral has acquired from IBM the Federal Systems Corporation. The contract with the FAA is only a part of the Federal Systems Corporation. In fact, a small part. So they bought a company that has many more ongoing businesses than just the FAA. We are a part of Federal Systems business. That is what Loral bought, the entire business.

Second, as I mentioned earlier, we are in diligent, careful discussions with Loral and IBM about the contract and about novation. And I think that is probably where I should stop with respect to that.

Mr. LAUGHLIN. Well, if we need to have an Executive Session to discuss where Loral is, and they may be the best corporation in America and I hope they are for our taxpayers' benefit, certainly you can request that of the Chairman. If he thinks it is appropriate, we can do that.

But the concern I have is whether they bought only this contract or bought many multiple contracts that the Federal system had under the ownership of the Federal company without remembering its full name. What is to prevent the Loral Corporation from running a shoddy operation to the detriment, expense of the American taxpayer, and passing it on to some other corporation after they have reaped some benefits, and the taxpayer has got no benefits?

Mr. HINSON. The process that I have put into place for trying to peel the onion and understand exactly what the status of the AAS program is, what role the contractors are and have been performing in that, and to decide a course of action so we can get this program in the field, hopefully within some reasonable cost level, is the determinative I think that will answer your concern about Loral's future performance. We have a very serious interest in addressing the very questions you are asking.

Mr. LAUGHLIN. Well, I see the red light is on. And, Mr. Hinson, all I can say is I wish you every success in doing that. And if you are able to get this contract under control where the traveling public, the consumer, the customer as you described earlier, has the benefit of this system in the next five years, then we ought to rename the National Airport the Hinson National Airport.

Thank you, Mr. Chairman.

Mr. OBERSTAR. He might not want that title right now. Not if you have to drive through National Airport to get to a gate at rush hour.

Mr. MICA. Mr. Chairman.

Mr. OBERSTAR. Mr. Horn.

Mr. MICA. Mr. Chairman, if I may a second, the gentleman had suggested an Executive Session to possibly discuss the subcommittee's interest in pursuing recapture of some of our funds or taxpayer investment in this program. And I would be very willing from this side to participate in anything of that nature.

Mr. OBERSTAR. We will have Loral Corporation on as the next witness, and after Mr. Schwartz has been sufficiently badgered by questions of this nature and stuck up against the wall, we will determine then whether anything is needed. But I suggest you ask the same questions and see whether—what kind of answers you get.

Mr. Horn.

Mr. HORN. Thank you, Mr. Chairman.

First, Mr. Hinson, a somewhat technical question, then a more general question. As I understand it, the AAS software is written in a computer language called Ada. I don't know if I am pronouncing that correctly. All of the programmers now graduating from college are trained in a computer language called C. And when AAS has to be updated in future years, will the FAA be able to find anyone that knows Ada? And, in brief, is Ada sort of the vacuum tube of tomorrow?

Mr. HINSON. The short answer, Congressman, is I don't know. Ada has—I understand that language has certain advantages for technological applications that other languages may not have. But it is clearly a language that was considered back in 1987 and 1988 when this program was developed.

I do have people who are experts and can answer that question specifically, and I would be happy to do that for you, in any form or any way you would like.

Mr. HORN. Could we get a letter from the FAA or the technical experts to put after this question as to the response of the Agency?

Mr. HINSON. Yes, sir. And I think, I just might—I probably shouldn't offer this because I am not going to be testifying, but there are others who are going to be testifying who are experts in this area who may be able to answer your question directly.

Mr. HORN. Okay.

[The information received from Mr. Hinson follows:]

Ada was adopted as an international standard computer language for critical software systems in 1983 and is currently undergoing modernization and updating, with international approval for the revised standard expected in either 1994 or early 1995. Use of Ada is mandated, by law (Public Law 101-511, Section 8092), for certain critical systems used by the DoD and is recognized in the industry as a superior language for building long life, reliable computer software.

It is true that most of the programmers graduating from college today have been exposed to C rather than Ada. The DoD is funding a number of universities to teach specialized software engineering skills and Ada. We expect there will always be some difficulty in finding skilled individuals to program the specialized systems required for the FAA, DoD and such projects as nuclear reactors, but we don't believe the problem will become worse as the software ages. Ada has unique characteristics that should make maintenance less costly over the long life of programs such as AAS.

The Air Force has had substantial success with Ada. In addition to reaffirming the Ada commitment, Mr. Lloyd K. Mosemann, II, the Air Force Deputy Assistant Secretary for Communications, Computers and Logistics, directed in February 1992 that Ada be used for all military systems including support and data processing applications. Air Force and all military use of Ada is increasing.

C and Ada are contemporary languages, both just over 10 years old. C has had substantial success in universities partially because the supporting technology is very inexpensive and most university programs are small, not life critical, and have a limited life. Ada has had substantial success in the military where programs are large, complex, have a long life, and the supporting technology for development is not the driving life cycle cost.

Mr. HORN. Now, the more——

Mr. OBERSTAR. If the gentleman will yield, that question the gentleman raised is very important. It is one of the key issues to be decided by the FAA at this very important juncture in the contract novation process, that is, turning it over to another successor company, and determining how to make the software flexible enough so that it does not become a dinosaur within—and may already have been some of which.

Mr. HORN. I appreciate that, Mr. Chairman.

The last question, as I said, would be a more general one. As I mentioned earlier, the chairman, Mr. Mica and myself, went out to look at what was happening. We have had testimony from your acting predecessor and others that the ship was being turned around. We had tight management controls, we were getting interdisciplinary coordination, all of that.

And the Chairman earlier referred to the fact that reports he has been knowledgeable of. But my query is simply, since this is going to be an ongoing situation, what kind of reports should we be expecting from FAA to keep the subcommittee as a whole informed as to the type of progress being made?

I must say, after last year's round, I was led to assume things were on the track and I am sure you are as surprised as anybody as a new administrator.

On the other hand, what can we do to set up some process of either 30-day reports along certain parameters that you feel and the Chairman agrees are the key indicators of progress and how we get that under control, so we don't read it in the papers and it doesn't come as a complete surprise? What do you suggest?

Mr. HINSON. I would suggest that we could and would be willing to provide any type of reporting, including any or variable data or discipline information that you would require or the Chairman would require in any form you would like it.

Your question begs one comment from me, Mr. Chairman, with your permission. I think some fairness is important here. When the FAA appeared before this committee a year ago, they said they would do certain things, which they did. And IBM did. They did assign a full-time team to the IBM facility.

The president of IBM Federal Systems did leave that job and take over full-time management of the program. They did set milestones and they have met until recently all those milestones on time, although some of the technical parameters can certainly be questioned. And a lot of people are working very hard on this program.

And our principal issue here is to say, as I said earlier, if we continue this direction our costs could escalate to those pointed out in the report, the Daschle report that the Chairman has referred to. And this is an early warning saying, you know, we ought to look at this again to see if we can preclude that happening. There has been mismanagement on the FAA's part and I don't think the contractors have performed all that well either. So we are trying to put all that together.

Mr. HORN. I was thinking, as I listened to some of the earlier dialogue, that maybe IBM, which has had its problems in recent years, ought to get the entrepreneurship award of the year for passing this off on the Loral Corporation.

So I am going to be delighted to hear from the CEO of Loral. Does he think he has been had or is he more optimistic?

Thank you, Mr. Chairman.

Mr. HINSON. I wouldn't presume to answer that for the Chairman of Loral.

Mr. OBERSTAR. The answer is that Loral likes this kind of challenge. They like tough problems, they like to clean up other people's mess.

Mr. Coppersmith.

Mr. COPPERSMITH. Thank you, Mr. Chairman. I just came in at the end of Mr. Laughlin's question, although I didn't hear the whole question, I heard the tone, so I know he addressed a number of the issues I wanted to get to.

I want to suggest that before we rename National Airport, the requirement is you serve two full years as administrator, since that would be a recent record I think that that is the sort of thing we name airports for, as well as this program.

I guess the question I have for the administrator is, are you comfortable with the—two questions, are you comfortable with the procedural changes that you have made, that you now have the process in place that additional slippage won't occur, given that essentially you are trying to do with this software design program something that really hasn't been done before?

Is the information process flexible enough, is it interdisciplinary enough, because we are dealing with so many unanticipated challenges, are you comfortable that the administration, the FAA as well as the contractor, are in a position to deal with what previous reviews of the program have not been able to do, whether it is due to changing parameters, whether it is due to failure to misunderstand, or whether it is simply due to the size and scope of the project?

Mr. HINSON. I am never going to be comfortable with this program until it is in place and directing traffic and it is behind us. We have, I think, taken what I would refer to as the classic approach in terms of difficulties encountered in any organization.

First of all, we had to find out what are the real problems, and that is what the Daschle report addressed in some ways, and that is what the internal revalidation team is doing. And that is what CNA is also working on.

So we are really trying to understand what are the problems, and apply realistic analysis to cost and schedule problems and the technologies that are available today that weren't available when we started to see if we are going where we want to go and if we can get where we want to go in a timely and cost-effective manner. So the answer to your question is, no, I am not comfortable.

We are at a point in the process where we have started a sequence of events based upon the strategy I just outlined. Hopefully, it will lead us to success. We may have to change our mind along the way as more information is made available.

I would answer it this way, Congressman. I am all right with the strategy we are embarked upon in terms of taking it apart and deciding where to go. I am less comfortable with being able to tell you that I am certain that is going to give us an optimum solution. I believe it will, but I am not going to be comfortable until I am there.

Mr. COPPERSMITH. Stepping back from the immediate problem, given your experience and now your knowledge in reviewing this program, have you become a firm believer in incremental rather than fundamental change when you are developing with undeveloped technology, and are there implications for not just the FAA but other agencies here as well in taking on projects of this scope in terms of software development?

Mr. HINSON. We discussed that a little bit earlier, the big bang approach versus more cautious incremental approach. I think we haven't taken a vote within the Agency or within our contractors or others, but I suspect that it would come out now in favor of the incremental approach, taking smaller bites with less risk, making sure that you are on solid technical grounds before you try to invent the entire solution in one effort.

In fairness, technology has changed a lot since this program was conceived. But I think you make a good point and I do think there is application there. In fact, you see this happening now in the private sector a lot, small incremental bites at large technical problems.

Mr. COPPERSMITH. Thank you, Mr. Chairman.

Mr. OBERSTAR. In response to a question asked earlier by our colleague from Florida, Mr. Mica, is there someone overseeing and reviewing? Yes, the defense contract audit agency has been involved in this process, and they are reviewing all aspects, costs and management, and at an appropriate time when that process is ripe, we will have a briefing for members.

In addition, at the outset of this process, realizing that it was a major contract, bigger than anything the FAA had managed before, the FAA brought in two private-sector companies to help it manage this contract and oversee it and advise: Martin-Marietta, no small corporation, no small potatoes operation, and TRW, again a company of considerable performance experience.

Martin-Marietta was to look at cost and scheduling problems and budgeting problems. They reported that access to information was difficult. They did send sort of bad news reports to FAA. They claim those reports were ignored. They didn't get up the ladder to a managerial level, or when they did, there was no administrator in place to act upon it.

I think that—my assessment, certainly my colleague's of the role of the two contractors, is poor performance. They didn't come to this committee and say our reports are being ignored, we don't think that our advice is being followed. Whether they were right or wrong, whether they were on track or not on track, they didn't perform.

Lamely they said, well, we were afraid of, you know, a bad reaction from FAA because we are a contractor, too, and we didn't want to be written out of this process. And after all, we were under contract to FAA, not to the Congress. That is still public money that is being dispensed.

And, you know, I think we have to just review this process of having outside contractors being advisers to private public arrangement. I think that has served poorly, very poorly. I want to get in a couple of things if we can proceed perhaps somewhat crisply. The reliability factor which has caused some pain in developing software, the contract was laid out so that there would be a very high degree of reliability. What that means in layman's terms is that now the system is down perhaps hours, many hours a year, and with backup, it continues to function.

This contract was to install a very high degree of reliability, Seven 9s as it is called, that is 99.795 percent reliability. In other words, down three seconds a year over a 20-year period. Was that too high a degree of reliability? Was that an unrealistic goal to achieve? Was FAA badly advised? Did IBM over reach?

Mr. HINSON. That is a question, Mr. Chairman, that is on the table, that I know that the Revalidation Committee is looking at. I am sure CNA is looking at it as well. Again, with the view of where we are today technologically, we presently, I think, experience about four 5s or five 5s, which is about five minutes a year. Whether we can get along with three seconds a year as a requirement is going to be determined. But that is certainly a valid question and one that is on the table.

Mr. OBERSTAR. My understanding from talking to all the various people involved in this CNA and, you know, all the other contractors, Loral and some of the other witnesses today, is that the hardware that has already been developed is of sufficient capacity to accept the extraordinary demands that will be placed on it to achieve that degree of reliability, but that the software is still a problem.

And one has—one of the informants has gone to the point of saying we could achieve Seven 9s reliability without any increase in cost because that cost has already been expended.

Mr. HINSON. I can't answer that, Mr. Chairman. I don't know, but I will get you the answer.

Mr. OBERSTAR. Whatever it is, I think we can tolerate minutes of delay in a system. We certainly can't tolerate hours of delay. We ought to not have any increase in reliability that results in increased cost or increased delay in developing or curing software problems that already exist.

Would you agree with that?

Mr. HINSON. I don't know whether I agree with it or not. I would like to, but I am not sure. I don't know enough to tell you whether I agree with that or not.

Mr. OBERSTAR. Okay. There has been a good deal of discussion about what to do with the contract that now exists between FAA and IBM, the novation process is extremely important. Were you reluctant to answer questions by Mr. Mica, I think appropriately, because there is some degree of discussion going on about the novation process?

Discuss for us what are the issues at stake in the novation process. What are the matters to be resolved? Where is the government exposed, where can you protect it against exposure?

Mr. HINSON. Clearly with the contract that exists with IBM, we have certain rights and certain protections and certain guarantees for performance. And during the novation process and the conclusion of new contractual arrangements, as I said earlier, Mr. Chairman, I have instructed our chief counsel and contracts people to make sure we preserve all of those rights and guarantees that presently exist.

Mr. OBERSTAR. I understand FAA is spending at a rate this fiscal year that significantly exceeds the appropriation, and that the program could run out of its appropriation this summer.

Is that the case?

Mr. HINSON. Well, we believe the committee has instructed us to be able to use some money that is in excess of $100 million that was set aside for contract liabilities. In fact, we have been directed to use that. And we will make sure that the burn rate we experience subsequent to the decisions we make at the end of May is adequate to get us through the year.

Mr. OBERSTAR. Okay. I have other questions that I think we will just withhold and we want to get on to other witnesses. It is very important.

Mr. Ehlers. Mr. Duncan.

Mr. DUNCAN. Mr. Hinson, just very briefly, because I know we do want to move on to other witnesses, but you heard the Chairman of the full committee state earlier that he was not a happy camper, and then that has continued on up until just a few moments ago, you heard some very strong statements by Mr. Laughlin that I certainly agree with, and I think it is accurate to say that just about every Member of this subcommittee is extremely unhappy with this whole situation. And that is probably putting it lightly. Would you agree?

Mr. HINSON. Yes, sir, it is very obvious to me.

Mr. DUNCAN. Based on your comments to the Chairman of the subcommittee and other comments that you made earlier, IBM has not been sued, but you did state just now that you have instructed your counsel to reserve any rights that the FAA may have. And are you also telling us that negotiations are going on with IBM at this time for some type of adjustments or compensation to the government in this situation?

Mr. HINSON. I would like to say that we are pursuing—we are well aware of our relationship with the contractor, legal relationship, and we are in the process of ensuring that we protect our position relative to the contract. And we will make determinations that are appropriate at the appropriate time. I am sorry I can't be more specific, but I really need to be cautious.

Mr. DUNCAN. Let me ask you about something else. I have heard that the unit at the FAA and the main people involved in this, that really nothing was ever done and that they were just transferred to different positions. Is that true?

Mr. HINSON. The gentleman that was the senior acquisitions officer at the FAA has left the FAA. The program manager has been reassigned, and we are going to use his engineering skills in another way. And the new program manager, Mr. Valone, who I introduced by name this morning, I am confident will make the additional changes necessary in the management of the program to assure its success.

Mr. DUNCAN. One of my staff members was taken recently to the control tower at National Airport and he was taken downstairs and shown, as he described it, an old Univac computer, vacuum tube type computer from the 1960s, I guess. Is it true that they are operating one of the busiest airports in the country, National Airport out here, with a Univac system from 30 years ago?

Mr. HINSON. It is true that we have some of the systems at National that are old and do have vacuum tubes. We also have some brand-new equipment out there. I quickly want to tell you, though, that the fact that it has a vacuum tube has nothing to do with whether it is safe or unsafe.

Mr. DUNCAN. Well, I understand that. In fact, he was told that that particular computer, while old, was functioning very well.

Mr. HINSON. Yes, they do.

Mr. DUNCAN. And what I am getting at is my staff member was told that the biggest need out there is for more people. And I am wondering if we—of course, now we have gone so far into this, I suppose that we have to continue with it, but I am wondering whether we even need this thing, if we couldn't have just come in and had some upgrades in the computers, and is your biggest need this system or is it more people?

Mr. HINSON. Apart from the AAS modernization effort, Congressman, we have a very carefully derived industrial engineering capability to determine adequate and proper staffing levels for all safety functions in the FAA, certainly in control towers. So the degree of staffing that is present in all of our control towers is derived not only by industrial engineering, but by long years of experience by FAA. And we have adequate staffing in all of our towers and approach controls and centers. We have all the staffing we need in all of these facilities dealing with today's environment.

However, the purpose of AAS and other improvements in the capital investment plan is to allow us to gain a disproportionate increase in the productivity of our people as the demands on the system increase in the future. That is to say, if air traffic doubles in the next 17 years, we don't want to have to double the number of people involved in providing air traffic control. We hope to be able to do it with the people we have today, because the new systems give them substantial, additional capacity and efficiency.

Mr. DUNCAN. Well, just let me ask you one other thing, going from that. This system is the biggest single item or the most expensive item in your capital program; is that correct?

Mr. HINSON. Yes, I believe that is correct.

Mr. DUNCAN. Is there something else that is close or is there——

Mr. HINSON. I was just thinking to make sure before I said yes. I think I agree with you.

Mr. DUNCAN. Is this a—is this the project that you would rate as the most important project to the future of the FAA?

Mr. HINSON. If you ask the question as it reflects or pertains to air traffic control systems, the AAS system and what it is to provide, is the most important, yes, sir.

Mr. DUNCAN. Are we going to see similar problems, cost overruns and mismanagement, in some of these other capital projects?

Mr. HINSON. That is a fair question. In fact, yesterday I briefed the Chairman on the results of the capital investment plan to date which is a $32 billion program that spans out to the year 2004. We have invested about 14, 15 billion so far. Back in 1980 and 1981, when the original NAS plan was incepted, it was much more modest and was to be completed in a much shorter period of time.

Of the original NAS plan, 87 percent of the hardware is in place and working. Out of 54,000 hardware items, 47,000 are in the field working. We put 660 in the field last year. The Agency has been delivering a good part of the capital investment plan as it was redesigned in the mid-1980s when it became apparent that the original NAS plan was not sufficient to provide the capacity that we need for air traffic at the turn of the century.

Some of those programs are late. Some are on time. The ones that are out there are working very well. So my answer to your question is that we have made a lot of progress in areas we don't talk about very much and we are continuing to make a lot of progress. I don't think the AAS program is symptomatic of the balance of the capital investment plan.

Mr. DUNCAN. All right. Thank you very much.

Mr. OBERSTAR. The gentleman's time is expired. With respect to the question about technology at the tower at National, it must be kept in mind that there is a major redevelopment program under way at National which includes the relocation of the tower to an as-yet undetermined or maybe somewhat in question location, but nonetheless that new tower will have all the newest technology.

And one of the reasons that some of the old technology is still hanging on is that they want to wait until they build a new one to put the tower Tracon equipment in place.

Mr. HINSON. In fact, Mr. Chairman, I had the privilege of cutting the ribbons in Chicago this year for a new tower at O'Hare and last week cutting the tower—cutting the ribbon, rather, for a new tower in Kansas City. This is all part of this capital investment plan. And we just opened a new tower in Detroit which is state of the art, so we are making some headway.

Mr. OBERSTAR. We are looking to have a new tower open in Minneapolis, too.

Chair Mineta.

The CHAIR. Thank you very much, Mr. Chairman. I assume that the next cutting of the ribbon will be at the Minneapolis tower. And as a member of the—as the chair of the Board of Review for the Metropolitan Washington Airport Authority, we are very well aware of the progress we are making on the National Airport facility.

Let me ask two very quick questions. One is as it relates to people who will be testifying later on, there are many who say, hey, we have got stuff off the shelf that is advanced, it is automated, good stuff. I am wondering, have you had a chance to take a look at any of those? How do they stack up with your requirements and do we think we will be incorporating? Is it too early, what do you think?

Mr. HINSON. Yes, sir, Mr. Chairman, the various companies in the private sector that provide aspects of air traffic control computers, hardware and so forth, have I think all been in to see me personally and other people at the FAA. We have obviously seen their equipment.

Knowing Mr. Horn's comments earlier about touring in Switzerland and Germany, I was there in December and saw all of the air traffic control systems in Europe firsthand and the new programs that are using some of the techniques and data provided and hardware provided by American companies. Clearly the revalidation effort and the CNA study are going to cause us to look at exactly what you are suggesting. And we will do so.

The CHAIR. Given the appropriation that has been given for AAS, if you were to chop that up on a one-twelfth basis, how are you doing on that? From what I understand, the spending curve is a little ahead of the one-twelfth for the normal fiscal year. Are you going to run out of money before the end of the fiscal year? If so, where do you go then?

Mr. HINSON. Mr. Chairman, I believe that we have sufficient funding to carry us through this fiscal year and depending upon the results of our initial steps at the end of May and early June, if necessary, we will readjust the spending rate to ensure that we have adequate funding for this fiscal year.

The CHAIR. Earlier you had indicated by the end of May you have to have all the reports in place and that you are working with DOT and OMB with regard to that. What is the OMB/DOT role in this whole issue?

Mr. HINSON. Well, OMB obviously provides an oversight function. And I think their reports have been quite good. With respect to DOD, we have a long history and relationship with the Department of Defense in providing air traffic control to each other.

The Department of Defense essentially uses FAA derived air traffic control procedures and equipment and we actually train some of their people and vice versa. We have a long, close relationship. They are part of the AAS program. They have made some investments in that. And it is, therefore, appropriate that they participate.

The CHAIR. I am sorry, I meant Department of Transportation, not DOD.

Mr. HINSON. Oh, I am sorry, I misunderstood.

The CHAIR. I am sorry, I misspoke, DOT, Department of Transportation.

Mr. HINSON. Well, of course I work very closely with the Secretary. He has a high interest, in fact, I assure you, a very high interest in the resolution of the problems with AAS and the recommended strategy that will evolve. We talk about it a lot and he is very, very current on it.

The CHAIR. Thank you very much.

Thank you, Mr. Chairman.

Mr. OBERSTAR. Mr. Horn.

Mr. HORN. Thank you, Mr. Chairman.

I agree with some of the comments that Congressman Duncan and others have made on hearing the people's side of this, having visited the LAX tower. And I would hope, Mr. Chairman, that we could perhaps get someone from the controllers' organization in to have that discussion with us. But let me ask you one last question on the software.

It has been suggested that perhaps the Center for Naval Analysis may report rewriting the ISAAA software, instead of correcting the current problems. What are the pros and cons of that suggestion? And if they do rewrite it or dump it, aren't we really back to ground zero?

Mr. HINSON. If I could make a comment first and then answer your question, Congressman, we have during the AAS program process in all of the development and testing we are doing, we have had air traffic controllers by teams, including their union representatives, working very closely with all of the engineers and scientists involved in developing the AAS program. They have been our partners from day one, are still our partners, and are actively involved on a day-to-day basis in deciding how this system works. So they have really been a part of the team all along.

Mr. OBERSTAR. I would like to add at this point, if I may interrupt, that it was our intention to have air traffic controllers, not just the organization leadership, but air traffic controllers testifying. But I determined that we would have to have a two-day hearing in order to do that and at this point, I wanted to get at the other aspects. But we will have air traffic controllers at another time.

Mr. HORN. Good, because I am thinking not just of this project, I am thinking of the Pay Project in Southern California and others that we think are pretty essential.

Mr. HINSON. With respect to your second question about—or your question, rather, about the code and the recommendations, I do not have CNA's recommendations specifically regarding the desirability or all of the pros and cons of changing code or starting over or any other recommendation in that context. That will be part of what comes out of this process that we hope by the end of May we will be able to have a fairly clear idea about.

Mr. HORN. Okay.

Mr. OBERSTAR. Mr. Mica.

Mr. MICA. Thank you, Mr. Chairman. Just to clarify a couple of points in my previous line of questioning, these records are a great tool and I hope you have the opportunity to go through this March hearing on the delays, technical problems, cost escalations, especially when you are negotiating some terms for responsibility and assessing that with IBM.

In fact, if you'll go back to page 57, I ask the same question in that March hearing about assessing some of the responsibility. GAO came back—they didn't have the information at the hearing, but I notice in the record it was supplied on a 19-month AAS—sorry, I can't read with them on.

On the 19-month AAS delay announced in December, 1990, FAA attributed five months to its change in the system requirements, this is assessing responsibility, and 14 months to IBM's underestimation of the effort necessary to produce AAS software. So we have a little bit of a record here.

My question to you and the information I would like is from the point of this hearing forward, you know, where do we assign responsibilities, a little bit of a clarification there.

Second point, on the audit function, I had asked questions about how the audit was being conducted as we went along, but obviously whatever we have done is certainly flawed. It doesn't—you know, and we have—it sounds like we have a host and array of public and private folks. But what we need to be doing is looking in the future and refashioning or refocusing our efforts and audit as we go along. I don't know in house FAA does that.

Do you understand my point there?

Mr. HINSON. Yes, sir, I do. I think I talked to that for just a moment I believe before you were in the room. Let me just state it again. The two principal oversight and partners are TRW and Martin-Marietta. Clearly, you have to say, you know, one, did they do what they were supposed to do; and two, if they did, did we ignore it or not pay attention to it, or is it somewhere in between? Part of the job that we gave RTA was to look at that question, and I expect to get an answer on that.

Mr. MICA. The other point is, I want the names of the individuals that are involved with IBM before they go on and work with them. And I want that made a part of the record. Again, I think that this creates some institutional memory of who is doing what and who says what and who was responsible.

[The information received from Mr. Hinson follows:]

With two exceptions, the people who worked for IBM prior to the sale of Federal Systems Company to Loral were offered jobs with Loral after the sale. The two exceptions were Gerald Ebker, CEO, and John Cantwell, AAS Financial Officer. Today, the key IBM/Loral personnel working on the program are: Jack Winters, President, Loral Federal Systems—Air Traffic Control; Robert Sogard, Vice President, AAS Program; H.A. Padinha, Vice President, En Route Systems; Linda Alexander, Director, Terminal Systems; William Bryden, Director, Tower Systems; Tom Willich, Senior Vice President, Business Development & Operations

Mr. MICA. The other point, the Executive Session that I mentioned, one of the other, the Members from the other side had requested, I intend to pursue something of that nature that expresses the sentiment of this subcommittee that—and it is a bipartisan fashion, that we intend to recoup whatever losses possible, as you negotiate any final conclusion of your contractual arrangements with the previous contractor, in this. And I think that is the intent of this committee.

We are not going to—we are not going to go in and negotiate the terms of the sale to these folks or transfer, but you have heard it today from both sides. And I intend to pursue it as long as it takes, that we recoup anything we can as far as losses.

Mr. HINSON. Yes, sir. We will certainly abide by the wishes of the committee with respect to talking about it.

Mr. MICA. Just one final point, question, Mr. Chairman, if I may. Have you submitted to us, and excuse my ignorance if I don't know this, any changes for suggestions and revisions for procurement for the program? Is there—do we have anything that needs to be done statutorily or any additional authority that you need to not repeat the disaster of the past? Or can you do that?

Mr. HINSON. Answering that backwards, yes, of course we can do that. We have—I am only hesitating because I am trying to make sure I remember this correctly.

We have internally in the FAA, in the recent past, taken a look at the procurement processes with a view of making changes that could be made within the existing procurement structure of the Federal Government. We can make that available to you.

Mr. MICA. Well, again, if you haven't made available—and maybe there are some slight changes in language that can be made. I have heard people talk about we are hamstrung by the Federal procurement process, blah, blah, blah. Well, if there are problems and we should have—and I would like that, too, as part of the record. And then I can say that, you know, when you come back here in two years, hopefully, or a year, hopefully, and I come back, too, we have both got a 50–50 shot at that, but eventually——

Mr. HINSON. Always just a temptation to comment.

Mr. MICA. But, again, we will have some record and we will be able to say that—I will defend you, you know. I can say that Congress was given that information, we didn't do a damn thing about it, and you can also use that. I appreciate your good efforts.

And, Mr. Chairman, I yield back.

[The following was received from Mr. Hinson:]

FAA's procurement problems are systemic. It is necessary to step back from the current myriad of processes and procedures imbedded in the Federal procurement regulations and statutes. From that perspective, it can be concluded that the statutes and regulations governing Federal acquisition activities were adopted piecemeal, albeit for sound reasons in each case. It is also clear, however, that in the aggregate they render FAA's procurement processes rigid, time consuming, and burdensome.

Specifically, current statutes and regulations inhibit FAA in the timely acquisition of advanced technology equipment, and result in the inefficient use of three critical resources -- time, people, and money.

To address these concerns, the Acquisition Working Group participating in development of the corporatization study provided ten essential recommendations designed to provide the U.S. Air Traffic Services Corporation (USATS) with the flexibility to purchase what it needs at the best price. Those recommendations included:

- Design of simplified acquisition guidelines in lieu of rigid regulations;
- Ensuring a predictable and stable flow of funds, without restrictions on allocation;
- Development, maintenance, and selection of contractors from technology-specified contractor lists;
- Permitting competition among selected qualified suppliers, or using sole source, based on good business judgment;
- Maintenance of investment in "proven" contractors throughout the life of a given program;
- Writing contracts with the flexibility to modify scope or enhance requirements without competition;
- Involving aviation stakeholders and customers in setting requirements and priorities;
- Forming partnerships between the corporation and suppliers to develop realistic solutions to user requirements;
- Allowing suppliers to propose system design within specific target costs; and
- Eliminating unnecessary oversight that does not add value.

To achieve these goals, the USATS proposal will expand upon specific legislative and regulatory reforms recommended in the Vice President's National Performance Review (NPR). Maximum success and efficiency will dictate that the corporation not be tied to other government agencies and processes that preclude the Corporation from being entirely accountable for its actions, and being as effective as any other business.

Mr. OBERSTAR. There are lessons to be learned about the procurement process and we are learning about them from the various contractors and various consultants that have been brought in, from the GAO, from the defense contract audit organization. And this committee will pursue the matter of procurement reform for FAA as a separate item.

But I didn't want to crowd too many things on to this schedule today. Not that this is of a lesser importance. What is of significance right now is what the problems are, how they are being fixed, where we go from here and how we are going to do that.

For the longer term, procurement reforms, government-wide issue, I want to focus on it just for the purpose of FAA, we will do that at an appropriate time, and I assure the gentleman we will have some good preparation for that.

You have been a very steadfast witness, Mr. Hinson, well-prepared, and responded to the questions appropriately. I appreciate your candor, your openness. We have a long ways to walk.

Mr. COPPERSMITH. Mr. Chairman, before you——

Mr. OBERSTAR. And I want to thank you for the extensive degree of cooperation you and your staff have had with us Members, the committee staff, in preparation for this hearing and as we have walked along the path of this contract and all of its complexity. There is a lot yet to do, and we are going to do it together, but I hope we can chain your leg to the desk for the next three years.

Mr. HINSON. Thank you for the comments, Mr. Chairman. And we—all of us at the FAA share your goals, I can assure you.

Mr. OBERSTAR. Mr. Coppersmith.

Mr. COPPERSMITH. Mr. Chairman, before Mr. Hinson leaves, I just wanted to—he has been here I think for close to three hours and has stood his ground well and answered questions. This probably has not been the most pleasant hearing you ever testified at.

And I wanted to state for the record that the last time I saw Mr. Hinson was at the Department of Transportation where there was a historic first, it was a joint rulemaking between both the FAA and the National Park Service, that deal with the very contentious issue of flights over national parks, that involved issues of accessibility and safety as well as preservation of the parks themselves.

And that is the kind of creative leaderships, that is something that has never been done before that should have been done before and I think it is only fair, after standing in here for two-and-a-half hours and taking it, that someone at least bestow a compliment on some of the leadership that you are showing—Deputy Administrator Daschle as well. This is a big problem and I am glad that it has your full attention, and let's hope that, together, we can solve it.

Mr. HINSON. Thank you, sir. I will pass your comments on.

Mr. OBERSTAR. This hearing marks a demarcation point, Mr. Hinson. Now it is on your watch.

Mr. HINSON. Somehow I knew you would say that, Mr. Chairman.

Mr. OBERSTAR. You are welcome.
Mr. HINSON. Thank you.
Mr. OBERSTAR. Thank you.
[Subsequent to the hearing, the following was received from Mr. Hinson:]

U.S. Department of Transportation
Federal Aviation Administration

Office of the Administrator

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

JUN 3 1994

The Honorable James L. Oberstar
Chairman, Subcommittee on Aviation
Committee on Public Works and Transportation
Washington, DC 20515

Dear Mr. ~~Chairman~~ Jim:

Several months ago, I advised you that we would complete by late May the FAA's analysis and initial strategies for addressing the future of the Advanced Automation System (AAS) program. Today, I am pleased to share with you the actions we are taking to bring this long-troubled program under control.

Under the direction of the new AAS program team, and working closely with Secretary Peña's senior team, we have undertaken an intensive review and analysis of the range of reports and other data compiled at my direction several months ago. We have already made a number of key FAA management and personnel changes indicated by these reports, without awaiting final resolution of all the program's issues. With the changes we are making today, the agency will achieve our modernization objectives in a simpler, more technically viable manner, at a savings of hundreds of millions of dollars from current estimates.

The additional actions we have decided to take to restructure the program are summarized below:

(1) Area Control Computer Complex (ACCC), which we suspended in March, will be canceled. We have concluded that the same safety and efficiency benefits can be provided to the industry and traveling public through Automated En Route Air Traffic Control (AERA) and other separate programs without additional schedule delays.

(2) We are canceling the Terminal Advanced Automation System (TAAS), and plan to satisfy the agency's near term needs through use of already-functioning ARTS IIIE technology. We will provide for the needs of the remaining terminal facilities under a new, competitive procurement that will use primarily commercial equipment to address the requirements created by limited consolidation.

(3) The Tower Control Computer Complex (TCCC), will continue, but we will scale back the number of towers in which it will be placed, based upon our revalidation of requirements.

(4) With respect to the Initial Sector Suite System (ISSS), in which the government has already invested over a billion dollars, we concluded that one additional analytical effort is needed -- a quantitative analysis of the capability of the software that has been developed to date by the contractor. This analysis must ascertain whether the existing software can be salvaged at a cost, and within a schedule, acceptable to the government, or whether it is necessary to terminate the existing contract and find an alternative that can be completed for the same or less cost and time.

The Center for Naval Analysis (CNA) report, which we commissioned in January, is highly critical of the software work. This underscores our deep concern about the value of the product received by the government to date, and going forward with the current program based on the already-completed and purchased software. Of special concern is CNA's conclusion that the current software architecture and design for key segments of AAS is outdated, flawed in many areas, and that it is not known whether the software can be made to work at a reasonable cost and schedule.

Like you, I am not anxious to extend further the period for final decision making on the future of ISSS -- even for the additional 90 to 120 days I understand will be required to complete a careful and quantitative software examination. Nonetheless, since 1988, the government has spent approximately $1.4 billion on this contract, and even more on the program as a whole. Prudence dictates that we be confident of the value of the existing software, or lack thereof, before final decisions are made. A decision to discard years of effort for which the taxpayers have already paid can only be based on the most definitive, quantitative information we can obtain. The Loral Corporation, which would become the prime contractor upon novation of the IBM contract, has been forthcoming in its willingness to cooperate with FAA in this validation effort.

At the same time, we cannot permit money to be spent on a "business as usual" approach while we gain further data. Expenditures on the program must be curtailed. I have directed the AAS Program Office to take all action needed to see that the expenditure rate is promptly and substantially reduced. We have also secured the understanding of the contractor that the government will require agreement on several key contractual protections to ensure performance and financial protection for the government.

These decisions go far in our effort to ensure that the public and the aviation community receive the promised benefits of modernized air traffic control at a price and in a time frame that reflects a disciplined, business-like approach. We look forward to providing you with continuing information on the progress of our decision making effort and having your views on the difficult issues that continue to confront our modernization efforts. We remain committed to seeing that modernization is achieved in a timely manner at substantially less cost than estimated in recent reports and believe these actions begin to fulfill that challenge.

Sincerely,

David

David R. Hinson
Administrator

Mr. OBERSTAR. Our next witness is the new contractor on the block, Loral Corporation, its chairman and CEO, Mr. Bernard Schwartz with such associates as he may choose to bring with him.

I see Mr. Frank Lanza accompanying you, Mr. Schwartz, President and CEO of Loral, and I welcome Mr. Lanza. He has made a favorable impression upon our committee and members of the staff who had the opportunity to visit with him, and we look forward to your testimony.

You come in at a very critical juncture and much is expected of you. We look forward to your testimony and just prior to that two observations, one on my part and one from Mr. Coppersmith, is that I must say that when Loral entered upon the scene, Mr. Schwartz came up to visit with me and Mr. Clinger.

And I observed that the same thing happened when IBM got the contract, they sent a big gun in to say we are here and we are going to do the job and we are going to work with you. And the Secretary of Transportation said he is going to ride herd, he is going to have the Chairman of the Board of IBM in his office for accountability sessions. And I said, that is fine. We never saw them again. And Mr. Schwartz said that won't be the case with us.

Well, this is his third visit, so we welcome you.

Mr. Coppersmith has a few introductory remarks.

Mr. COPPERSMITH. Thank you, Mr. Chairman.

I want to join you in welcoming Mr. Schwartz, chairman and CEO of Loral, as he joins us today to testify before this committee. Many of the Members may know Loral operates a large aerospace facility in Goodyear, Arizona, west of Phoenix, and has a significant economic presence in Arizona. My familiarity with Loral's other operations and their track record in complex, highly technological projects gives me confidence, in addition to their willingness to be here and to work with you, in their ability to fix the advanced automation system without, we hope, a major and costly overhaul.

I had the chance to review Mr. Schwartz' written testimony which explains Loral's rethinking of the final phases of the AAS, their willingness to consider other company's systems and the remaining portions of the project to make the architecture as open as possible and so on.

I believe that Loral can bring the leadership needed to resolve the problems that have plagued the AAS system for a decade and that have made it simultaneously a major technological advance and at the same time a textbook example after troubled procurement project.

Again, I want to thank Mr. Schwartz for coming to testify at this oversight hearing today and I look forward to more work and hopefully better hearings in the future.

Thank you.

Mr. OBERSTAR. Thank you very much, Mr. Coppersmith.

Mr. Schwartz, you have a very detailed 28-page statement. And let us assume that the entire statement will be included in the record—without objection, it will be—and that you will summarize the highlights. And we will take for granted all the good and valid things about Loral as a troubleshooter corporation that came in eyes open to tackle a big problem. It likes to fix big problems. Let's get to the meat of what you are going to do.

TESTIMONY OF BERNARD L. SCHWARTZ, CHAIRMAN AND CEO, LORAL CORP., ACCOMPANIED BY FRANK LANZA, PRESIDENT, LORAL CORP.

Mr. SCHWARTZ. Thank you, Mr. Chairman, and I appreciate the opportunity to be here, and thank you, Chairman Mineta, and other distinguished Members of the committee. It is an opportunity for us to talk to the record and I welcome that very much.

One thing we all can agree is that the works of this contract and this committee are very essential to the traveling public and that the concern about the extensive investment that has been made in this program to date can be saved and utilized for the benefits of the traveling public.

Mr. Chairman, if you will permit me to say just a few words about Loral Corporation, even though it is contained to some degree in the written report. Loral does employ 35,000 employees in the United States. And we are almost entirely engaged in the engineering, manufacturing and integration of large scale hardware and software systems. We think that is particularly relevant as we go on with the discussions today.

We operate facilities in 25 States. Our aggregate sales this year will be about $6.5 billion, ranking Loral among the largest industrial companies in the United States. And our backlog will exceed $10 billion and more significantly probably from our point of view, that for the past 22 years we have produced an unbroken record of improved earnings, achieving during that span an annual compounded rate of growth of 34 percent in earnings, 28 percent in assets, and 28 percent in stockholders' equity.

I point that out only because we could not be in the business for 22 years and achieve the kind of record we did unless we were able to deliver a good quality product over a long period of time to a very demanding customer. We had to be doing some things that were right and I think those resources are particularly relevant in what we are doing here today.

Without going through the detail, we have capability in serving the Defense Department needs, some of the leading technologies that are inherent today in the high technology climate atmosphere of the United States and the world.

In addition to our DOD efforts, we have initiated a new cellular telecommunication program based on a constellation of 48 low earth orbiting satellites which will bring modern communications to the most remote corners of the earth. And in addition to that, we have been—in addition to what we do in a normal course, we have enhanced our growth in a series of eminently successful acquisitions.

There is a lesson to be learned there as the committee determines what Loral's position here is with respect to the contract changes from IBM, and that is that every one of our acquisitions have been successful and they have been successful because they have been good business fits, that the criteria that we have put upon the assessment was able to go into the programs and the technologies and determine in effect their enhancements of our own business base.

Federal Systems met the strategy and I must say it is a world class leader in systems integration and modernization. At $2.1 billion of total revenue for Federal Systems, that of which this particular contract is only a small portion, of the 10,000 people working in Federal Systems, 2,500 people in Federal Systems work on the FAA program, so that they had managerial and resources and skills that went beyond this particular program and they do manage some of the largest modernization programs in the U.S. Government, including the Internal Revenue Service and the Postal Service.

They are working on the U.K. air traffic control systems and very important military programs such as Lamps and Sustaining Base Information Service. Their 10,000 employees represent a very dedicated and important resource. There are some comments earlier today with respect to Loral's awareness of the contract problems that were going on prior to our coming on the scene.

We were fully aware of the AAS program and the contract difficulties before the acquisition. We had and have a firm conviction that the program is fixable and is in fact a good opportunity.

Mr. Horn mentioned a little bit earlier that perhaps the management of IBM should get the entrepreneur medal of the year. I submit to you, sir, that I expect to get the entrepreneur medal of the year after turning this contract around, and will deserve that award, by the way. We think we have an opportunity to do so and I will explain later on why IBM in fact was not benefited, was not—was indeed penalized in this transaction. And I will go into that a little bit later, perhaps.

During our 22-year record of proven program performance, Loral has been able to do many things that in effect have relevancy today. One example I would like to point out to the committee, is that in 1990 in our acquisition of Ford Aerospace, we acquired a contract for the Geostationary Operational Environmental Satellite, the GOES contract, which was to put up five satellites for weather monitoring in the United States, an essential, very, very essential service.

The Washington Post described that program as, quote, equally bollixed up. That program was over budget at its time of our arrival by a factor of almost three times, and was over two years late.

After a brief comprehensive study, Loral produced a new program plan. We delivered the first of the five satellites ahead of plan. The remaining deliveries are on schedule, and all within the plan cost. We put that program on a sound course through careful management and control, and the application of superior technological expertise. I am happy to report today that at 2 o'clock this morning, the first satellite was successfully put into orbit. And I must say that that was indeed a challenge that we undertook with full understanding of the technical and managerial implications.

A hearing similar to this was addressed by me two-and-a-half years ago in the Senate Committee having oversight responsibility for the GOES program. And during the questions and answers, Chairman Hollings asked me whether or not Loral would accept the responsibility for the execution of the contract and whether we were up to doing so and whether we would be accountable. I said yes, one word.

Afterwards, someone observed that in the congressional halls, short answers were not necessarily something that they were used to. But the fact is the question of fixing accountability and responsibility requires a very short sentence. It doesn't require a large explanation, and we are up to that opportunity and responsibility and we look forward to the opportunity to do so.

I should say something about the plan, the program itself. Loral is fully committed to the success of the AAS program, and will apply all of our resources to complete the program on schedule and at a cost that the FAA and the Congress can rely on. Secondly, the AAS program objectives are important, they are valid, and the implementation of the program can be modified to achieve both objectives at a fair cost and within a reasonable schedule. Most importantly, I would like to emphasize that the $1.5 billion investment in ISSS and TAAS is valuable and we think will be the cornerstone of the architecture of the plan going forward.

Loral brings experienced management skills and disciplines to a large complex program, like AAS. And further, some comments were directed toward what the Federal Systems group is. It is a very large world class system integrator. And they have put together a highly skilled team that, under our management, we believe will fulfill the obligations.

In short, Loral has put forth a plan called the fast track deployment for ISSS and TAAS Metroplex control facilities. I think it is also worth pointing out that Loral has no hardware bias in this program. We are not committed to any particular architecture. We believe if there is not a hardware problem, it is a software problem.

And I might say, the distinction I just mentioned is a very important one that separates us, Loral Corporation, from almost all other players in this program. We have already brought significant resources to the administration of the program, to this effort. We brought in management, contracting administration, software engineers, hardware engineers. We moved people to direct on-site operations and consulted with a wide galaxy of people in industry and academia and government for their expertise.

The objective in our in-depth analysis was not to fix blame for past sins. It was instead to determine a constructive course of action. The program had certain strengths as it is constructed today. The technical team devoted to AAS is highly skilled and organizationally structured and promotes effective teamwork and communication between all the parties.

That is important because much of the interface, particularly with respect to the man, the machine/man interface, and the discussions with the air controllers, is a wealth of capability that has been garnered over a period of years. And that experience is absolutely necessary for the continuing success of the program.

There are certain weaknesses of course in the program, and we recognize those as much as anyone else. We believe, however, that the greatest weakness was management controls and a failure to have a discipline with respect to looking at costs and schedules that were completely inadequate and we believe we have the capability and will have the techniques to correct that.

There was an inadequate provision for the continual technology centers, for moving developed and commercial hardware software. That open architecture, we believe, is extremely important. And the current schedule for the follow-on site deployment was unrealistic and the risks were very high. The fast track program that Loral is promoting, is suggesting here today, and presented to the FAA, corrects many of these issues.

I will remind the committee, again, that this was a very daunting and challenging program from the very beginning. Some of the stringent performances were extraordinary. The Chairman made reference to the downtime provision of no more than three seconds over a long period of time. The system requires more than 2 million lines of software code that must be written, tested and de-bugged and integrated to create a high availability, full tolerance system.

The ISSS part of it provides for en route air traffic controllers and capability that far exceeds any of the requirements of the other air traffic control systems in the world. This segment alone contains more than 16,000 functional requirements. So this was a very difficult program from the very beginning.

Earlier on, there were some comments with respect to the contract arrangements between the FAA and IBM. It was not—we were not here at the time and I cannot speak to who said what about whom. But I can tell you that this was recognized as a very challenging program from the very beginning.

It is not atypical in large and complex programs, particularly in the area of the DOD where we do a lot of technical work, it is not atypical for the contractor and the customer to recognize that the challenges are so difficult that contracts should be fashioned in cost-plus rather than fixed price arrangements, in recognition that there is in fact a great deal of challenge with respect to these kinds of programs.

The current program bears all the indications of that kind of challenge and there should be some tolerance in looking back as to what was done wrong here. I think there are lessons to be learned. But the most important lesson, I believe, is that the investment of the government of $1.5 billion, or thereabouts, in the ISSS and the TAAS programs, has great value and should be the cornerstone for anything, any architectural plan that occurs in the future.

I might point out one other thing with respect to the early parts of the contract. It should be recalled that the FSC award, the contract award of the AAS contract, was in November 1988, which occurred after a four-year fly-off between Hughes and in a competition with FSC, and that that competition was based on actual products and operational performance, not on rhetoric and not on proposals. And it was a recognition then that the FSC approach was the correct approach to this very difficult challenge.

Our proposal for the fast track program will emphasize an increase in user and operational input into the final design and reduce the program risk. I think it is particularly, Mr. Chairman, appropriate to recognize that this is fortuitously an interesting time for these discussions to take place.

To the extent that the software and the hardware that has been committed up to this point are valuable, is at this point on in the program where the greatest risk would have been incurred. And to the degree that there is now a change of attitude, change of management control, a change of direction in terms of the future investment, we think that we can, to a very great degree, produce a system that will have a great ability for performance, testing, a great opportunity for interface with the users and input into the system from the users and ability for the FAA to produce at the end of the period a useful program that can meet the objectives of the original contract.

I will cut short the rest of my remarks, Mr. Chairman, in the interest of brevity, and Mr. Lanza and I are more than willing to answer any questions you might put forth.

I might say one other thing. I hope the committee will recognize in answering the comments of the Chairman with respect to the commitment, I hope you recognize that my appearance, the chief executive officer of Loral and Mr. Lanza's appearance, the chief operating officer, is an indication to our personal commitment to this program and our complete confidence that we can manage this program and acquit ourselves well of the promises we make here.

I can't make guarantees about the future, but I will make one promise, Mr. Chairman, you will see us again and often.

Thank you.

Mr. OBERSTAR. Thank you very much, Mr. Schwartz. And that is reassuring and I also assure you we will want to see you often.

There are a lot of numbers floating around. Members on both sides of the aisle cited numbers back and forth about the cost to deliver this program. The report says the most likely cost is $6.9 billion if all elements are delivered and if we continue to proceed as planned up to this point.

What is your estimate of the fast track approach and what will be its costs?

Mr. SCHWARTZ. Our commitment is that we can complete the contractor's portion of this program for less than $4 billion. That includes the $1.5 billion that has already been invested in the program. So our view of it is that we can produce the contractors responsibility for a $2.5 billion commitment going forward.

Mr. OBERSTAR. $2.5 billion commitment from this point on?

Mr. SCHWARTZ. Exactly.

Mr. OBERSTAR. What do we get for the $2.4 billion?

Mr. SCHWARTZ. For one thing, we will have the completion of the Block Updates of 2, 3 and 4.

We will have the TAAS demonstration unit in San Diego in June 1995 and the operational readiness deployment in San Diego in August 1996.

We will continue the Atlantic City functional tests from June 1994 onward.

We will be able to operate a shadow mode in Seattle starting in 1995 and be in ORD in Seattle in April 1997.

We will have a Salt Lake City and Denver beta site with operational readiness in Salt Lake in March 1998, and in Denver in May 1998.

We will have a plan for further deployment on a monthly basis of deployment after a pause, after the ORD to get actual real-time capability assessed and put into the system. We will have an open architecture system that will allow for technology input in the future.

We will have a deployment of the 150 basic towers and 170 LCFs, and we will have completed the ISSS and the metroplex centers.

Mr. OBERSTAR. That is a very ambitious schedule.

Mr. SCHWARTZ. It is reasonable. We have studied it very hard, Mr. Chairman. It is reasonable. It is making maximum use of the investment put in to date and it will be a challenge, but it is not beyond our ability or the agency's ability to deliver.

Mr. OBERSTAR. Now, some of those elements that you cited—and I applaud you for having done this much detail work and setting goals for yourself and committing yourself to objectives and specific dates—but some of the items that you cited include cost reimbursement items for which costs are not as certain as they are for the fixed price elements of the contract.

For example, TAAS has some software design items that are reimbursement—reimbursable items and costs may grow. When you say that we are going to go to open architecture system—and that includes TAAS—does that also include some cost growth or what are you going to do for cost containment and will that result in delivery of less capacity than anticipated?

Mr. SCHWARTZ. The $4 billion estimate includes—our estimate of the total cost of the contractors portion of the program, that includes whatever risks there are including cost growth. We would think that the total program is incorporated, the fixed price portion of it and the cost reimbursable portion, is included in that number.

We would take whatever management—we have already added a good deal of resources to the program and our in-depth study would indicate to us these are reasonable estimates going forward both of the schedule and of the cost.

Mr. OBERSTAR. Let me come back to the point I raised about the software design for TAAS and the redesign to an open architecture approach. What is that going to require in terms of personnel to rewrite this software which in this area already has several thousand open items that have yet to be closed.

Mr. SCHWARTZ. Those are different issues. The open items that are trouble reports are something we are troubled with. We think that it is an excessive amount of those. We should recognize that a system as complex as this would yield TRPs in the regular course of events. We have this and we are looking hard as to why the TRPs have not been closed more quickly in the past.

We are looking at other issues as to why we cannot get more productivity in the software, for example. There was mention here that for the average, it is 80 percent greater than the software cost of line of code, for example. I would of course ask you to remember that the complexity of these lines of code and the simultaneous testing puts a great burden on this particular program as compared to other average systems. But we are looking at those issues to see how we can get greater productivity into the activities in the software.

I will remind you that there are 200,000 lines of code that have been written for the ISSS, almost all of which have been adapted to the TAAS as well, so that investment will not be lost.

I can tell you one other thing, Mr. Chairman, we have looked very hard at the TRP as we are able to observe that the character or nature of the TRPs that are now being revealed in this procedure are considerably less significant than the ones earlier in the program. This is a natural development. What we have been able to assert is there are in the TRPs the backlog that must be handled. There is no blockbuster. There is no showstopper in our estimate that will deflect us from reaching the goal, either the time or the costs, in going forward.

Mr. OBERSTAR. I understand, but let me explain before I go further. There is an awful lot of shorthand used in this discussion and some—for good reason, some of these terms are very long and cumbersome in themselves. The one we are talking about right now is Program Trouble Reports.

Mr. SCHWARTZ. Yes.

Mr. OBERSTAR. PTR, you can rearrange the words however you like, but——

Mr. SCHWARTZ. Program, right.

Mr. OBERSTAR. But they are Program Trouble Reports. They are sort of like the canary in the coal mine, they are an indication of system problems and perhaps potential failure.

The Daschle report and other reports we have received said that IBM was closing as many PTRs, trouble reports, as they were opening. The report said that the rewrite to the computer software lines of code was 100 percent. Every line written had to be rewritten. The original contract plan called for an estimate, the contract didn't call for it, but the estimate in arriving at this contract was given the complexity, only 40 percent, 4 of 10 would have to be rewritten. Far, far—performance far exceeded that optimistic estimate.

What is Loral doing differently than IBM to assure that each line of code doesn't have to be rewritten, what are you doing about closing the PTRs, are those IBM's problems, have you bought those problems, do you sign off on them, does IBM sign off on them? I acknowledge that these are the questions Mr. Mica and others asked earlier but in the detail we need to get at that now.

Mr. SCHWARTZ. Loral is responsible for those.

Mr. OBERSTAR. All right.

Mr. SCHWARTZ. We will not be looking to IBM to sign off on those. They have actually no input into the operation today and they have had none since January 1. I exclude from that considerations of novation, I am talking about the operation of the program. It is our responsibility and we are accountable for it. We have changed some of the procedures by which Federal Systems has been operating in the past.

One of the things about our management style, Mr. Chairman, is that the corporate group at Loral is much more deeply engaged in the operation. This is our business. This is our only business. We are not in the business of selling $60 or $70 billion worth of hardware to the consumer public. This is the business we are in. Mr. Lanza and I are deeply engaged because we need to have—we have to be in the operations here and we will continue to be.

I would like to ask Mr. Lanza to address the issue of how we are going to manage PTRs in the future.

I will say one other thing before you start. As of yesterday, there was a report that the schedule of handling PTRs was being executed a little bit more slowly and the PTRs were a little—coming through a little higher than the rate that the Federal Systems management had expected at this stage. That is something we are going to be looking at, peeling back the onion to see and to manage those issues.

Frank.

Mr. LANZA. Mr. Chairman, people make a lot of to-do with buzz words like PTRs and what the effect of them is, but we want to see more PTRs and expected to see many more than IBM predicted when we made our report to the administrator February 4th.

The important part of this program and a key ingredient to why we are changing the program and recommending changing it to a fast track is that everybody was panicking to meet a date of either April or June to start official buy-off by the FAA of the system which was to start on April 4th and then go into OT&E a year later, where basically after it was bought off in the period April to July, one could say the FAA owned it. There was a mad rush by IBM as well as the FAA to get all the problems cleaned up, worked 24 hours a day so we can get ready for this area.

The system is not ready to be bought off and what is more important, of course, is to do rigorous engineering testing, not official OT&E testing, but to peel the onion and get these problems out. Don't put them in backlog, get the key people there in Atlantic City. And we have transferred a lot of people there, to fix the problems there so that the customer-contractor relationship is one of partnership not writing procedures of trying to buy product.

The key ingredient of fast track is to allow us one more year over the present schedule conceived in 1993—which was very flawed even under the perfect conditions—to fix all the problems, incorporate all the changes that are in process now would be resolved with our customer, the FAA some of which are not definitized, I might say, and they are called BU3. So that when we go to tests, we have all those problems resolved and we have a year's experience in Seattle with real-time controllers using real radar to give us that familiarity of the end user. This dissolves all the myths about COTS in open architectures because there you have the real people working on the real system, not scientists driving the technology of the system.

This system is open and COTS. There is $80,000 worth of hardware in a console. That is the extent of it. All of it is COTS. COTS computer, a COTS Sony display, and a special purpose only Raytheon processor, which one of these days the commercial field will have one available to replace, or even Raytheon might. It is not needed at this time. It has got the Unisys operating system, open architecture, a higher language called Ada, not C++, but Ada is an open architecture and it has got open networks and communications.

So there is a mental block by people who are trying to make a Volkswagen chassis grow into a Mercedes and it looks the same and feels the same but doesn't seem to run the same saying that there are products available that can grow into what the ISSS has to do.

The program we are providing you is going to provide for the testing over the next year so that we can pull out all the PTRs, solve them rapidly. And in the meantime, we have been assured by the administrator, by Linda Daschle and by the program manager, that they will establish and freeze the requirements and the design so that we can freeze the design. I believe they will do that.

Then we can march off without having any problems associated with major changes.

Mr. OBERSTAR. If that doesn't happen, you will never get to the end of that process.

Mr. LANZA. All the people at FAA agree that that has to happen, I believe.

Mr. OBERSTAR. One year after we asked them to do it, but that is not bad. Mind you, I am asking these questions, but I don't want to appear harsh that I am making judgments on Loral. I want you to deliver all that can be delivered but at the same time, don't over-promise. Tell us what the problem areas are as you see them as you are coming on board.

How many levels—I am going to conclude with this—how many levels of sign-off are included within Loral to make a design?

Mr. SCHWARTZ. Depends on what the question is. But I might point out that the characteristic of Loral Corporation, we are a large company, is that we have a very small staff. You see most of the staff sitting in front of you today. And we have open communications.

I might say to you, Mr. Chairman, we do not have regularly scheduled staff meetings. We don't depend on people preparing great reports for us. It depends on what level we are talking about. For a capital expenditure, for example, over a certain amount, it requires corporate approval. That is really one corporate approval, not many.

For taking on new program assignments, it takes one corporate approval. But let me suggest this to you, Mr. Chairman, our style of management is to be deeply engaged in the divisional operations. We are at the sites very often. We are really part of the review process.

We are part of the decisionmaking process. And there really is not a gate that it has to go through that comes to corporate and it has to be rereviewed. It is really one process from the beginning to end. I think we are probably as close to the ground as any corporate management team in the United States.

Mr. OBERSTAR. That is refreshing, because if you have 14 levels of sign-off as Mr. Hinson has complained that he has to go through in FAA, you will never get there.

Mr. SCHWARTZ. Mr. Chairman, I might observe, when you reach my age, you don't have a lot of time to think about 14 sign-offs, or gates.

Mr. OBERSTAR. Yes, that is—well, the cost of doing all these fixes for the rewrite of software, and 80 percent of the software was written before IBM sent the cure notice out, so whatever has to be fixed, there is an awful lot that has to be fixed, but that IBM's cost of doing this exceeded the industry average by 40 to 80 percent.

You are going to reduce that cost?

Mr. SCHWARTZ. We are going to look at it, Mr. Chairman. We are going to try—we don't understand why it is as high as it is. It certainly exceeds the Loral average software cost of writing line of code. We are going to look at that very hard.

We think there are other areas that might have appropriate cost containments as well. We are pointing that out to the customer and the FAA and we will be quick to reach out to get other expertise to see how we can improve the procedures as we go forward recognizing that it is our responsibility.

You will not hear at this table remarks that we have to reach outside the company in order to reach the definition of our accountability. The accountability is here. But we will take expertise from any place.

Mr. OBERSTAR. We want so much to believe that this system can be fixed and will be fixed, and as the new guys on the block, you have all the sounds and all the moves to do it, we just don't want to believe too much.

Mr. SCHWARTZ. I understand, sir.

Mr. OBERSTAR. Mr. Ehlers. I am sorry, I exceeded my own five-minute limit here.

Mr. Ehlers.

Mr. EHLERS. Mr. Chairman, I just want to follow up on the last series of questions.

I notice in your testimony several times over you referred to what a talented, highly skilled team you acquired when you purchased FSC or when you took over the project, and you imply that the only problem was a management problem. Yet when we get to issues such as the one the Chairman just raised, 40 to 80 percent entire cost per line of code, that is not necessarily a management problem. In fact, that is generally a line problem.

Are you sure that the team you acquired is as talented as you profess it is in the document, and what are you going to be doing to double-check that and to ensure that?

Mr. SCHWARTZ. First of all, sir, I am not sure that I would agree that it is only a reflection—the lines of code cost was only a reflection of the imagined issue of the people on the line. I think the people on the line who are—the 2,500 people in the team are as good as we have seen. It is why Loral paid $1.5 billion.

This is not a capital intensive company that we bought. It is people, it is talent that can walk out the elevator every day. We believe that this talent is a unique aggregation of resources and experience that is a world class operation. We think they are very, very good.

Part of the problems about the cost of hardware is the way the program restructured. Mr. Lanza made reference to the need, as the program was being executed, to be in real-time, incorporating fixes in without having a proper testing period. We believe that the fast track program will give us an opportunity to focus on issues, stabilize the program, stabilize the architecture of the program which has never really been done and be able to go forward without a wasting of the very important resource of line code engineers. We think that is fixable.

It is partly in terms of management, it is also partly in terms of the way the program was executed in the past. We would hope to avoid those traps. It is not a reflection of the talent or the people working on it. They are good people.

Mr. EHLERS. All of them?

Mr. SCHWARTZ. I don't know 2,500 people, sir.

Mr. EHLERS. That is my concern.

Mr. SCHWARTZ. In all, we have 35,000 people who are also very talented and we are not responsible for what every one of them does, but we are in touch with the procedures, with the results, and I have to say that our assessment, our individual assessment of that asset rates it very high. And I might say that in the competition for the Federal Systems Company, there were other companies who rated the value of that asset very highly as we did. It was a competition and we won the competition.

Mr. EHLERS. Thank you.

Mr. OBERSTAR. Mr. Mineta.

The CHAIR. Thank you very much, Mr. Chairman.

Let me ask about what we are buying. Are you saying that the initial goals that were envisioned for the advanced automation system are still valid today?

Mr. SCHWARTZ. Yes.

The CHAIR. Given those goals are still valid, then what will get squeezed, requirements or dollars? Somehow, if we are going to buy the same basket of goods, it is either going to cost this or this. If we only have this amount of money, do we have to reduce the requirements? I don't see us being able to do anything else.

Mr. SCHWARTZ. Mr. Chairman, we have looked at the requirements of the program and the requirements of the contract, and it is our collective assessment, thoughtfully arrived at, that to complete the balance of that job, to get us to the ORD schedule that I mentioned earlier on, will cost an additional $2.5 billion. It takes into——

The CHAIR. That is an additional $2.5 billion on top of the original $6.4 billion that was envisioned?

Mr. SCHWARTZ. No. No, sir. It is very hard to reconcile so many numbers that have been bandied about this program.

The CHAIR. Right.

Mr. SCHWARTZ. The $4 billion of our contract cost, we believe, we will stand on that. We believe that is in the context of Deputy Administrator Daschle's conclusion that the program is something in the range of a $6.9 billion program.

Our portion of that, $4 billion, is we think reasonably involved in that $6.9 billion. That seems like a valid number. But we are not responsible for the amounts that are paid by the FAA or how they take on other consultants. We are not in charge of that part of the program. What I am suggesting to you is the $4 billion meets the requirement that has been established at this point.

I might say, also, Mr. Chairman, it is not only our hope but informed guess that we will have opportunities to reduce that amount as we get deeper into it.

We have provided in the fast track schedule a very ample time for testing and hands-on testing and utilization at the various sites particularly Seattle. We think there is a good possibility that, as we get into it, we are going to find that it will not require that kind of testing, but we are not prepared to make that promise to the committee at this point.

The CHAIR. We are talking about, I guess, a certain number of lines of code. What is that number? Any idea?

Mr. SCHWARTZ. Going forward?

Mr. LANZA. The total system is over 2 million lines of code, most of which I might add, over a million lines, all that code has been written.

The CHAIR. Sorry.

Mr. LANZA. All that code, Mr. Chairman, has basically been written, it is now in the de-bug cycle at Rockville and Atlantic City. That is why you are seeing so many changes. We are at the peak of de-bugging the basic software for ISSS of which a quarter of it is used for TAAS.

Into that, you have to recognize there are some changes that are going to be introduced over the next four to five months of scope that have been in work and completed which will raise that level also for the test. We would expect by the time we deliver to Seattle, this 1995 of "Shadow Mode," that all the major changes would be in the system that they will be testing and in the En Route Center will be in excess of a million lines of code which is—it sounds big, but we are involved in many programs that have much more than a million lines of code, much more than a million lines of code.

The CHAIR. My perspective as an insurance broker, if you could explain this, is part of this effort to also reduce the number of lines of code that you are trying to get at?

Mr. LANZA. The answer to your question is our primary focus is not to go in there and reduce lines of code because that is not productive. We don't have a reason to want to make the code at this point in time more efficient. What we want to do is get the code that has already been written to not have problems in it.

In parallel, the new code being written for other requirements we put much greater disciplines on that in regard to its quality the first time around. So the code that is already written, the expense now is not to rewrite it. The expense now is to de-bug it and take the problems out of it, which is what they define as PTRs and we fix it.

A PTR we price out at about 30 percent of the original line of code. That is about what it is costing us. The new code would be written much more efficiently because one thing IBM did lack, they did have talented people, they needed more systems software engineers.

Those are the people that lead the young people who do the coding, and we did lack over—senior software people who could put the programming together right the first time and not have a lot of bugs in it. There were not enough senior software people on the program to implement the software.

The CHAIR. Would you go back over for me the earlier characterization you had about the Mercedes-Benz and the transition to the Volkswagen?

Mr. LANZA. There is a lot of commentary in regard to open architecture in COTS. What I am trying to say is, the system we have primarily has all COTS in it. The hardware value of this contract is fairly negligible. The common console that the controller sits on has a cost of $70,000. It has three pieces of hardware: One from Sony, one from IBM computer, and we can go buy somebody else's computer just as well, and a graph intersection processor from Raytheon. That makes up the hardware, all of which basically is COTS.

When I say the computer is COTS, Sony is the only one that can produce a 2,000-by-2,000 line display, and the only one I would say that is not really COTS is the graphics processor by Raytheon. But the architecture of the system says that as the commercial sector drives new graphics processors or processors mainly driven by the multi media world, games and entertainment, we can include that.

Number two, somebody develops new computers which we are testing now, Unisys based. We can replace the IBM computers by a computer from somebody else. We are not locked into buying IBM computers all the time. So that part of it is open.

The software is also open. It is open architecture, nonproprietary Unisys operating system. When you were in Silicon Valley and IBM and DEC and Data General were fighting the World War III, each had a proprietary system and when you bought IBM, you died with IBM, right? All of a sudden, people said I am fed up with it, we are going to open nonproprietary, and then came Intel and Motorola with VCs. We have an operating system not proprietary to IBM. We have a networking system not proprietary to IBM.

Where is the COTS in that? Unfortunately, there is not a lot of third-party geniuses around writing software for $79 in shrink-wrap to run air traffic control. That is what COTS is.

And there is just not a lot of these geniuses around. It is a very special software. Are there some operating software we can buy and use from other companies like whether its Raytheon, Unisys? Yes, they have developed some. You want to call that COTS, fine. They have developed it, call it COTS. It really isn't. COTS is when I go to ComputerLand and buy my $79 shrink wrap. We can incorporate that into our system.

But most software we put into the system, we try to keep COTS, except for that which is application driven for the FAA because they have a very special requirement that is not used by most housewives; FAA's trying to control 6,000 airplanes.

So this word COTS gets to be very frustrating and depressed being the new man on the block because it is being overstated by people who have self-serving reasons or are scientists trying to drive this program bananas.

We at Loral want it to be open architecture. We don't build any of the hardware. We have no equity in the hardware of the system. We don't build the computers, processors, displays, nothing. We don't care. Motorola comes out with a better computer than IBM, I am going to buy it. Software, whether it is Raytheon or whatever, if we find something in the San Diego Tracon, Norway or Canada—we have been to these places—we will incorporate it where it saves money.

But in general, your system will be open architecture, you can bring new hardware in over the next decade as the commercial world makes it better. And if somebody develops better software and we can incorporate that software into our system including ADA, which is the concept the owners want for the system. That is what I was trying to say.

A lot of people are trying to make a Volkswagen that has 40 stations someplace in the world look like a Mercedes. That is where the expression came in.

It looks and feels like it, but you have got to live with the requirements of what we are really trying to accomplish and the unique requirements of the FAA. Just because it works in San Francisco, San Diego or Sweden, doesn't make it work here.

That is how we probably got into this trouble in 1982 when we spent $400 million in a dem-val with two companies who said, here it is, let's demonstrate and go on, right? Didn't work, did it?

So there is a lot of words being given, but the reality is, and we are trying to stand back and tell the FAA we don't have any equity in any of this hardware or software, we are willing to work with everybody in the industry because we work with them anyway, some of whom have good product.

We will incorporate it, and we presented a schedule that Bernard has shown you called fast track, that we wouldn't present if we couldn't meet it. We just wouldn't give that schedule if we couldn't meet it.

The CHAIR. Mr. Schwartz, let me ask you that quickly, about the contract or your purchase of the Federal Systems Division. As I understand it, the FAA portion maybe is about 20 or 25 percent of the total ability of the work there, the balance being Department of Defense or FHHS and other parts of the Federal Government.

With this purchase by Loral of the Federal Systems Division of IBM, what is the liability or how do we keep—maybe I should even go more basic—is IBM still liable for this contract? Are you a subcontractor to IBM? What is going to be the relationship in terms of this contract novation that has to take place here?

Mr. SCHWARTZ. During the period when the contract is novated, IBM has assigned to Loral the responsibilities and the operations of the program. The primary contractor, until novation occurs, is IBM. We are hopeful that we are going to resolve that issue and we see that as nothing more than a technical thing that has to be taken care of.

We would expect that the FAA is going to protect all its rights under the contract they have now as they go forward. We don't expect that anyone is going to be punitive against Loral. We are willing to stand up to the contract terms as we understand them between the contractor and FAA.

Going forward, there are some contractual arrangements between Loral and IBM as to liabilities that come out of the FAA program and that has been part of the purchase price, in effect, that we pay for the whole Federal Systems group. But short of that, IBM is really out of the picture. When the FAA contract is finally resolved, Loral and IBM will establish what the disposition of those contract clauses are and once the novation is completed, IBM will be gone from the scene.

The CHAIR. Thank you very much.

Mr. SCHWARTZ. Mr. Chairman, may I make one observation, if I have time, with respect to IBM and Loral and the holding the contractor responsible?

The issue of whether or not IBM has after assignment liability, having charged the government $1.4 billion is an issue that I don't want to get into. That is not my problem.

But I will point out an observation, we have been advised that IBM lost $50 million of write-offs in this program. I have been told this has been as high as $100 million, I am not sure. I really don't care about that, Congressman. That is their problem. I do understand that the investment of IBM here has been a very substantial one in the contract. But I might point out something for your observation that you may not be aware of.

There was a penalty to IBM with respect to this transaction and it was reflected in the purchase price.

The troubles of the FAA program was in the AAS contract. It was totally aware to us and to the other bidders for Federal Systems. We all factored in—I don't know about the other company, but we, Loral, certainly factored in the performance on this program, the potential liabilities, what it would cost to straighten it out, and that was reflected in a decrease in the value that was paid to IBM for Federal Systems.

One can speculate about how much that could be, but it was not a small amount of money. They got no credit for the fact that they were on this contract. It was a decrement of the value that we paid, so with all due respect, I might say that if you take that into consideration, we understood that liability of fixing the contract going in and it cost IBM a substantial sum in the purchase price.

Mr. OBERSTAR. Thank you for that explanation.

Mr. Mica.

Mr. MICA. Mr. Chairman, these two witnesses have not been sworn in, have they?

Mr. OBERSTAR. No.

Mr. MICA. Then, gentlemen, I just ask you if you will tell me the whole truth and nothing but the truth in the questions I am about to ask.

Mr. SCHWARTZ. I'll be glad to do that.

Mr. LANZA. Sure.

Mr. MICA. Okay. Have both of you read this from cover to cover, this report? Tell me the truth, the whole truth, and nothing but the truth.

Mr. SCHWARTZ. I have not. I have read selected passages, however.

Mr. MICA. All right. Will both of you read this from cover to cover?

Mr. SCHWARTZ. Yes, sir.

Mr. MICA. You will not.

Mr. SCHWARTZ. Sir, I would do that——

Mr. MICA. Would you please ask the people who are involved in the top management to read this from cover to cover?

Mr. SCHWARTZ. With all due respect, sir——

Mr. MICA. Now another question, you are both under oath, have you seen the movie Groundhog Day?

Mr. SCHWARTZ. No, I did not, sir.

Mr. MICA. Well it is not worth paying a lot for. I go to these 99 cent movies; they are now up to $1.50 because of inflation, but I saw that movie and it is a movie about a fellow that keeps repeating the same day over and over. I feel like I am part of Groundhog Day.

This is March 10—go back and read the Chairman's questions, Mr. Oberstar's questions, read the questions of the other panel members, it is all here. We did this one year and one month ago. Okay?

That is why it is so important that I ask you to read this. Go back and read it, please, and even the technical questions that have been asked today were asked a year ago. I asked the staff if we had a tape of our meeting at Georgetown with the IBM folks; we don't have that. I wish we had a copy of that, a transcript, that is why this record is so good.

I ask you to have your other folks read that. You can learn something from that. They can learn something from it. I won't feel like I am participating in another Groundhog Day.

Mr. SCHWARTZ. Congressman, what we are telling you is our best judgment. It is based on a truthful assessment. The reason we were somewhat facetious about reading that document, I think it will be educational and amusing. I am not sure it will help us in addressing the problems of the FAA program because we have been in—this management has been in place in Loral for 23 years. This management has been in place for 23 years.

Mr. MICA. That is all fine, but it gives you a history. You have dealt with Federal contracts before, sounds like you have had a lot of experience.

Mr. SCHWARTZ. It is all of our business.

Mr. MICA. This is part of—it is a good record of the problems that we have experienced. Imagine my frustration representing the taxpayers, you know, I feel very comfortable with you two with this program. I feel like I have known you—like it is better than I and Frank and John, that we have known each other for a long time. But you are entrusted with a lot of financial responsibility.

The program has been a disaster. Fortunately, it sounds like you have a record that you have already taken and snatched disaster and made it victory. I have a couple of questions, though, that deal with some of the other questions I raised before.

One is the audit function. If you would look at the way this program has been audited in the past and performed, and maybe you have been involved in some successful programs where there has been a good audit function—not that I am going to tell you to tell me how the fox should guard the hen house—but if you can give to us some recommendations, because whatever we did in the past was wrong and flawed. Okay? That is one. I would appreciate your suggestions, and recommendations.

The other thing is, there have been problems with the procurement process. I have asked the administrator to give us his recommendations.

If there are things—this will be a five- or six-year program on out. It will be into one of my future terms when we finish this and we will finish it, but the procurement process, if you can also give us input as to how the committee can change or FAA can change, sometimes the bureaucrats are reluctant to move forward and sometimes there are legislative or rule constraints that we can deal with.

That is the second item that I would like to know.

How many people from the old IBM project are in—are going to work for Loral or be involved in Loral or will be with Loral?

Mr. SCHWARTZ. I hope all of them.

The problem, one of the problems we do have, which is not answering your question, but perhaps the committee would be well to be aware of it, is that the continuous presentation in the media that this program is in trouble is causing additional burden on us to make sure that the good assets that are in place in Federal Systems continue to see their career future in order to continue to work for us. So our job has been, up to this point, to assure the continued emplacement of that asset. We think those assets are very important.

If the answer is have we engineered any failure, any firing, any head rolling? The answer is that that was not what we intended to do. To the extent that there are resources there that cannot do the job, we will not keep them in place.

Mr. MICA. Well, this is my final question, Mr. Chairman, if I may, but the past experience that we have had has been a disaster. You have had a lot of good experience. It sounds like you have pulled some chestnuts out of the fire in some of these things.

One of the problems—you go back to this, the Chairman asked the same questions about the lines of authority, the numbers, it is all in here. We asked IBM those questions.

It sounds like you have pretty close-knit operations and it won't be deferred.

How big of a portion of your business is this project going to be? Can you tell me, is this 25 percent of your business, the contract?

Mr. SCHWARTZ. It would represent about 7 or 8 percent of our volume.

Mr. MICA. Seven or eight. Okay. I feel comfortable with you all at this point. I look forward to working with you. I have nothing on your case. I want to see you succeed and the committee does, too, but I don't want another Groundhog Day a year from now. Thank you, Mr. Schwartz.

Mr. SCHWARTZ. I appreciate that, thank you.

Mr. OBERSTAR. Take Mr. Mica's offer seriously. Those who do not read and know history may well be condemned to repeat it.

Mr. SCHWARTZ. Yes.

Mr. CLINGER. Will the gentleman yield?

Mr. OBERSTAR. Mr. Clinger.

Mr. CLINGER. As someone who represents Punxsutawney, Pennsylvania, I don't want to hear anything detrimental to Groundhog Day like there is something wrong with Groundhog Day.

Mr. MICA. I only brought that up while you were gone, Mr. Clinger.

Mr. OBERSTAR. Next thing we know, we will be blaming Punxsutawney Phil for this, and he can't defend himself.

Mr. CLINGER. There is plenty of blame to go around.

I have a couple questions, Mr. Chairman. Maybe this has been asked before and I apologize if it has. I am sorry I was not here to hear your testimony, but I will have a chance to review it.

Do you think that the software can be rewritten or should we scrap it and start all over again? What is your best judgment on that?

Mr. SCHWARTZ. Our best assessment is that much of the software is valuable, needs not to be rewritten and will be utilized in the future system.

Mr. CLINGER. Thank you.

You have indicated one of your goals is to have a flexible program. However, the AAS en route software is written in computer language called Ada. Most computer programers are trained in the C computer language. Does this concern you at all that the AAS software updates may be very difficult in several years because everybody will be trained in Ada?

Mr. SCHWARTZ. I would point out to you, sir, that the official language for the Defense Department is Ada; that most of the advanced language, software language in most complex systems today is in Ada; and that I think the most reliable approach is to think that Ada will be usable going forward. To the extent there needs to be migration into a higher order of language at some later date, there would be an opportunity to do that.

Mr. CLINGER. In other words you think Ada is going to be the future?

Mr. SCHWARTZ. Is the present and I think will be much of the future. There may be additional kinds of languages that come forward. Ada is an open language, high order open language. I do not know whether 10 years from now new systems will be written in Ada.

Mr. CLINGER. Perhaps we are training in something that is not matching reality if we are training people in the C computer language.

Mr. LANZA. It used to be FORTRAN, right? That is a general statement that we are training people, you know, good people who program in code are trained in multiple languages because there is no one language. Some use Assembly, Fortran, Ada, some use C, some use C++. I think that is really not a problem as long as your operating system remains open and it is not proprietary.

Whatever language you transition to a decade from now, you can reassemble in a compiler as long as the operating system doesn't change. So I think you are getting too much on to the language part of it and whether you are writing in Ada or C-square-square, and I have an opinion of what I would like to write in, but Ada is a universal language, it is a Department of Defense language, C++ is a good language, people who are good programmers are going to work on your system. I assure you they will be trained in both of them.

Mr. CLINGER. You mentioned one of your objectives for the AAS system is increasing air traffic controller productivity and user benefits.

Isn't it true that none of the AAS benefits will be implemented until much later in the overall program, probably the year 2000? What is Loral planning or doing to get benefits to the users faster? Is there a way we can expedite the process and get some of those benefits? Because I think that is important.

Mr. SCHWARTZ. Mr. Clinger, I would think so. We have not addressed that issue now. We would hope, going forward, there will be an increased dialogue between us and the user community, and that is something we plan to do.

The user community, we think, should be much reassured by the fast track program that gives them the opportunity for hands-on involvement and feedback before the final deployment. I think that should give them some sense that the system that they get finally will be much more reliable and that their input, there will be provisions for that input, operating input to be infused into the program as we develop it rather than waiting until after to implement it.

Mr. CLINGER. Thank you both.

Mr. SCHWARTZ. Thank you.

Mr. OBERSTAR. Mr. Schwartz, one of the major issues in the continuation of this program is the interrelationship of the several elements. The peripheral adapter module replacement item has been developed.

Still to go are the initial sector suite, the terminal advanced Automation, TAAS I thought that was a Russian newspaper when I first heard that, radio and TV program, it isn't. The TCCC, terminal control computer complex, AERA, and ACC which apparently everybody knows to be the automated area complex computer system, will apparently be set aside at least for the moment, maybe permanently.

Now, if there is delay in the initial sector suite development, that delay would have had effect on ACC which is now going to be set aside?

Mr. SCHWARTZ. Yes.

Mr. OBERSTAR. Will any further delay in ISSS have any effect on any other elements causing other delay?

Mr. SCHWARTZ. I think not. Why don't you respond.

Mr. LANZA. I think putting TAAS aside, which could be delivered Monday, those are just not an issue; and putting LCFs aside, the small Tracons 30, 40, 50, which could be a different configuration or this configuration; the metroplexes which are very similar to the ISSS because they are high density, one would have to say that if ISSS was not stabilized and the software—we did stay on track, it would have an impact on the metroplexes because they are linked together in software and capability.

In the areas of towers and LCFs, the answer would be no. Those would be independent of what happens on ISSS and the metroplex.

Did I answer the question?

Mr. OBERSTAR. Yes. There are significant—I hope your comment about towers that could be delivered Monday is a figure of speech.

Mr. LANZA. Yes, towers are not a significant problem on this program and they can—they are available from industry and from Federal Systems to be deployed very rapidly. They are not a technical problem, they are not a basic issue. In fact, there is not a technical problem with the low volume Tracons, all LCFs at this point in time.

The major problem, as we reported to the—to our customer is, we are going to focus on the core program which is ISSS which has most of the problems and focus all of our attention because that has got to be fixed and fixed fast. And everything else is down hill.

We have been doing that. Once that is fixed, the metroplexes come along very easily. That is where we put most of our resources on.

Mr. OBERSTAR. Let me restate the question then. What is interrelated with ISSS in your system?

Mr. LANZA. The metroplexes.

Mr. OBERSTAR. The metroplexes. The focus must be on the million-plus lines of code involved in ISSS?

Mr. LANZA. Yes, sir.

Mr. OBERSTAR. And fixing—let's get to your philosophy or your approach on dealing with that software that is inherent in the ISSS.

Is it your approach to test the existing software and change it or to change it and then test it?

There is a significant difference in the two approaches, and maybe a cost difference and maybe a delay difference.

Go ahead, Mr. Lanza.

Mr. LANZA. No. We are going through a very, very detailed, rigorous engineering test, item by item in Atlantic City, to—of the present software and point out the problems. That is the smartest way to do it.

We have had an independent team since December from Loral, all Loral people, where we had 30 people put in residence at Rockville, looking at the architecture of the system, the openness of the system, and are there any major show stoppers, an independent team. And they were all Loral people.

The software that is being developed, that is being debugged now, is being monitored by our people. And the smart way that we are doing it is fixing the problems as they develop because we are down in the detail level. You can't say "Let's rewrite new software for this function," and fix it. We have deployed more people to Atlantic City, in fact, at the management level, so we can accelerate the fixing of those problems there on site and back home because that will get us to the next phase sooner, by fixing what we have.

Where we find we have a material problem that somebody did some stupid thing five, six months ago, of course, that segment will be rewritten. But on balance, it will be testing it and rewriting it when we have problems.

Mr. OBERSTAR. Keeping in mind the observation made in the national report that as a schedule becomes more compressed, the risk of not meeting the schedule increases.

Have you set a time frame within which to accomplish this portion of your challenge?

Mr. LANZA. Yes, absolutely.

Mr. OBERSTAR. What is that time frame?

Mr. LANZA. We laid out a time schedule and taken away the pressure point that made it have to happen last week. The time schedule was that we want to change the official testing, called OT&E, from End Route Center No. 1 to End Route Center No. 2, which delays it one year to have to do that.

We intend to spend between now and January of 1995, debugging the system and going through a rigorous functional test with the FAA testers; not acceptance tests, functional tests, which we will write with the FAA. It will be based on the requirements that the Administrator said he was confirming this morning. He said he had a committee looking at, establishing and reconfirming the new requirements and old requirements.

We want to write the procedure around that and test the system in Atlantic City to that unofficial procedure of functional test, not a spec test. In other words, don't test to check the spec, test to check functionally whether it will work. That will be completed by January 1995, and that system will then—or equivalent system—will be shipped to Seattle, where the next phase of testing is the controllers using real radar.

Mr. OBERSTAR. That will be in place in Seattle?

Mr. LANZA. In Seattle starting January 1995, Mr. Chairman. It takes about two months to get it set up in the installation. So by the first quarter of 1995, controllers will be working with the system using real radar.

Mr. OBERSTAR. Do you anticipate any increased cost in getting to that point, in cutting through this rather substantial amount of software?

Mr. LANZA. It is going to be cheap. It is going to be less cost than what we are on, because we don't have to test and retest.

Mr. OBERSTAR. And because you don't have to deal with the ACC interface?

Mr. LANZA. That is right, but the old plan has you testing, then go official, then retesting and retesting and retesting. That one was flawed by the 1993 plan that was put together by people who I am sure meant well, but it was an impossible plan they put together.

Mr. OBERSTAR. All right.

Now, following on this point, you have said, both you and Mr. Schwartz, that the weakness in the program has been management controls on costs and schedules, and that those management controls have been inadequate. You have also addressed the problem that failure to have discipline on costs and control has allowed cost estimates at any rate to escalate, the problems to creep in.

What are your cost control pressure points here?

Mr. LANZA. That is a good question. One of the biggest problems we had was the customer was not one customer, and our first recommendation is the customer ought to get a CEO on the program and Loral ought to do the same because there really wasn't an equivalent of a CEO on the customer side who could cut through all the chaff and make decisions.

Mr. OBERSTAR. That is the acquisition executive that Mr. Hinson is going to bring on board.

Mr. LANZA. That has been accomplished by Mr. Valone.

Mr. SCHWARTZ. It is the program manager.

Mr. LANZA. Our problem was that when we say management, we mean both technical management and general management, so the word management doesn't mean administrative. It means technical management as well, the people who tell the engineers what to do and give them the guidance.

The program has no matrix on it. There was no way to determine what you were doing in any kind of a schedule for work completion, because there was no measurement other than cost that you spent. We know what we are spending, that is pretty easy, but what you were accomplishing.

So management will review this, in some cases in a vacuum, really didn't know what they had accomplished for the work that month. Because there was no setup of matrixes that will allow them to have that.

Number two, we had a very poor department of estimating, what it costs to complete and what it costs to put in new scope. That has been changed by the transfer of a new Senior Vice President of Finance.

Number two, we needed—we had good material people, but we needed an executive that could run large material acquisition because on this program are some big subcontractors, you know, Sony and Raytheon, some software people.

Well, you need to be able to manage those contracts and buy the material smartly. They had good people, but not a senior person. We transferred the best material and acquisition manager in the corporation to that division full time to run that operation. We transferred one of our senior vice presidents to be the financial person, to cover the costs, set up the matrixes, and be able to give the program office good estimates of what it would take to do something.

We have transferred engineers there and we intend to do more systems engineers and a vice president from the corporation who works for me to be on site there, working with the Rockville people.

Mr. SCHWARTZ. May I just point out that these are not temporary assignments. These are full time assignments going forward. People are actually changing their homes to move on site.

Mr. OBERSTAR. On that, I have to say, I take you on face value. It is very reassuring, very encouraging, I like to say that.

Put yourself in the shoes of the skeptics, no longer here. They have gone to eat, I hope to refuel for this afternoon. If they would have stayed, they would have been a lot meaner than we are, the skeptics on both sides of the aisle, and give me some interim benchmarks to which you are willing to be held, I mean between now and 1 January 1995.

Mr. SCHWARTZ. We have submitted the fast-track schedule to the FAA and I think you have seen that schedule, certain milestones for performance, when we are going to be moving to Seattle, when we go to Salt Lake and when we go to Denver, et cetera. Those are milestones that we can bring you up to date on.

One of the things we would like very much to do, Mr. Chairman, we have suggested in our fast track that we have an openness of approach that has not been visible in this program up to now. We would like to issue regular news bulletins that report on our progress, report on our problems, report on the new technologies. We recommend having a symposium where everybody in the community is able to come in and give suggestions and we can take advantage of their expertise.

We would like very much to be able to come back and brief you as well.

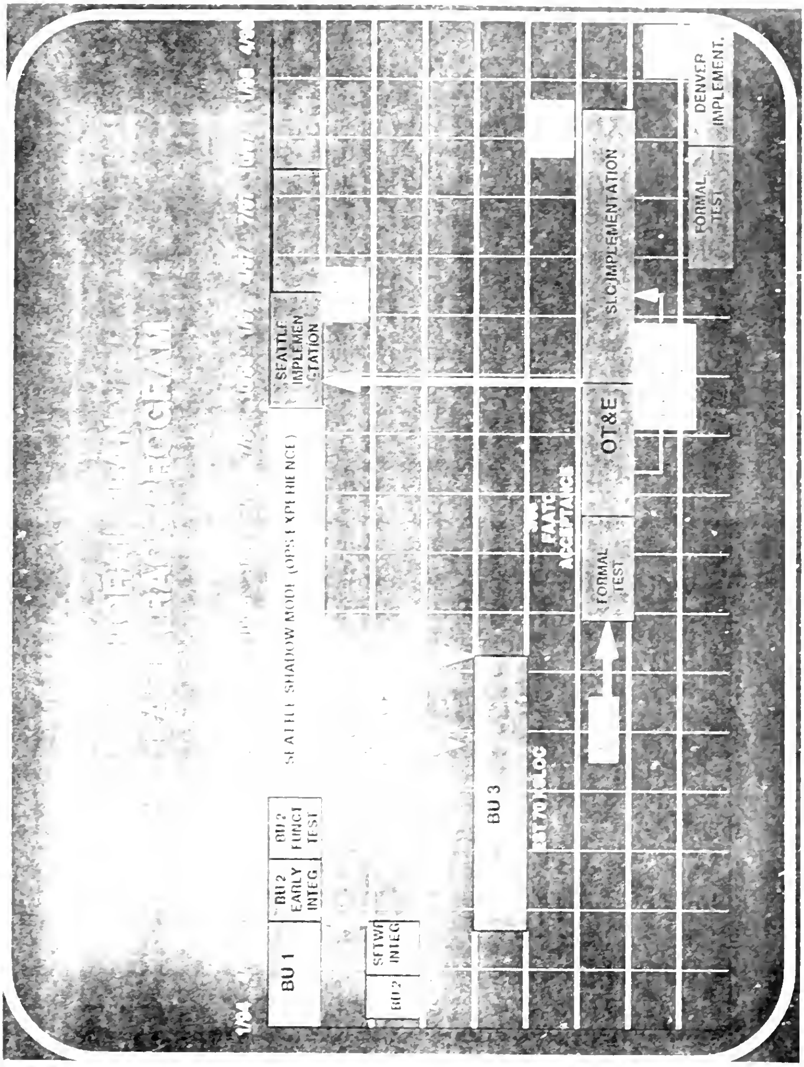
Mr. OBERSTAR. We will happily do that and we will do it in other than a formal hearing setting, because I think we can move faster and be informed. But this hearing is for the purpose of establishing those benchmarks and this transition point and what is expected of whom.

Mr. SCHWARTZ. If you will refer, sir, to the fast-track schedule, and we will send that to you——

Mr. OBERSTAR. We will incorporate it into the hearing record at this point.

Mr. SCHWARTZ. And you will be able to see the natural milestones for performance, that we should be held accountable, to which we should be held accountable.

[The information received from Mr. Schwartz follows:]


BU 1
BU2 EARLY INTEG
BU2 FUNCT TEST
BU2
SFTW INTEG
SEATTLE SHADOW MODE (OPS EXPERIENCE)
SEATTLE IMPLEMEN TATION
BU 3
FAATC ACCEPTANCE
FORMAL TEST
OT&E
SLC IMPLEMENTATION
FORMAL TEST
DENVER IMPLEMENT.

ALTERNATIVE II -"FASTRACK" WHAT LORAL RECOMMENDS

FOCUS

- START WITH A MINIMUM ESSENTIAL SYSTEM
  - » ISSS FOR EN ROUTE MODERNIZATION
  - » TAAS FOR TERMINAL MODERNIZATION (9 METROPLEXES)
  - » STOP ACCC UNTIL REQUIREMENTS REVISED

- THESE ARE BOTH NEEDED TO REPLACE AGING EQUIPMENT, PROVIDE PERFORMANCE UPGRADES, AND TO FORM THE BUILDING BLOCK INFRASTRUCTURE FOR THE FUTURE
- FURTHER IMPROVEMENTS, SUCH AS IMPLEMENTING EARLY USER BENEFITS (E.G., AERA, CTAS, ETC.), WILL THEN BE INCORPORATED AS AVAILABLE
- A LOGICAL FOLLOW-ON TO ISSS AND TAAS IS ACCC, AND LCF (BOTH FAA AND DOD)
- TCC HAS NO TECHNICAL ISSUES AND COULD BE IMPLEMENTED AT ANY TIME, INDEPENDENT OF ISSS AND TAAS

RECOMMENDED ACTION (Cont'd.)
FAST TRACK MODIFIED ISSS CONCEPT

PROBLEM

- CURRENT PROGRAM PLANS CALL FOR 15 MONTH CYCLE OF FAA ACCEPTANCE OF THE ISSS SYSTEM AND OT&E, ALTHOUGH REQUIRED FUNCTIONALITY WILL NOT BE AVAILABLE UNTIL BU 3 IS AVAILABLE 15 MONTHS LATER.
- HANDS-ON OPERATIONAL EVALUATION BY FIELD CONTROLLERS CANNOT OCCUR UNTIL SEATTLE IMPLEMENTATION IN 1996

SOLUTION

- TO PROVIDE A SOLUTION TO THESE ISSUES, LORAL PROPOSES A FAST TRACK CONCEPT. WHICH WILL ACCOMPLISH ALL OBJECTIVES OF FAA INCLUDING OT&E, BUT PROVIDE A LOGICAL LOW RISK PROGRAMMATIC PLAN.
- STOP CURRENT DT&E/OT&E ACTIVITY AT ATLANTIC CITY
- CONTINUE TO USE ATLANTIC CITY AS DEVELOPMENT SITE, FUNCTIONAL TESTING ON BU1 AND BU2 AND DEBUGGING.
- DEPLOY SYSTEM TO SEATTLE 1/95 FOR "SHADOW MODE" FUNCTIONAL OPERATION WITH REAL RADAR
  - HANDS ON OPERATIONAL EXPERIENCE
  - EARLY USER FEEDBACK
  - CONFIRMATION OF AUTOMATIC ADVANCED ENROUTE CENTER
- CONDUCT IMPLEMENTATION AND ORD FROM 10/96 TO 4/97 AT SEATTLE.
- FOCUS NEAR TERM EFFORT ON COMPLETING PTR's AND ENSURING SYSTEM STABILITY
- START DT&E/OT&E ON 9/95 (CONTAINS BU 2 AND BU 3) AT SALT LAKE CITY ENROUTE #2, TESTING COMPLETE 10/96, ORD 12/97
- LORAL WILL REVIEW SYSTEM HARDWARE AND SOFTWARE FOR FAA TRACONS TO ACHIEVE COST SAVINGS

RECOMMENDATION (Cont'd)
DEPLOYMENT SCHEDULE

- THE CURRENT DEPLOYMENT SCHEDULE CALLS FOR A "WATERFALL" CONCEPT FOLLOWING SEATTLE ORD, WITH A ONE-MONTH SET-BACK

- LORAL INSTEAD RECOMMENDS A PLANNED PAUSE OF 6 TO 9 MONTHS FOLLOWING THE FIRST 3 SITES E.G., AFTER DENVER SEATTLE AND SALT LAKE

- THIS TIME WILL BE USED TO VALIDATE AND FINE TUNE THE SYSTEM PRIOR TO FINAL DEPLOYMENT BASED ON REAL-WORLD CONTROLLER HANDS ON EXPERIENCE AND FEED BACK.

- INCORPORATE CHANGES BEFORE ATLANTA.

- PROCEED WITH FINAL DEPLOYMENTS BASED ON STABILIZED, RELIABLE, ACCEPTED CONFIGURATION.

FASTRACK RESULTS

- BASIC PROGRAM TO DEPLOYMENT
  - ISSS (20+2 ENROUTE CENTERS)
  - METROPLEX (9 CENTERS)
- PRIME CONTRACTOR COST
  - LESS THAN $4 BILLION, (INCLUDING 1.5 BILLION CURRENT INVESTMENT, ALREADY SPENT)
- SEATTLE - DEPLOYED AND OPERATIONAL - 9/96
- MAXIMIZING $1.5 BILLION SUNK INVESTMENT.
- PRODUCES RELIABLE SYSTEM TO MEET REQUIREMENTS.
- ELIMINATES RISK OF UNWORKABLE SCHEDULE - LOW RISK PROGRAM
- CONTAINS COST
- ALLOWS FOR FUTURE PRODUCT IMPROVEMENTS
- WHEN DEPLOYED - IT WORKS!

LORAL STRONG RECOMMENDATION

- IMPLEMENT FAST TRACK SOLUTION
- SAVE ISSS AND METROPLEX INVESTMENT
- ADOPT MANAGEMENT MODUS OPERENDI
- RESTRUCTURE PROGRAMMATICS
- MAKE USE OF EARLY USER FEED BACK AND EXPERIENCE
- LORAL WILL SUBMIT FORMAL CONTRACT CHANGES TO INCORPORATE FASTRACK MODIFICATIONS

RECOMMENDED AAS PROGRAM

ISSS

THE CURRENT PROGRAM PLAN CALLS FOR "CUSTOMER ACCEPTANCE BASED ON A FORMAL TEST OF BU 1 FOLLOWED BY HARDWARE APPROVAL FOR SEATTLE BASED ON AN OT&E OF BU 2. RECENT FAA DIRECTION CALLS FOR AN ADDITIONAL FORMAL TEST OF BU 2 PRIOR TO OT&E. THERE WOULD THEN BE ANOTHER FORMAL TEST AND OT&E OF BU 3 PRIOR TO ACCEPTANCE IN SEATTLE. IT IS LORAL'S OPINION THAT THESE FORMAL TESTS ARE VERY IMPORTANT AND SO THEY SHOULD BE PERFORMED. HOWEVER, THEY WILL CAUSE THE SEATTLE DELIVERY TO SLIP AT LEAST SIX MONTHS AND FURTHER JEOPARDIZE THE ORD DATE AT SEATTLE. FURTHER, HANDS-ON OPERATIONAL EVALUATION BY FIELD CONTROLLERS IN A FIELD SETTING CANNOT OCCUR UNTIL SEATTLE IMPLEMENTATION AFTER REQUISITE FAATC TESTING. TO PROVIDE A SOLUTION TO THESE ISSUES, LORAL PROPOSES A BETA TEST CONCEPT WE CALL THE FAST TRACK ISSS CONCEPT.

FAST TRACK ISSS CONCEPT

LORAL'S EXPERIENCE IN OTHER LARGE SYSTEMS IS THAT THE BEST FEEDBACK COMES FROM THE ULTIMATE USERS. GETTING THAT FEEDBACK AS EARLY AS POSSIBLE GREATLY REDUCES THE RISK OF FIELDING A SYSTEM THAT DOES NOT FULLY MEET USER NEEDS. THEREFORE, LORAL PROPOSES A MODIFICATION TO THE CURRENT PROGRAM PLAN WHICH ELIMINATES THE MULTIPLE FORMAL AND OPERATIONAL TESTS ON BU 1 & BU 2, DOES NOT REQUIRE THE FAA TO "ACCEPT" THE SYSTEM BASED ON INCOMPLETE SOFTWARE, AND ALLOWS EARLY USER FEEDBACK.

UNDER THIS CONCEPT, WE RECOMMEND THAT THE FORMAL TESTS AND OPERATIONAL TESTS CURRENTLY PLANNED FOR BU 1 AND 2 BE STOPPED. THESE WOULD BE REPLACED BY A NEW (TO BE DEVELOPED) FUNCTIONAL TEST OF BU2 FOLLOWED BY DEPLOYMENT TO SEATTLE AS A BETA TEST SITE AS EARLY AS JANUARY 1995. A BETA TEST IS ANALOGOUS TO FAA'S KEY SITE TEST. IT PROVIDES HANDS ON EVALUATION AT SEATTLE OF ISSS OPERATIONAL SUITABILITY AND SUFFICIENCY BY USING ISSS TO "SHADOW" LIVE OPERATIONS. A BETA TEST SITE WOULD NOT BE EXPECTED TO CONTROL LIVE TRAFFIC OR

TO PUT ISSS INTO OPERATIONAL USE. STARTING BETA TEST WITH BU2 WILL GIVE USEFUL SUPPORT AND FEEDBACK INTO BU2 BASED FAATC OPERATIONAL EVALUATION TESTING AND WOULD ALSO PROVIDE PTR UPDATE MATERIAL TO BU 3 FUNCTIONAL TEST. BU2 BETA TESTING WOULD FOCUS ON OPERATIONS AND MAINTENANCE, ADAPTATION, AND SYSTEM MANAGEMENT AND MAINTENANCE. AIR TRAFFIC CONTROL TESTING WOULD WAIT UNTIL THE ARRIVAL OF BU 3. BU3 COULD BE INSERTED INTO THE BETA TEST AT THE COMPLETION OF BU3 FUNCTIONAL TEST AT FAATC. BETA TEST CAN THEN EVALUATE AIR TRAFFIC CONTROL OPERATIONS WITH BU3'S FLIGHT DATA SIMPLIFICATION.

A SEPARATE ES/9121 SYSTEM (NON REDUNDANT) IS RECOMMENDED TO ACT AT THE DEDICATED HOST FOR BETA TEST. THIS WOULD ENABLE BETA TEST TO BE RUN IN A NON INTERFERING MANNER WITH NORMAL OPERATIONS. NOT HAVING A SEPARATE 9121 WOULD MEAN THAT THE OPERATIONAL NAS SOFTWARE WOULD HAVE TO INTERFACE WITH ISSS BEFORE SITE ACCEPTANCE OR THAT ELEMENTS OF THE OPERATIONAL HOST SYSTEM WOULD HAVE TO BE LOADED WITH NASM AND DEDICATED TO ISSS BETA TEST. THIS WOULD LEAVE LESS THAN A FULL COMPLEMENT OF THE HOST SYSTEM SUPPORTING NORMAL OPERATIONS DURING BETA TESTING.

THIS EARLY DEPLOYMENT WILL ALLOW HANDS-ON EXPERIENCE 12 MONTHS EARLIER THAN UNDER THE CURRENT PLAN AND WILL ALSO ALLOW FSC RESOURCES TO BE DEVOTED TO CLOSING THE LARGE NUMBER OF OUTSTANDING PTR'S PRIOR TO ANY FORMAL TEST AND ACCEPTANCE. WE RECOGNIZE THAT SEATTLE CAN NOT STAFF NORMAL OPERATIONS AND FULLY MAN SYSTEM MANAGEMENT AND AIR TRAFFIC POSITIONS FOR BETA TESTING. SEATTLE CAN, HOWEVER, GAIN OPERATIONAL, SYSTEM MANAGEMENT AND MAINTENANCE, AND ADAPTATION EXPERIENCE WITH THE FULL ISSS SYSTEM WHILE CONFIGURING AND ADAPTING THE SYSTEM FOR AIR TRAFFIC CONTROL OPERATIONS FOR USE BY THE AVAILABLE STAFF. ALSO, FIELD STAFF FROM OTHER CENTERS COULD PARTICIPATE IN BETA TESTING AT SEATTLE IN ORDER TO PERFORM SHADOW OPERATIONS ON A LARGER PORTION OF SEATTLE'S AIR SPACE. THIS POSSIBILITY WOULD HAVE TO BE BALANCED AGAINST THE NEED FOR FIELD STAFF FOR FAATC OT&E.

FORMAL DT&E AND OPERATIONAL TEST WOULD THEN BE CONDUCTED ON BU 2/BU 3 IN OCTOBER '95. ONCE FAATC OT&E IS COMPLETE, ISSS AT SEATTLE COULD BE UPDATED WITH A FINAL SET OF PTR FIXES RESULTING FROM OT&E. AT THE SAME TIME, ISSS COULD BE DEPLOYED TO SALT LAKE CITY TO BEGIN THE DEPLOYMENT WATERFALL.

BETA TESTING SHOULD SHORTEN THE TIME FROM START OF SITE ACCEPTANCE TO ORD AT SEATTLE. THE SITE TEMPLATE ALLOCATES SIX MONTHS FOR ACCEPTANCE ONCE HARDWARE IS INSTALLED AND INTEGRATED, FIVE MONTHS TO ACHIEVE IOC, AND FIVE MORE MONTHS TO REACH ORD. ACCEPTANCE TEST MIGHT BE SHORTENED BY AS MUCH AS THREE MONTHS, BUT IS GATED BY THE AMOUNT OF OPERATIONAL HOST TIME ALLOCATED TO ACCEPTANCE TEST. THE TIME TO REACH IOC IS GATED BY THE NEED TO HAVE TWO THIRDS OF THE CONTROLLERS TRAINED ON ISSS BEFORE DECLARING IOC. BETA TESTING WILL FAMILIARIZE CONTROLLERS WITH ISSS AND SHORTEN TRAINING TIME, BUT MECHANICS OF CONTROLLER CERTIFICATION ON A SITE ACCEPTED SYSTEM MUST BE CONSIDERED. IOC MIGHT BE ACHIEVED WITHIN THREE OR FOUR MONTHS OF ACCEPTANCE. ORD IS GATED BY SEATTLE'S NEED TO CONTROL LIVE TRAFFIC AND IMPLEMENT SECTOR BY SECTOR TRANSITION FROM PVDS TO ISSS COMMON CONSOLES BEFORE DECLARING OPERATIONAL READINESS. AGAIN, BETA TESTING WILL SHORTEN THE TIME NEEDED TO GAIN CONFIDENCE IN LIVE OPERATIONS. TWO OR THREE MONTHS SAVINGS IN THE TIME FROM IOC TO ORD MIGHT BE ACHIEVED AT SEATTLE. GIVEN THE ABOVE, THREE TO SIX MONTHS SAVINGS FROM START OF ACCEPTANCE TO ORD MIGHT BE ACHIEVED AT SEATTLE VS THE

CURRENT TEMPLATE OF 16 MONTHS. THIS NEEDS FURTHER STUDY AND AGREEMENT WITH THE FAA BEFORE REDRAWING THE TEMPLATE FOR SEATTLE.

THE KEY TO THE SUCCESS OF THIS CONCEPT HINGES ON FOUR FACTORS: (1) THE FAA'S WILLINGNESS TO DEPLOY A BETA TEST BASED ON RESULTS OF A FUNCTIONAL TEST, (2) FAA AGREEMENT THAT NEEDED OPERATIONAL ENHANCEMENTS CAN BE CONTAINED WITHIN BU 3 (ROUGHLY 75K SLOC), (3) CHANGES/FIXES RESULTING FROM OT&E WILL BE HANDLED AS FAA OPERATIONAL RELEASE MODS RATHER THAN THE MORE FORMAL BLOCK UPDATE RELEASE CONCEPT AND, TO A LESSER DEGREE (4) THE ABILITY OF SEATTLE TO REDUCE IMPLEMENTATION TIME BASED ON BETA SITE EXPERIENCE.

FIGURE 1 SUMMARIZES THE SCHEDULE FOR IMPLEMENTING THIS FAST TRACK CONCEPT.

Mr. OBERSTAR. Mr. Ehlers, any further questions?

Mr. EHLERS. Two very brief ones.

Mr. Schwartz, have you ever written a computer program?

Mr. SCHWARTZ. Have I? I am sorry?

Mr. EHLERS. Have you ever written a computer program?

Mr. SCHWARTZ. No. No, sir.

Mr. EHLERS. Mr. Lanza.

Mr. LANZA. Yes.

Mr. EHLERS. What languages have you used?

Mr. LANZA. Fortran, and a little bit of Ada.

Mr. EHLERS. Okay. Thank you.

Mr. OBERSTAR. Mr. Clinger?

I will say one of the most encouraging things I heard about this new team is from one of the experienced contractors who dealt with IBM and with FAA for a long time, who said that the refreshing thing in dealing with Loral is that you don't have to wade through layers of people to get decisions.

He related a decision that Mr. Lanza made on the spot, took action, something was delivered that day. That is what it is going to take to cut through all this stuff and deliver these systems on time.

From here on, it is kind of like the road to the Final Four in the NCAA, wherein you start in the round of 64, if you will. I want to see you get to the round of four, along about October. I don't want to trivialize this or oversimplify it, but you are engaged in an extraordinarily serious matter.

If we can deliver to the air traveling public the promise of increased safety, significantly increased reliability, lower cost operation of aircraft en route to destinations, more reliability in take-offs and landings, reduced fuel costs for airlines, reduction in cost to travelers of delays that cost the traveling public two years ago $14 billion because we had 114 million hours of delay in the system, then you will have accomplished something extraordinary, of great value and parenthetically, something of value that can be sold elsewhere in the world.

Mr. SCHWARTZ. Mr. Chairman, we are well aware of both of those circumstances. We see this FAA contract to be a very valuable opportunity for us, which will bring rewards if we are able to perform.

Mr. OBERSTAR. We are counting on you to do it.

The subcommittee—the House will go in session in a few minutes. We will have a vote. We thank and dismiss this panel and will resume in approximately 45 minutes, with the next panel consisting of Raytheon, Hughes, Unisys, BDM, and Tandem.

The subcommittee will stand in recess.

[Brief recess.]

Mr. OBERSTAR. The subcommittee will resume its sitting.

I apologize to the witnesses for having been called away by a rather high-level phone call from a Cabinet officer. I would not have interrupted a hearing for any other purpose, and I apologize for having done so.

Our panel consists of Mr. Dale Reis, Vice President, Raytheon Company; Mr. William Marberg, Vice President, Air Traffic Control, Unisys Corporation, from Minnesota; Mr. Robert Kramp, Group Vice President and General Manager, Command and Control Systems Division, Systems Sector, Hughes Aircraft Company; Mr. Philip Odeen, President and CEO, BDM International, Inc.; and Mr. Robert Yeldell, Director of Federal Operations, Tandem Computers, Inc.

TESTIMONY OF DALE REIS, VICE PRESIDENT, RAYTHEON CO., GENERAL MANAGER, EQUIPMENT DIVISION; WILLIAM P. MARBERG, VICE PRESIDENT, AIR TRAFFIC CONTROL, UNISYS CORP.; ROBERT H. KRAMP, GROUP VICE PRESIDENT AND GENERAL MANAGER, COMMAND AND CONTROL SYSTEMS DIVISION, SYSTEMS SECTOR, HUGHES AIRCRAFT CO.; PHILIP A. ODEEN, PRESIDENT AND CEO, BDM INTERNATIONAL, INC; AND ROBERT YELDELL, DIRECTOR OF FEDERAL OPERATIONS, TANDEM COMPUTERS, INC.

Mr. OBERSTAR. Welcome. We are glad to have you here.

We will start in order of appearance in the witness list, Mr. Reis.

Mr. REIS. Mr. Chairman, Members of the subcommittee, good afternoon. I apologize for correcting you. My name is Dale Reis.

Mr. OBERSTAR. Reis.

Mr. REIS. Good German name that got spelled wrong when the family came over.

Mr. OBERSTAR. There is the Reis Coal Company in Minnesota, used to be. Then there is the Rice Delivery Company.

Mr. REIS. I am from the Reis side, thank you.

I am the Vice President of Raytheon Company and General Manager of Raytheon's Equipment Division. I am responsible for a major portion of the FAA's Advanced Automation System.

I certainly welcome this opportunity to share some of our perspectives on the state of technology in air traffic control automation systems and in AAS in particular, and I will keep my remarks brief. And I respectfully request that my prepared statement be submitted for the record.

Mr. OBERSTAR. Without objection, the entire statement will appear in the record.

Mr. REIS. Thank you. Raytheon is a major, diverse international technology-based company. Our Beech Aircraft subsidiary is a leading supplier to the general aviation industry. We are also one of the few systems integrators of turn-key civil air traffic control systems in the world.

Raytheon's air traffic control systems capability grew out of our radar experience in World War II, and today we have ongoing FAA and international ATC contracts with an aggregate value approaching $2 billion.

Raytheon has been an ATC systems engineering and technology leader in the U.S. since 1956. We provided systems to the FAA that include the ARSR–1 and 2 radars in the 1950s, the Radar Bright Display Equipment and enroute Plan View Displays in the 1960s, the primary backup Direct Access Radar Channel in the 1970s, and the Enhanced Direct Access Radar Channel and Terminal Doppler Weather Radar, known as TDWR in the 1980s.

We believe that the performance on the TDWR system should serve as a model for other FAA programs. Systems were delivered six months ahead of schedule with no increase in contract price. We received maximum incentive fee for this achievement, and a critical factor to success on this program was strong program management and systems engineering on behalf of both Raytheon and the FAA.

Outside the United States there are 34 countries using Raytheon ATC systems and equipment. For example, in 1977, Raytheon contracted with the West German civil aviation authority to replace all of the enroute, terminal and tower systems throughout the country with modern, reliable systems. Since the first operational system was installed in West Germany over 13 years ago, there has never been a system outage caused by Raytheon equipment or software.

In the same mid-1980s time frame that AAS was awarded, we won two major contracts with Transport Canada to develop and integrate new radar systems and redundant automation systems that are now providing nationwide coverage for that country. Final commissioning of the last sites will occur this summer.

Automation is the heart of any ATC system. It is networked to all ground and air space control elements, including radars, navaids, communications, satellites, weather, aircraft and remote facilities. Secure communication between these elements is vital. Raytheon has the capability to integrate these elements with communication links into a fail-safe total system. For example, we are delivering a turn-key system to India that ties together every ATC hardware and software element, including many remote sites, multiple sensors and our own Mode-S data link.

Our involvement with the FAA continued on the AAS program. IBM, as prime, was responsible for the system architecture, central and distributed processors, communication network and the software. Raytheon is responsible for the development and production of the common consoles, tower position consoles, and the backup channel system interface.

Raytheon has performed all of the AAS tasks assigned, including early production units on schedule and within the contractual budgets. All of the equipments have met the performance requirements specified and in many instances exceeded those requirements.

I would like to point out that, contrary to Mr. Lanza's statement, the main display controller is a commercial, off-the-shelf product. It was designed on Raytheon funds, uses a Silicon Graphics corporation commercial off-the-shelf graphics language. The main display controller has been sold to numerous U.S. and foreign customers and has always been considered a commercial off-the-shelf product on the AAS program.

Much has changed since the inception of AAS in the early 1980s and that should clearly affect the direction of the program and the system design. Traffic increases at half the projected rates, consolidation concepts that have been diminished, facility backup that has now been minimized, system availabilities of seven 9s that may no longer be required—all factors that drove the original AAS design.

No one could have foreseen all these changes, but it is critical now to correct them and select a new direction that makes sense.

In the area of system availability, concerns about methods of software upgrade of computer complexes have led to the need for a dual-channel system. This requirement is further motivated by the need to provide continuous operations even during periods of system upgrades.

In addition to major requirement changes, technology has changed significantly since 1983, when many of the AAS design decisions were made. Two key items that bear directly on the current evaluation of the AAS program are open system architecture and its related X-Windows technology. X-Windows technology is essential, since it allows third party software to be integrated into the Advanced Automation System with minimal effort and minimal cost.

The timing of the AAS program, unfortunately, just missed the open system technology window. The rest of the ATC world began purchasing open systems in the 1980s based on the Non-Development Item or NDI approach. The cost, schedule and risk savings are clearly demonstrable.

For example, we were awarded a contract in early 1991 to provide an NDI open system to Norway. It offers similar capabilities to those originally required for the Initial Sector Suite System, while also providing much of the capabilities required for the Area Control Computer Complex, capabilities which currently would not be available here until the year 2000. Our Norway system will be controlling air traffic by early 1995, and we call our product name for this AutoTrac.

And, to date, we have sold open systems to several other customers including the Netherlands, India, Germany and Oman.

We all recognize that the AAS program is at a difficult stage. The promised benefits to the air traffic controller, airline community, general aviation and general public appear to be in jeopardy. However, we would propose some immediate actions can be taken to correct the course of AAS and still offer early cost savings, increased safety and operational benefits.

In response to the Center for Naval Analysis request for a total system solution, we at Raytheon prepared an alternative based on the principle of Non-Developmental Items and open systems that would replace the existing Plan View Displays with common consoles using our DCX multi-channel display controller. This alternative would also replace the current Initial Sector Suite System architecture with a fully redundant dual channel architecture based on an NDI open system and would assure system availability and transition to a fully open system architecture for the future.

This alternative would require enhancements to address FAA specific requirements, and we have estimated this change to represent less than 12 percent of our off-the-shelf software code.

In addition to addressing obsolescence issues, this approach would offer the added benefit of X-Windows to allow the low-risk integration and earlier introduction of third party software applications such as improved weather analysis, Automated Enroute Air Traffic Control, and Center TRACON Automation System functions. I believe these are important to bringing early cost benefits to the airline and general aviation and the flying public.

Program risk can be significantly reduced by the use of field-proven NDI application software. Open systems exist today that can meet most of the FAA's needs. Raytheon has developed our system with over 750,000 lines of application software code that represents an investment of approximately $200 million made by the German, Canadian and Spanish governments, as well as Raytheon and our Spanish partner, Ceselsa.

This total system solution is the correct clean slate technical answer. However, we are not in a position to assess the status of the ISSS software.

Assuming that ISSS software is on a predictable path to completion, we support an evolutionary approach. It allows significant portions of the AAS system that are now under development and test to be used to provide direct user benefits in the near term. It maximizes the benefit derived from the AAS effort and sunk costs to date. For example, over $150 million has been invested in the Raytheon Advanced Automation System acquisition phase subcontract alone. And the air traffic controllers desperately need the common console modernization.

We would introduce NDI solutions for early field deliveries to address obsolescence issues with the existing controller workstations and the backup channel. Plan View Displays would be replaced with the new AAS common consoles upgraded to a demonstrated and proven Multi-channel Display Controller, referred to as DCX, which is being developed on internal funds by Raytheon. It would allow the new common consoles to interface to both the existing E–DARC and NAS host.

E–DARC would be replaced with a proven and modern automation system based on an open system. This would provide a redundant backup channel for both Radar Data Processing and Flight Data Processing with modern computers for continuous operation. When the AAS/ISSS processing string is operational, we would replace the existing NAS equipment with a second open system channel, and the final step in this low-risk transition would evolve to ACCC with AERA functions and other software enhancements on the dual redundant, open architecture system.

I am not privy to all the contractual issues that must be resolved on AAS, but I would expect FAA management to focus their immediate efforts on modernizing ISSS with some open system attributes and initiate independent efforts to address other parts of the program such as the Area Control Computer Complex, Terminal Advanced Automation System, and the Terminal Radar Approach Control. This would further open the door to NDI open solutions.

And, in this regard, we can learn lessons from our international civil aviation friends. NDI is not new to them. Functional specifications are used to prescribe the essential performance with the accompanying requirement for a demonstrable system. For example, India competed for the acquisition in March, 1993, for two complete airports of ATC equipment. They will begin receiving systems in late 1994, with commissioning scheduled in early 1996. And I can tell you personally that their price was much less than comparable equipment in the United States. Why can't we do this?

And, in summary, the requirements that originally drove AAS have changed. Technologies exist today that simply were not available at the time of FAA conception of the NAS plan, and those technologies offer immediate solutions to many of the AAS problems. The important thing is to take advantage of these changes and get on with the program from here.

So I wish to thank you for the opportunity to appear today, and, furthermore, I wish to pledge Raytheon support to Congress, the administration, the FAA, the air traffic controllers, the public and all others selected to participate in the AAS program. Raytheon stands ready and able to support you in fielding a successful Advanced Automation System. Thank you.

Mr. OBERSTAR. Thank you very much.

And Mr. Kramp.

Mr. KRAMP. Mr. Chairman. Thank you for the invitation to make this presentation today.

First, just a couple words about myself and my organization. I have been with the company over 35 years and have spent most of my time with systems projects. My division has the name Command and Control Systems, but, essentially, it is an area of large systems expertise. We focus on large, complex, real-time systems that include air defense systems, air traffic control systems, et cetera.

With that, I will continue with a prepared statement. First, I would like to provide you some background on Hughes Aircraft Company's experience relevant to the AAS program.

In the early 1950s, the senior executives of Hughes made a critical management decision to invest in the development of technologies, both hardware and software, that could be applied to the implementation of large-scale, real-time systems for air space management. Turn-key air defense systems were the initial focus of this corporate initiative.

By the early 1960s, the company was already the world leader in supplying such sophisticated systems, a distinction we believe we still possess today. During the past 35 years, we have supplied more than three dozen such software intensive systems to the United States, Canada, Japan, NATO, the United Kingdom, Germany and numerous other valued allies around the world.

While each one of these systems is unique, they tend to share common characteristics. Each system requires hundreds of thousands to over one million lines of new software code. Each system is made up of sites spread throughout a national or continental area. Each system is customized for the specific users. And today, with the tremendous investments made in the commercial computer industry and open systems, these large systems are generally hardware independent.

And, finally, any company building such systems must go through a learning curve. History shows that it is impossible for a contractor to complete a large, complex system on time and on budget without having first served an apprenticeship with turn-key systems over a period of many years.

At Hughes, because large scale turn-key systems are part of our core business, we have invested greatly in improving our program management, systems engineering and software process control needed for systems of this complexity. Some people will tell you that Hughes now has in place to support its air space management systems the best software process control in the business. We certainly feel that is the case.

Several years ago, when the Software Engineering Institute of Carnegie-Mellon University began grading companies on software process, Hughes was one of the first to be evaluated. We took that initial evaluation seriously, learned from it and put in place a multi-year plan of improvement efforts. Today, the Hughes software process in Fullerton, California, is viewed as the model for the aerospace industry.

It was about 15 years ago that Hughes Aircraft made another long-range management decision, this time to focus technology and resource to provide commercial air traffic control systems. When you take a close look at the technologies and processes required to build either air defense systems or air traffic control systems, you will see many similarities. In fact, except for specific operational uses, the way you go about building either type of system is nearly identical.

Today, Hughes has successfully completed a national air traffic system for the Republic of Korea and a backup system for portions of Germany. The company is actively building systems for Saudi Arabia, Belgium, Switzerland and Canada. The system in Canada closely matches in many ways the requirements for advanced automation contained in the U.S. system under development.

On the air defense side, Hughes continues and is currently active in building systems for Iceland, Taiwan, Kuwait and Saudi Arabia.

It is the last program I mentioned, it is called Peace Shield, the air defense system for Saudi Arabia, that I would like to elaborate on for a few moments. While Hughes was an original bidder for the billion dollar program and ultimately lost out in the competition, we are now under contract to complete the system. The original supplier was ultimately terminated in January of 1991 and a recompetition was conducted. Hughes was placed under contract to build the system, called Peace Shield, in July, 1991. Hughes is now 33 months into the program and is on schedule to deliver the project six months early, in month 48.

One of the primary reasons for our success on Peace Shield, we believe, is the high level of maturity we have reached in our program management, systems engineering and software development processes. We have invested greatly in these areas during the past five years, and our efforts are producing impressive results. Detailed planning involving over 75,000 inchstones allows the program and technical management to assess progress and redistribute personnel and capital resources at the earliest detection of problems. Further, this review and adjustment is done jointly with the customer on a continuous basis.

However, should problems occur, which is inevitable as requirements often change during the process, we are able to deal with them through our iterative development process. This systems development process is one where you build a little and test a little as you go along. This allows you to uncover problems in your overall systems approach at the earliest possible stages and allows you to take immediate corrective action.

Five years ago we established a defect database for the sole purpose of finding out what defects occurred in what phase of the software development life cycle. That is, design, code, unit test, inte-

Within that context, then, how does the Advanced Automation System meet the needs for terminal automation in the United States?

I think it is important to remember before we do that, though, that the U.S. system is by far the world's largest air traffic control system. Within the U.S. we have over 60 percent of the entire world's air traffic. And to give that a different perspective, the 17 largest airports in the United States handle almost 50 percent of the entire world's air traffic. Comparisons with international systems in that kind of context need to be done very carefully.

For example, in working with Raytheon in Germany, we have recently upgraded the air traffic control system in Germany to provide two features, conflict alert and minimum safe altitude warning. These are features that have been in the U.S. systems since the late 1970s, but they are just now being introduced into the European context. So we need to keep that in mind.

The Terminal Advanced Automation System segment of the AAS program has the following characteristics in my opinion:

It is a distributed architecture that is scalable from very large sites to medium sites to small sites.

It is a relatively open hardware platform, using an industry standard local area network and modern commercial computers. That is, it is taking advantage of things like the IEEE standards for networks and the best technology that the commercial world can provide.

The software is written in a higher level language that is transportable.

And it is using a state-of-the-art high resolution color work station that I do believe is a COTS product, in deference to my Raytheon colleague.

With regard to the TAAS architecture, we think it is fundamentally sound and will provide a good platform for the evolution of Terminal ATC systems well into the next century. The scaleability of the system is especially attractive because it ensures commonality amongst the various sites. We believe commonality was one of the primary objectives of the system when it was first designed, because commonality in this context translates into lower life cycle cost for the FAA.

However, we believe there are two major issues that need to be addressed by the FAA and Loral, and I think we have talked about them several times this morning. I will be brief. The first is: what are the key functional and performance requirements? The second is: how can we ensure delivery to the field in the quickest possible way?

There needs to be firm commitment on the part of the FAA and Loral to achieve closure on requirements. There are still a number of requirements in the TAAS specifications that are unclear, in my opinion, may be impossible to achieve and drive costs upward.

To use an example that has been talked about today, the basic up-time or availability for the TAAS at its most basic level of functionality is specified to be seven 9s (0.9999999). This means the system can only be down for three seconds a year. In today's system, we achieve about five 9s (0.99999) of availability, but we solve the problem of down time by having a totally independent backup system made up of different components—in this case, analog radar.

It is very unlikely that these two independent systems will fail at the same time. For example, there have been no operational failures of the Unisys automation system at the New York TRACON since mid-1991. A similar solution, based on simple, cost-effective backup, ought to be applied to TAAS.

With regard to schedule, it is in the best interests of all users of the systems, passengers, airlines, civil and military, to implement TAAS as quickly as possible. We believe the best way to do this is an incremental approach that provides well-defined sets of functionality in a series of deliveries or builds. An incremental approach starts with the functional and performance characteristics of today's system and builds off of that baseline.

Under this approach, we believe that the first phase of TAAS implementation can be completed by the end of 1996 or even earlier. I would actually suggest it could probably be done by the end of 1995. The first phase would incorporate the TAAS baseline hardware and only that software needed to provide the performance and functionality available at today's existing facilities.

Additional TAAS features like electronic flight strips, flight plan processing, final approach spacing tool and other functions could then be added as software upgrades to the existing TAAS baseline. And I believe these upgrades could be done at a fixed cost to the government.

The recent TAAS baseline proposal from Loral and what we heard about today from the fast-track proposal provided an incremental approach to TAAS deliveries. We fully support this approach and strongly recommend that the FAA adopt it.

In conclusion, Unisys believes that the TAAS architecture provides an excellent foundation for Terminal Automation Systems for what is the busiest airspace in the world. We believe it is in the best interest of the users to get the system into the field as soon as possible, and we urge the FAA and Loral to take the management actions required to achieve this goal. Thank you.

Mr. OBERSTAR. I thank you very much, Mr. Marberg. Your testimony is well received.

And we will go to Mr. Odeen.

Mr. ODEEN. Thank you, Mr. Chairman. I intend to summarize my statement and ask that my full statement be placed in the record.

Mr. OBERSTAR. Without objection, it will be.

Mr. ODEEN. Mr. Chairman, Members of the committee, I am Phil Odeen. I am appearing today as President and Chief Executive Officer of BDM International, an information systems and technology company. I very much appreciate the opportunity to discuss BDM's air traffic control initiatives.

We have implemented and certified the first and only next generation terminal air traffic control system in the FAA inventory. At a time when FAA's success in fielding new systems is being closely scrutinized, I can say with no small amount of pride and pleasure that this air traffic control system is an FAA and DOD success story.

I am expressing my views today based on 30 years of experience in the public and private sectors. I believe these experiences have given me a good perspective in both the way the public sector and the private sector handle large-scale systems development.

And as Chairman of the so-called Odeen panel, which was requested by former Secretary Aspin to look at the defense program last year, I have a good sense for the funding problems that all agencies, including FAA, face. There are not enough dollars around to support government missions if we conduct business as usual and fail to embrace new and more cost-effective approaches.

Before I discuss the air traffic control system we have built and delivered to the FAA at the High Desert TRACON in southern California, I would like to provide a brief overview of our information systems development philosophy.

Until the mid-1980s, the industry's information systems philosophy focused on developing custom software as opposed to building on and integrating off-the-shelf products. Most information systems were stovepipe solutions that used proprietary software and adhered to rigid engineering specifications, allowing for little flexibility.

This approach typically made the client a technology developer in the sense that he had to identify requirements, provide build to specifications, develop solutions, contract for their development, and then maintain the system through its whole life cycle. This may have been correct at the time, but it did lead to high development costs, significant development risks, rapid hardware and software obsolescence, little ability to cost-effectively expand functionality, and significant training and life cycle maintenance costs. FAA and other government agencies face many of these issues in their current air traffic control systems.

During the mid-1980s a revolution in computer hardware, software, and telecommunication technologies occurred. Desktop computing increased, new technology was rapidly introduced, and users faced the problem of not being able to take advantage of new, more advanced computer technology because it required a total rework of existing software. This led the user community to insist on hardware and software portability and interoperability, an open systems architecture approach.

Today, open systems architecture is defined as software that can be migrated across multiple vendor computer platforms and easily interfaced to other software and hardware that can be upgraded over time with little software or system impact.

BDM recognized the benefits of this technology revolution and quickly adopted an open systems architecture philosophy. We believe this approach is particularly important to a mid-size company that is attempting to enter new systems development markets. In fact, in some Federal Government environments, mid-size companies are not viewed as being viable information systems integrators. Through an open system architecture approach, we believe we can bring computer system innovations, which are typically spawned by small to mid-size companies, to our proposed clients at a cost that can overcome their predisposition to use larger but often less flexible contractors with long client histories.

This open system architecture approach was used by BDM in its recent development of an air traffic control system for the FAA and DOD. The FAA and DOD identified core requirements and additional capabilities and developed functional and performance specs and acceptance criteria. How the system was developed was BDM's job. The result of this innovative joint effort is the first FAA certified air traffic control system that shifts the FAA from a technology developer to a technology user, their proper role in my view.

Most importantly, this approach resulted in an air traffic control system that was developed, integrated, FAA certified, and implemented at three locations at a cost of $15.4 million in under four years, requirements through commissioning, including two planned upgrades.

Why was this effort so successful? Because this initiative had a small dedicated team of FAA air traffic and DOD range management individuals, FAA and DOD controllers, and BDM personnel. I might add a total of less than 50 people, about 20 BDM and roughly an equal number of government people. All participants were involved throughout the program, and the effort was unencumbered by too many nonessential support contractors or excessive oversight.

The initiative focused exclusively on fielding an agreed onset of capabilities in a reasonable amount of time at a reasonable cost. Once fielded, it could easily accommodate system enhancements. This approach was necessary to get controller acceptance and enthusiasm as well as maintain program momentum.

At this time, I would like to highlight a number of the benefits the High Desert TRACON system provides to both the FAA and the Department of Defense. The system is the latest successfully delivered modern air traffic control system in the FAA. If implemented system-wide, we believe it can provide the following risk reduction benefits to the AAS program:

In the area of reduced cost risk, there are five primary benefits of the High Desert TRACON system:

First, affordable implementation costs. The development of this system is complete. Depending on the number of controller positions in a TRACON facility, the cost for implementing the system ranges from $700,000 to $7 million. We estimate the cost to implement the system in an average terminal environment to be about $3 million.

Second, the system reduces life cycle maintenance costs. The FAA can take advantage of new hardware and software maintenance approaches. System hardware can be upgraded every three to five years for less than the cost of maintaining the current hardware. And most of the system software can be maintained through a central maintenance organization and distributed via the standard telecommunication lines.

Third, the system reduces life cycle equipment costs and can evolve incrementally with technology. The FAA can buy what it needs as it needs it.

Fourth, the system reduces long-term development costs. If developed under open system standards, technology integration is not a major issue. This flexibility enables the FAA to direct its scarce resources—people, time and money—to only the small, unmet system development needs as opposed to a complete system redesign and development.

And, finally, the system reduces training costs. The significant commercial off-the-shelf content of this system enables the FAA to extensively utilize cost-effective vendor provided training, which has already been approved and assigned course numbers by the FAA academy.

Mr. OBERSTAR. I am sorry, we are going to have to interrupt you there. We have got four minutes left on a recorded vote on the House Floor. We will have to recess for this and three subsequent votes.

[Recess.]

Mr. OBERSTAR. The subcommittee will resume its sitting. And we will proceed with the concluding remarks of Mr. Odeen. I am sorry, I thought this was going to be a brief interruption and it turns out to have been four recorded votes and an extended period of time, unfortunately.

Mr. ODEEN. My peers up here have urged me to start at the very beginning, Mr. Chairman, but I won't do that. I was commenting on the cost——

Mr. OBERSTAR. They will have to sit there and listen to it all if you do.

Mr. ODEEN. I was commenting on the reduced cost risk issues when the vote came along. So let me turn to the technical risk where we see four benefits from the High Desert TRACON. The system is FAA certified. It has been operational since June of 1993 and certified since January of 1994. Under the guidance of the FAA headquarters and the FAA's tech center, the system was tested and fully commissioned.

Secondly, the system meets or exceeds terminal requirements. The system can handle both the small TRACONs and the large metroplex control facilities. In addition, it brings to the controller extended capabilities.

Third, the system has the ability to introduce earlier cost saving benefits to the airlines. A 1993 Volpe Center study shows that the airlines could achieve significant dollar savings by implementing enhanced air traffic control functionality in the terminal environment. One particular FAA program that the study highlights, known as CTAS, shows that the airlines could save approximately $1.9 million per year per terminal facility on fuel savings due to the ability to expedite aircraft departures and arrivals.

Adding this functionality to just the top 50 TRACONs equates to airline savings of almost $100 million a year. Current terminal air traffic control systems cannot easily or cost-effectively accommodate these features but the High Desert TRACON system could accommodate CTAS because of the functionalities developed under an open system architecture.

Finally, the system is accepted by the user and enjoys enthusiastic FAA western region, DOD range management, controller, and union support. This is particularly important because the San Diego TRACON is scheduled for the first implementation of a terminal air traffic control system under the AAS contract. Western Region acceptance and support for the High Desert TRACON system would greatly assist deployment.

In the area of reduced schedule risk, there are three important benefits of the High Desert TRACON system. First, the system can be implemented and adapted for particular environments and installed within six months. Since the system has been operational in an FAA environment since June of 1993, we believe that the FAA tech center's testing schedule can be shortened.

Secondly, we believe that the system can be deployed in the field by 1995, one year ahead of the current AAS schedule. The AAS schedule calls for the first implementation of a reduced TAAS in San Diego in October of 1996. Using the High Desert TRACON system with full terminal functionality, we believe that schedule can be accelerated by one full year.

Third and finally, the system will enable the DOD to meet its deployment schedule for the automation of approximately 50 terminal facilities. DOD funding for these terminal facilities depends on TAAS meeting the FAA's operational test and evaluation date of October 1996.

The High Desert TRACON system is ready today and will allow DOD to move forward expeditiously. The FAA, DOD, and the BDM team have created a real success story. It is a win-win environment for the FAA, for Defense, and the American taxpayer. We are hopeful that the High Desert TRACON system will be adopted by the FAA for its system-wide implementation because it effectively addresses the FAA's cost, technical, and schedule risks.

It is affordable, manageable, and it works today. BDM is really to assist the FAA in this important endeavor. Thank you very much, Mr. Chairman.

Mr. OBERSTAR. Thank you. We followed with interest your High Desert TRACON and its successful implementation and will have some questions about that.

Mr. Yeldell, welcome.

Mr. YELDELL. Last but not least.

Mr. OBERSTAR. I never use that word, last but not least term. It is just not appropriate. You are also on a level of equality here of significance and importance of testimony, and of attention span.

Mr. YELDELL. Thank you. I appreciate the opportunity for Tandem to come and present to you this afternoon. Tandem is in the business of delivering, manufacturing, designing fault tolerant, high availability, continuous availability systems. We have been doing this for approximately the last 15-plus years, and are implementing systems in the private sector as well as in the public sector; clearly within the Federal Government area and specifically within FAA.

What I would like to do this afternoon is spend a little bit of time talking about a Tower System, and I know that the committee is spending a great deal of time looking into the long-range AAS implementation. But I would like to talk about Tower Modernization.

I would like to suggest that a near-term, low cost, low risk alternative exists within the FAA today. This system can provide automation and consolidation of tower functions and will improve safety and aid controllers in the complex job of airport traffic control.

The FAA is currently operating an airport traffic control tower data collection, information display and operational control system. This system is designated the Tower Integrated Display System and provides air traffic controllers with most of the critical and supplementary information required to perform tower cab duties. It combines most of the functionality of the numerous, space-waste and controls, displays and keyboards into fully integrated, compact, daylight readable display screens.

The system is in operation in a successful test environment at the FAA's Airways Facilities Tower Integration Laboratory in Atlantic City, New Jersey. We believe that it could be deployed at selected towers across the country within a six month period as a low risk, cost-effective alternative solution for tower modernization.

The Tower Integrated Display System evolved from the consolidated cab Display System which was developed by the FAA based on verified air traffic requirements and needs in the 1979 to 1981 time period. The system was directed at providing air traffic control tower personnel with a versatile standard display configuration that could handle most types of information for the busiest towers as well as for the lower activity towers. The system was approved by the FAA administrator at that time for 11 sites.

The development contract was awarded in 1981 and two systems, hosted on Tandem nonstop computers, were installed and delivered in 1982. The systems were tested and accepted by the FAA. The production contract was waived, however, when the requirements for the tower display system were incorporated into the AAS procurement.

In 1989, urgent concerns within the FAA for consolidating information displays in tower cabs precipitated a renewed interest in the system. The FAA rehosted the application, the Tower Integrated Display System application on a state-of-the-art Tandem fault tolerant computer system, and replaced the custom built CCDS displays with full color, sunlight readable, touch screen commercial off-the-shelf liquid crystal displays. These displays are driven by industrial quality, personal computers functioning as intelligent terminals in the client-server architecture.

The CCDS met the air traffic control tower requirements in 1982. The Tower-Integrated Display System utilizing the latest commercial off-the-shelf technology compares favorably with the requirements for 1994, and the next decade.

The Tandem host computer that is utilized in this system is the same model that is used by the FAA in two other mission-critical applications. The Voice Switching and Control System, which we are partnered with Harris Corporation on, and the Remote Maintenance Monitoring System. The computer is designed for fault tolerant, continuous operation and is fully integrated into the FAA's logistic system with trained FAA maintenance personnel at all locations.

We believe that by utilizing this proven computer system focused on fault tolerance and continuous availability in this mission-critical arena, the government-owned application, which is currently operational in Atlantic City, and the off-the-shelf display technology, the risk and much of the cost associated with fielding an operational tower display system is virtually eliminated.

Modernization of the tower display system has been delayed many, many years. An FAA-developed system utilizing the latest commercial, off-the-self technology functions today in a laboratory environment.

Mr. Chairman, we recommend the congressional support for further review and study of this existing system and ask that you consider deployment of this system in selected towers across the country. This would not be an ultimate solution, but clearly would represent a quantum leap in tower function beyond what is available in the tower today.

We look forward to working as a partner with the FAA and with this committee in any way possible. Thank you very much.

Mr. OBERSTAR. Thank you for your testimony and—all the members for time and effort and attention put into development of your testimony for today's hearings.

All of you have contractual relationships with the FAA or AAS or other programs. You have all had an opportunity to observe the FAA at close range in management of its programs. And you have some familiarity with the origins of this procurement and its evolution. What does the FAA need to do to make its program and management of the AAS program effective? And don't hedge your comments thinking that, oh, God, if I say this, we will never get another contract again from them.

Mr. MARBERG. I guess I will begin, Mr. Chairman Oberstar, and say that I think the idea of having a single strong program manager with the authority to make decisions quickly and who can resolve requirements issues and essential technical issues is essential. That person has to have the contractual authority and the management authority to do his job and needs to be able to cut across the various other organizations within the FAA to do that.

The model that I would suggest that the FAA look at is something that we see in the Air Force called "the special projects office," which is set up with a unique mission to do one job and to complete that job only. And from what we have heard today, Mr. Hinson is considering that, and Mr. Valone is the person designated with that responsibility.

Mr. OBERSTAR. Was there something fundamentally flawed in the way that procurement was approached from the outset?

Mr. MARBERG. I believe that there is one issue that never really did get resolved; the need for closure of requirements.

During the design competition phase, we found that there was a lack of communication between the FAA users, that is to say the air traffic controllers and the airlines, and the contractors because of the necessity to run what we called an A–109 procurement. Two separate contractor teams were set up that were quite isolated and there was little communication between the FAA user community and these teams. And once the contract was awarded, there was a sort of flood swell of requirements that had been held up because of the procurement process.

For example, one that got ISSS in trouble is how do you transition from today's system to the next generation system? We had designed it so that you would have a control room and all the new displays would be in the new control room and you would flip a switch and go to the new system all at once. The controllers didn't like that. They wanted to transition one sector at a time, so you might have some people using the old system and the new system intermingling. That is a much more difficult problem in terms of recovery and data integrity.

This requirement did not come out until after the contract was awarded to IBM and that was purported to be the cause of the first 13 month slip. During the acquisition phase proposal period, which was about a year, there was no discussion between the FAA user community and the contractors because of the needs of that procurement cycle. That is a pretty hard thing to work around, in my opinion.

Mr. ODEEN. Could I make a comment, Mr. Chairman? One is, I mentioned one of the reasons I believe our high desert TRACON system was successful was that the FAA spelled out their needs, their requirements, what the functional needs were, and they let us take the lead in terms of actually doing the system. They did not get involved in all kinds of detailed specifications and requirements. They really gave us the flexibility to go after this. I think that is an important way, a different way of managing the system that I think can be very successful.

Second, and perhaps I think Mr. Hinson this morning talked about the big bang theory, it was a very large complicated contract system and they tried to do it at one time. They made constant changes in the requirements as opposed to trying to bite off a smaller piece to find the requirements and the needs, let them build that and then upgrade that as they went, which is the approach that we have taken. I think that is a much sounder way to go about these kinds of complicated systems. And also related to that, there is an enormous amount of paperwork and reports and oversight and support contractors that are involved that greatly complicate the process and make it difficult for the contractor and I think perhaps for the government as well. So those are just a few thoughts that I have, Mr. Chairman.

Mr. REIS. Mr. Chairman, I would like to go back and give you a little bit more detail on our success on the Terminal Doppler Weather Radar which is about to be commissioned, the first site down in Houston, to detect wind shear in the vicinity of airports.

We just completed our production run of 47 systems for the FAA and I think that has been a very successful program. As I noted in my remarks, we were on schedule and within budget and received the full incentive award.

And to me that was successful for a couple of reasons. One is we really froze all of the requirements right up front at the system design review and we didn't change those requirements after that. Raytheon and FAA had very strong program managers on that program. We adhered to a rigid software methodology and a rigid hardware methodology and we assigned experienced systems engineers who really understood system problems and how to escalate problems that were not being solved up to higher levels of management so that they got out on the floor and got quickly disposed of.

And we were incentivized by the financial rewards that were on that contract for delivering early and we delivered six months ahead of schedule. This to me proves that there are ways to be successful with the FAA as it exists today with the regulations that are in place. It takes a strong team and it takes a strong set of managers on both sides to make it happen.

Mr. OBERSTAR. One of the findings that I think will come out of the CNA analysis was that this was the biggest contract or procurement, however you want to call it, that FAA has ever undertaken. They weren't prepared for such a large undertaking. And they tried to do all of it all at once. And I think the recommendation would be for the future—and I doubt there will be such procurement—that it be broken into its smaller components and each one of them attacked. The approach from here on in should be to deal with the elements of the program and move forward, much as you have suggested, Mr. Odeen.

And, also, problems did not seem to escalate to the top. They seemed to founder at the bottom or middle management. That is also an important lesson, I think, to be learned from this experience.

And having a strong program manager is, again, an element that is very important and should have been foreseen, and every one of the military contracts has such a person. That is another lesson that the FAA has learned and is implementing.

Another suggestion that I think will come out of the CNA analysis, is to provide some incentives for financial incentives for early action, early completion of pieces of this contract. And I wonder what you might think. Is that an appropriate undertaking at this point or is that sort of—are we past that point?

Mr. KRAMP. Yes, sir, I think financial incentives are an appropriate action at this point. We have some experience, as do some of my colleagues with incentives and they are very helpful in focusing everybody on what is important.

I'd like to comment about continuing with a system of this size. To get some of these benefits that we are talking about for the aviation industry, you really do need a large system. It is a system of systems and is required in order to get that benefit. You can put a lot of pieces together but you may still fall short on some of the benefits you desire.

To be successful, what is needed in addition to the strong program manager is an approach that creates a team from top to bottom. It must integrate both the contractor and the FAA. The larger the system, the more complicated the system, the more involved senior management has to be on a regular basis. As these systems get bigger, the level of management involvement required for success goes higher and higher.

Mr. OBERSTAR. That is a fair assessment, I appreciate that.

At this point, I will ask Mr. Ewing if he has any questions.

Mr. EWING. Thank you, Mr. Chairman. And I want to apologize for not hearing all the testimony here from this panel, but I do have some questions.

To what extent—this is to any of you—is the AAS as currently structured, open to the hardware and software produced by other companies?

Mr. KRAMP. Are you talking about open systems? Open architecture?

Mr. EWING. Yes.

Mr. KRAMP. I believe that there would have to be a number of design changes made to be more open and available to products across the industry. In certain parts of the system, there are open standards within subsystems and then there are levels of standards at each level within the system. So some are open—more open now, and others are less open.

Mr. EWING. So you would think that the FAA would have to keep going back to Loral for any changes or add-ons, upgrades or improvements?

Mr. KRAMP. Again, there will be a mix. There will be a number of things that can be done there. But in large complicated systems, the probability is that they are going to have to go back.

Mr. MARBERG. I would disagree with that. I think the system is open; the principal part. The local area network that is used both in the ISSS and the tower is compliant with the IEEE, and the ISO standards. So that means that if you want to put in a different computer, you just have to put in an interface that meets those standards. I may buy that software from you or build it myself, but if you meet those standards, you will hook up to that network.

What they have used is the IEEE 802.5 token ring standard, an accepted standard. So you have to comply with that standard. There is always a question about how open is open. You have to say that the UNIX implementation that IBM has chosen for their RISC 6000, for example, is just a little bit different than the one that we do in Unisys but it is very much transportable.

The software, the application level software would run on a different processor. They have implemented a fault tolerance scheme that is unique to their application, which may or may not be transportable. But we have run our software on the IBM processors and it runs fine. It doesn't run as well—sometimes there are performance issues, but it is essentially transportable.

The Raytheon display, for example. In my test bed in Minneapolis, I have a Raytheon display hooked up to another system. That seems pretty open to me. I had to pay a lot more for it than you do but I still can get one.

Those sorts of things, the controller interface—the one single point of failure in this whole system, nobody makes a 20 by 20 square color display monitor that I am aware of. Sony is the only supplier of that. But there are plenty of graphics engines. Raytheon builds one. We use BARCO in our European operations. The processor in the display could be IBM or Unisys. The application software seems to move around reasonably well in the system, would be my opinion.

Mr. ODEEN. I think your point about there is open systems and open systems, and my understanding is that while there are elements being open, there are a lot of elements that are not being open and there would be a lot of difficulties in costs involved and so forth. It is not open systems in the traditional sense that the commercial world talks about that today. There are elements certainly, but there are a lot of aspects of it that are quite closed.

Mr. EWING. This is probably a good softball question and you could all hit it right out of the park, but what would be your impression of Loral's ability to handle such a large scale endeavor such as the AAS?

Mr. REIS. Pass on that one.

Mr. MARBERG. I think they could do it almost as well as Unisys could do it.

Mr. EWING. I guess we have no other answers, Mr. Chairman.

Mr. OBERSTAR. Thank you. Mr. Horn.

Mr. HORN. Thank you, Mr. Chairman. You all have had a lot of experience with government procurement and various types of procurement regulations. Based on that experience, what, if any, changes would you recommend to this committee that we think about crafting into law to improve the effectiveness and the efficiency with which procurement can be undertaken, both from the standpoint of the benefit of the taxpayers as well as your interest in getting a decision and knowing what it is and over what time period you are supposed to implement it?

Mr. ODEEN. Well, let me try to respond to that. That is—it is a big topic, obviously. I have been fairly involved in defense procurement reform for a number of years, and I am a member of a Defense Science Board task force working for Bill Perry. There is a laundry list of things that have to be done, and it bears on much of what we talked about today, a series of actions that permit government agencies to buy commercial type products, COTS products, in quantity without very, very long procurement cycles. There are a series of things that are required to facilitate this kind of buying.

And, second, there are a series of actions that are required to dramatically shorten the process. The procurement cycle is so long that the technology cycle is, in many cases, shorter than the procurement cycle.

And you have a situation now in Defense, and I think also in FAA where the technology is developing so rapidly in the commercial world, the government simply is not able to avail itself of this technology because of a very long, convoluted process. And, for example, the FAA right now managing this problem is really constrained in its options because of the complexity of the procurement process. They don't have a blank slate. They have long, complicated steps ahead of them if we want to make major changes in the contracts. It really does cripple them. It is a long complicated topic, but I would be happy to put together a note for you and summarize some of the things.

Mr. HORN. I would appreciate that.

[The following was received from Mr. Odeen:]

Philip A. Odeen
President and
Chief Executive Officer
BDM International, Inc.

April 27, 1994

The Honorable Steve Horn
U.S. House of Representatives
1023 Longworth House Office Building
Washington, DC 20515-0538

Dear Mr. Horn:

I very much enjoyed the opportunity to appear before the Aviation Subcommittee last week to discuss BDM's involvement in the development of the first and only next generation terminal air traffic control system in the FAA's inventory. We believe this system addresses the FAA's cost, technical, and schedule issues for the TAAS part of the AAS contract and provides an opportunity for the FAA to demonstrate a real success story.

Although we are not a legacy contractor at the FAA, we do have a long history of successfully developing large software systems for other federal government agencies. We are committed to bringing the same success to the AAS program.

With regard to your question on reform of the federal government's acquisition system, let me make a few general comments. Fundamental change and reform are essential if we are to have an efficient and economical acquisition process for both the buyer and the seller. This is also essential if we are to harness America's industrial and technology base to defend our national security interests and contribute to our economic security goals.

In terms of specific acquisition reform proposals, I am enclosing for your information a copy of my testimony on acquisition reform before a joint hearing of the Senate Armed Services Committee and the Senate Governmental Affairs Committee. I would, however, like to highlight three important areas of reform. First, the procurement cycle is too long and needs to be shortened so that the procurement cycle is shorter than the technology development cycle. In fact, today the length of the procurement cycle oftentimes obsoletes new technology. Second, the government needs to shift away from very detailed

1501 BDM Way, McLean, Virginia 22102 • (703) 848-5090

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specifications and focus more on performance specifications. Detailed specs and many other government-unique reporting and compliance requirements delay progress and significantly drive up costs. Finally, changes must be made to allow government agencies to buy off-the-shelf commercial products and services. We simply can no longer afford both a defense industrial base and a commercial industrial base, especially when the commercial base is more advanced. Technically, the House Armed Services Committee draft reform bill is a good start. I urge you to support it when it gets to the floor.

I want to thank you again for the opportunity to appear before the Subcommittee. If you should desire any additional information on either BDM's air traffic control capabilities or my thoughts on acquisition reform, please feel free to contact me.

Sincerely,

STATEMENT BY

PHILIP A. ODEEN

PRESIDENT AND CHIEF EXECUTIVE OFFICER

BDM INTERNATIONAL, INC.

BEFORE A JOINT MEETING OF THE

SENATE GOVERNMENTAL AFFAIRS COMMITTEE

AND THE

SENATE ARMED SERVICES COMMITTEE

OF THE

UNITED STATES SENATE

SECOND SESSION, 103RD CONGRESS

MARCH 16, 1994

WASHINGTON, D.C.

Mr. Chairman and members of the Committee, I am Phil Odeen. I am appearing today on behalf of the Acquisition Reform Working Group and as President and Chief Executive Officer of BDM International, Inc., a 6,000-employee information services and technology company. I am also representing the Professional Services Council (PSC). We appreciate very much this opportunity to discuss the acquisition process from the perspective of an industry and a company providing information technology and other essential scientific and engineering services to the federal government.

In expressing my views today, I am drawing on over 30 years of experience in both the public and private sectors. I served in the Pentagon for eleven years, including service as Principal Deputy Assistant Secretary of Defense for Systems Analysis. After leaving the Pentagon, I was Director of Program Analysis for the National Security Council. Since my tenure in government, I have been a Vice President of Wilson Sporting Goods, Managing Partner of the Federal Consulting Practice for Coopers & Lybrand, and now President and CEO of BDM. This experience has given me a broad perspective of both the federal acquisition process and commercial buying practices.

THE TECHNOLOGY SERVICES INDUSTRY

Before I discuss a number of specific issues related to the acquisition process, I think it is important to share with you some perspective (1) on our industry and its concerns and (2) on the Professional Services Council and what its members accomplish for the federal government.

The Professional Services Council, of which I am a former Chairman, represents the interests of over 130 member companies--large, small, woman- and minority-owned--with total revenues of approximately $25 billion a year. The

Council speaks for the relatively new and growing technology services industry, a significant job-producing sector of the American economy, estimated to be in the $200 to $300 billion range per year. The industry's products are ideas and solutions. Primarily, we focus on the application of scientific, engineering, and specialized problem-solving knowledge to help government and commercial clients use advanced technology to solve important technical and operational problems, affordably and effectively.

Today, the technology services industry encompasses research and development firms, independent laboratories and test facilities, computer software and development houses, systems integration and support companies, and program analysis and evaluation organizations, to name a few. Our people are engineers, mathematicians, physicists, artificial intelligence specialists, computer scientists and programmers, and specialists from many other disciplines.

A typical technology services firm provides value-added services to both the public and private sectors. For the Department of Defense or the military services, companies in our industry provide technology services that are integral to the design, development, production, and maintenance of weapons and other operational systems. In addition, many of the companies in the technology services industry, including BDM, are developing large information systems to improve the efficiency and effectiveness of the varied activities needed to ensure the operational capabilities of the federal government's departments and agencies. An example of this is the Requirements Data Bank contract, which involved the development and implementation of a large-scale information system to automate the Air Force's logistics requirements and spare parts. This system, which was developed by BDM, tracks the entire purchase, maintenance, and repair requirements of the Air Force and has reduced the down time, due to repairs and maintenance, for Air Force weapons systems. I might add that, though not fully developed, it proved to be of great value during Desert Storm.

THE NEED FOR FUNDAMENTAL CHANGE AND REFORM

The acquisition process has been a visible and troublesome issue for both buyer and seller for many years. But despite a series of legislative and regulatory efforts to correct apparent shortcomings, the system remains in real crisis today and fails to meet the needs of our government and the American taxpayer. I am, however, encouraged by this Administration's commitment to accomplish farreaching reform of the existing federal procurement process.

But if we are to have real and meaningful change in the acquisition system, I believe it is imperative that the public and private sectors work together more closely than in the past to achieve that change. This is essential if we are to have an efficient and economical acquisition process. It is also essential if we are to harness America's industrial and technology base to provide our military with the weapons and equipment they need to defend our national security interests, while also enabling that industry to contribute to our economic security goals.

Budget pressures, deficit reduction, and the need to stretch every dollar make it even more imperative that we enact legislation this year to begin radical overhaul of the acquisition system. As Chairman of the so-called "Odeen Panel," which was requested by former Secretary Aspin to look at the FY94-99 Future Years Defense Program and specifically at the adequacy of funding to support planned defense forces and weapons programs, I have seen first hand the significant funding problems that confront the Department of Defense in the out years. There are simply not enough dollars to support our military forces and maintain a sound industrial base if we conduct "business as usual." For these reasons, radical acquisition reform is critical to our nation, to the Department of Defense, and to American industry.

The legislation being considered this year is a meaningful start, important and worthwhile, but only a start. The reform process must continue next year and beyond until the change in the acquisition process serves both the buyer and the seller in an efficient and equitable manner. This will require more than changes at the margin. To make a difference, very fundamental change is essential.

THE ACQUISITION OF TECHNOLOGY SERVICES

Acquisition reform must address not only the procurement of hardware and goods but also the procurement of high-technology services. Historically, the technology services industry has not been understood well by public policy makers. As a result, today's acquisition system is designed principally to buy hardware and goods, and past changes in the acquisition system have had a similar bias. Given the many unique aspects in the acquisition of technology services, I urge the Committee to look carefully at how its reform proposals will impact the technology services contracting community.

The current acquisition system for technology services literally degrades quality and responsiveness and inflicts significant, non-productive cost penalties to a degree that would be unthinkable in a competitive commercial context. Among the most salient factors that contribute to the malaise are:

- A continuing tendency to embrace the low bid and sacrifice quality;
- Extraordinary and costly delays and negligent time management in the procurement cycle;
- Excessive, micro-managed financial and audit controls;

- Debilitating and costly bid protests that continue to erode trust in the system;
- A pervassive lack of positive incentives for innovation, creativity, productivity, and cost efficiency; and
- A growing gap between the education, training, and tools needed by federal buyers and the professional demands imposed in buying modern technology-based services.

To correct these problems, it is essential that we fundamentally reengineer the acquisition process. We have a unique window of opportunity, where, at one moment in history, the Executive Office of the President, the leadership of the Department of Defense, the Congress, and private industry are all committed to major change. If we miss this window, it may be many years before we have another such opportunity.

SPECIFIC PROPOSALS FOR REFORM

At this time, I would like to step back from the macro arguments for acquisition reform and touch briefly on several aspects of services procurement that we believe require inclusion or strengthening in S.1587. We believe these items are critical to achieving a truly contemporary, efficient, and high performance services acquisition system.

- <u>Value-Based Contracting</u> -- Value-based contracting or "best value" contracting have become well-used phrases, and few people dispute the need to buy based on value to the government, not merely the lowest bid price. But the reality is that their application, and, indeed, their very meaning, vary from agency to agency and from department to department. Often, there is wide variation even within agencies and departments. We believe what is needed is an unequivocal legislative mandate to implement value-based contracting government-wide.

- <u>Contractor Past Performance</u> -- There is universal agreement that one of the foremost discriminators for selecting winners in competitive procurements is contractor past performance. Ironically, the practice of government agencies and departments in this regard varies widely and suffers from inconsistent, incomplete, and generally inadequate efforts to evaluate this critical element in the source selection process.

Industry shares the government's firm commitment to quality and accountability. Thus, we strongly support efforts underway by Office of Federal Procurement Policy Administrator Kelman to establish consistent standards and guidance with regard to contractor past performance being a major factor in determining the successful bidder in a competitive procurement. We believe this laudable effort should be given impetus through a legislative mandate.

- <u>Using Commercial Practices to Acquire Technology Services</u> -- Both the Congress and the Administration are advocating bold measures to facilitate access to commercial goods--a long overdue response that will save money and provide improved performance in many cases. We believe the same treatment should be accorded to acquiring commercial services--to reflect the exponential growth of this marketplace in the private sector economy. By starting with a limited and tightly drawn definition of commercial services, we are confident this can be done without jeopardizing the government's obligation to protect the taxpayers' interests. We have developed a definition for commercial services and hope to work with you on its inclusion in S.1587.

- <u>Protest Reform and Debriefings</u> -- The increasing frequency, intensity, and ultimate cost to the taxpayer of bid protests underscores the underlying problems in the acquisition system. Protests--often nothing more than fishing expeditions for information--have become a way of doing business for many companies. In fact, the highest number of protests ever was in 1993. We are pleased to see that S.1587 includes statutory language to improve the current situation.

- Negotiated Rulemaking -- Finally, let me raise an issue of great importance--bringing the buyer and the seller together in a constructive, problem-solving relationship. The stakes are too high and the issues too complex to risk continuation of the current arms-length approach to rulemaking. The National Performance Review strongly endorses negotiated rulemaking as an instrument for constructive partnering between the public and private sectors. Unfortunately, the current approach to rulemaking is essentially a unilateral process where the government goes through the motions of soliciting industry "input" and makes only token adjustments to proposed rules. We believe S.1587 should include a strong mandate to use negotiated rulemaking as one of the primary vehicles for reinventing the acquisition system.

RELIANCE ON THE PRIVATE SECTOR FOR TECHNOLOGY SERVICES

Before closing, I would like to discuss an issue that is especially relevant to the procurement of technology services--government reliance on the private sector for technology services and solutions. While this issue is not, strictly speaking, an acquisition reform issue, we consider it to be a major part of the acquisition policy equation and believe it deserves serious attention.

As downsizing of our armed forces and its support structure has occurred and as the Administration moves forward with the National Performance Review's goal to reduce federal civil service employment by 252,000 people, the balancing of public and private sector roles has become much more complex and controversial. We see tangible evidence of this public-private sector friction--if not competition--in the Department of Defense depot environment and in recent actions at EPA and the Department of Energy. In the latter two cases, substantial civil service staffing increases are being financed through termination of service contracts.

In our view, the recent Office of Management and Budget Policy Letter 92-1 on inherently governmental functions provides an excellent policy framework for making judgments on whether work must be performed in-house or can be outsourced to the private sector. While not perfect, we believe this policy letter offers a reasonable solution to a difficult problem. As such, we urge government-wide implementation of this policy letter, as expeditiously as possible.

SHIPBUILDING CLAIMS REFORM

Since the shipbuilding industry is not represented by any of the three industry witnesses, I have been asked by the Acquisition Reform Working Group to raise an issue of particular importance to that industry. The issue concerns the arbitrary and inequitable 18-month time limit on submission of claims. This is especially ironic since the normal procurement cycle for shipbuilding is usually five to seven years.

The ABA, the Section 800 Panel, and the Acquisition Reform Working Group are all recommending a six-year standard through repeal or modification of the current law, and we urge the Committees to support this position.

* * *

Mr. Chairman and members of the Committee, this concludes my formal remarks. I again want to thank you for the opportunity to appear today to discuss the very important subject of acquisition reform. A rare and possibly brief window of opportunity exists to radically reform the acquisition system and develop a legislative framework for change this year. Such reform will not be easy and may take a number of years to effect, but we owe it to the American taxpayer to move forward expeditiously to ensure that the necessary incentives and commitment to excellence are present in the government contracting environment.

I look forward to working <u>with</u> you to make acquisition reform a reality.

Mr. HORN. You raise an excellent point on the advances in technology, our inability to keep up when you are going through the specification process and specifications become written that price us out of the market for comparable markets that are available to the individual in the commercial world. Any of you would like to add to that?

Mr. REIS. We heard this morning some discussion about the need to change contracting from the detailed specification levels of the past to more of a top level, nondevelopment item type of approach to let industry decide how to do it, while the FAA essentially describes what they need. We see some procurements coming up in the near future that are good NDI candidates. The LCF TRACON is one, the ASR–11 is another, where we believe that NDI-type procurements is the right thing to do.

I think the difficulty is going to be that it is a different way of contracting than what the FAA has done in the past. And I believe that there will be some needs to change contractual vehicles and regulations in order for them to do that effectively. I think that is probably part of the reason why we have seen some delays in some of these procurements, and I would like to encourage everybody to work through that process because I think it will be for the betterment of the entire system.

Mr. KRAMP. In the competition phase, the dialogue is necessarily regulated by the rules of competition. As a result, when an award is made, and you start the program, there still is a dialogue needed about requirements, clarification and understanding of requirements. It seems to me that it would help tremendously if we could build into the procurement cycle this period of time to have such a dialogue. At the end of that dialogue we should get agreement on the specifications and make necessary adjustments in the program plan at that point to reflect what is now a better understanding of what it is we are trying to do.

Mr. HORN. Very good.

Mr. YELDELL. Given the long period of time that it takes to develop requirements, the long period of time for the procurement cycle and the technology changes happening as rapidly as they are happening, cutting off the ability for the vendor community to be able to have a realistic dialogue with the user who is developing the requirements, results in the government losing out on the opportunity to really understand what the new technology is and how it could impact what the requirements are There is too much of a protectionism built into the procurement system.

I think we have to get to the point where we accept the fact that there can be a legitimate partnership between the vendor and the government customer. There is clearly a focus that there cannot be a partnership there; that the vendor community is out to take the government. Well, we have to break that because we have got to give the opportunity for the user to be able to have an open dialogue on a continuing basis for the purposes of ultimately ending up with the best solution. You cannot do it any other way.

There is too much going on in the industry—the technology is changing too rapidly and the procurement cycle is too long. If you take some of the suggestions that Mr. Odeen has in his mind to shorten the cycle, that would help, but that clearly needs to be done.

Mr. MARBERG. I would just make one comment, that many of us in this industry today are looking at ways to make ourselves more efficient, and the way we are doing that is driving decision-making down to the lowest possible level.

I would suggest that you look at eliminating levels of oversight and driving the decision-making to the lowest levels within the FAA. If the current FAA organization cannot do that, then maybe you ought to look at that. I believe less oversight is better. Decision-making made at the local level. Trying to get out of the situation where you have to meet overarching procurement regulations that maybe don't make sense in today's fast, changing technology.

Mr. HORN. Good suggestion. One short last question, Mr. Chairman. I asked this of earlier witnesses. The AAS, I am told, is written in a computer language we know as Ada. And I have been told that most of the computer programs that come out of school now are in the C computer language. Is this a problem in terms of the continuation of Ada as the computer language for this project?

Mr. REIS. I don't see it as a problem myself, sir. We routinely do development programs in Ada for the DOD. Our experience has been that we can take programmers experienced in other languages, we train them in a three-week training course and at that point they are up to speed in Ada to be just as proficient as they need to be to meet our contract requirements. So I don't see from Raytheon's standpoint that that language is an impediment. There are a lot of good languages and any number of them can meet the requirements and are going to be maintainable in the future.

Mr. HORN. In terms of flexibility, is the C language much better than the Ada language?

Mr. REIS. No, I think they are pretty much comparable, in our experience.

Mr. ODEEN. Our high desert TRACON system was built using the C language. We believe that there are more modern programming tools, ways to more efficiently use your programs using C. We felt it was more efficient and better for that purpose. There is a new language called C++. If we upgrade, we will probably use that. It has a lot of flexibility. But clearly Ada is a sound language. You can use it and it would be crazy I think at this point in time to go back and redo it, but if you started from scratch, I think it would have been interesting to see if they would have made the same decision, but they made that decision and went down that path.

Mr. HORN. So we will live with it and in the long run the cost of training for conversion won't add up to facing it now.

Mr. ODEEN. I don't think it is a huge problem, no.

Mr. KRAMP. I would agree that it is an issue of training up front. But where we have choice, we will pick Ada. Some of the advantages have to do with the discipline of the design, but as you look downstream we see the advantage for Ada in the area of less cost, maintenance, changes, modifications. We think this gets easier in that part of the life cycle. Ada has got some advantages.

Mr. MARBERG. I also agree with the panel that Ada is not the issue. Software development process methodology and discipline is

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Mr. MARBERG. I also agree with the panel that Ada is not the issue. Software development process methodology and discipline is really the issue. For example, Unisys lost the TDWR contract to Raytheon, and we believe that we lost it because they had a much superior software process than we did at that time.

We find as we move more into a commercial realm and we are using more of the computers that we are using in the commercial area there is a lot more support for C and other languages and not as much support for Ada. So if you are looking ahead to where the next generation commercial guys are going, Sun or HP or people like that, are going, they—we don't see them supporting Ada as much. And it might be an issue for the next generation, but the choice of language is not that important.

Mr. HORN. Thank you.

Mr. OBERSTAR. From this hearing, from the panel's testimony, from the preparation that we have done leading up to this hearing, reviewing the progress of this procurement and all of its elements, some lessons are emerging. And the first is that in 1986 and 1987, FAA was designing a system that did not exist for problems and needs that were forecast a decade in advance, and for which software was not available. They provided design specifications rather than performance specifications. They spent an enormous amount of time developing it. By the time that the procurement went forward and the challenge was resolved and the work began on the contract, a great deal had happened. Almost four years had elapsed from the beginning to the award and the beginning phase of implementation. A great deal happened in the commercial sector driven by commercial needs other than defense and moving along much faster.

Now, that was a point at which, in hindsight, we could say here is where the FAA needed to be flexible; here is where the procurement system needed to be flexible to be able to move and take off the shelf items, put them in place, and then expand them as more robust technology came along. Instead, FAA was wedded to a contractor with which it has dealt rather significantly for 30 years in putting in place the technology of the air traffic control system. Some of IBM's thought process rubbed off onto FAA, a good deal of it in fact, the commitment to main frames and commitment to large systems done all at once instead of breaking those systems down into smaller component parts and putting the program manager in charge. And so, it just went from one aspect or one phase of the problem to the next. And in between, just as one FAA administrator was beginning to understand the complexity of the problem, he was gone, a hiatus came in, a new person comes in.

There is a crash or there is a problem of spare parts, there is a problem of minimum equipment or there is this security crisis and the attention is focused on something else. Then this person gets up to speed. General Thomas told me in December of 1992, he said, I know I have to leave. I hate to leave because it has taken me nine months and now I am beginning to understand the problems of the AAS.

Mr. OBERSTAR. And it is going to take the next person nine months to get there. It is just about right on target, taken about nine months for Mr. Hinson's kind of a gestation period here, just about ready to give birth to understanding of this problem and they are gone, you know. There is a miscarriage.

So I hope that Mr. Hinson hangs around for a while. Whether he proves to be the most brilliant administrator in the history of FAA or just an average one, he is someone, he is there, he is in charge. He will give direction, he knows what needs to be done, and I think he has the managerial ability to make decisions.

Now, in the—I want Hughes and all of you to respond, I guess. In bidding on systems in other countries or for other government agencies, do you bid against performance specifications or design specifications? Do you bid against a specific that is set forth and frozen in time or do you more frequently see sort of rolling requirements?

Mr. REIS. Well, I can start by answering that.

Our experience has been we bid to performance specs. In fact, many of those customers are even willing to change those performance specs as they become more aware of what is out in the market. And I think they do that to their advantage. So they go through, oftentimes, several iterations of the bidding process until they are happy that they have competition but they have the right performance systems that meet their needs.

Mr. OBERSTAR. Are you speaking about other Federal Government agencies?

Mr. REIS. Yes, yes, I am. Governments of, say, the Netherlands, Norway, India. That tends to be the process, performance level specs. They are not out with large teams trying to design the details of their system.

Mr. OBERSTAR. And when you come home to bid for other U.S. Federal Government agencies——

Mr. REIS. Out comes the 40 pages of the design specs, yes, or the hundred pages.

Mr. OBERSTAR. And the levels of review to get through to a decision to be made upon it? Is that the experience of others at the table?

Mr. KRAMP. I would agree we bid against performance specs. We will find areas where the host country has an area of expertise, and they will write in detailed design specs that they want to pursue. But for the most part we bid against performance specs.

Mr. OBERSTAR. Does this mean that there is not sufficient flexibility in the procurement system operated by the Federal Government of the United States to avoid such problems in the future?

Mr. MARBERG. I think the——

Mr. YELDELL. Absolutely. Everything that you talked about, the issue is the procurement system. And it has the impact on the Agency because if you want to do a big bang—if I have got a large complex system project that you can implement over a number of years, the procurement system stops you from doing that because if you were to break it up into small pieces that means you have to do multiple procurements.

And the multiple procurements take extended periods of time. That means you have a risk of running into multiple vendors and how do you go through that whole process? So a lot of the things that occur, occur directly as a result of how the Federal Government procures.

And as far as the foreign governments are concerned, I think how they procure is in direct proportion to how much they want to be like the United States. If they have a relationship with and a knowledge of how the Federal Government of the United States procures, you will see them doing the similar kinds of things.

So we can dance around it as much as you like, but I think the procurement system is a major impediment to the acquisition of good solid systems for the Federal Government over the long term. It has got to be changed.

Mr. OBERSTAR. I am going to hold you to that.

Mr. Marberg.

Mr. MARBERG. I was just going to say I think it varies a lot with the country. In places where you are doing automation of the system for the first time, where they are going from manual procedures to automation for the first time, the specifications tend to be performance oriented. They tend to be very high level. And there tends to be because the customer is trying to do something new for the first time.

In Germany, we found that they gave us detailed specifications that are just as interesting as the ones from the FAA. In Taiwan, we also had detailed specs. The two examples I use is Taiwan and Germany where we have currently put in systems.

In both cases, we had very detailed development level specifications because in both cases the customer was very concerned about having to maintain a system for 10 to 20 years, and they had had bad experiences with vendors developing systems, delivering to them and then disappearing and never coming back. So there was the need for pretty detailed specifications.

The example I would use is you probably are more careful about buying your automobile today than the first time you bought one in that you found out the things that can go wrong if you don't ask the right questions.

So the level of sophistication of the buyer. We as an industry need to do better on that. We need to understand the total problem and really form, I think, some sort of partnership. You can't have an adversarial relationship and be a success.

Again, to use the Raytheon example, the TDWR program was a big success because there was a real sense of teamwork. We ended up inheriting the program manager after that on one of our trouble programs, and he finally convinced us to do that. That was a real source of success.

But many countries, we have found, are very suspicious of industry because they have had some experiences where the experience has been adversarial. In that case, they are going to document everything and have a lot of lawyers come and look at it. That is not a very good way to build systems.

Mr. ODEEN. Just a brief comment on that.

I agree with what has been said. On the other hand, the FAR, the U.S. procurement system, does not force you down that detailed spec route. I mean, you can do it other ways. This is one of the major thrusts that Bill Perry is trying to do in defense is to move away from detailed not only specs for the system but process specs and things of that type.

And, again, to the system we developed, the High Desert TRACON, that was done with essentially functional requirements, and we were given great flexibility in meeting them. And I think it is a case where the FAA did, in fact, run a development operation using broad requirements, not detailed specs, but laying out the functional requirements and giving us flexibility.

So it can be done. It is not done very often, but the current system can do that.

You do get the problem that Mr. Yeldell mentioned if you try to cut it up in pieces and having to go through repetitive procurements because of the complexity and the time consumption. But it is possible with the current system and is done from time to time.

Mr. OBERSTAR. If FAA and other government agencies are stuck with a flawed procurement system, does this bode ill for curing the current AAS procurement and its several elements? Does that mean there is not enough flexibility to actually do the things that Mr. Hinson says he will do and needs to do?

Mr. KRAMP. I think we have all cited examples of successful programs within this procurement system. And so it is really a case, of, in each one, paying attention to the job at hand at the beginning. The relationship with the customer, I agree, has got to be a team relationship.

In the United States, because of the size of the installed equipment base and the complexity of the new requirements, the requirements documents are more difficult than in a lot of other places. I think I would expect to see more detailed requirements in the U.S.

Now, how far down do you go in detailing specs? There is a stopping place that is better than going down to absolute detail. There are improvements that can be made to the existing procurement system, but successful procurements are possible within the system today.

Mr. OBERSTAR. Well, Loral said this morning that they are wide open, they are willing to do whatever needs to be done to get this contract on track within cost and on time, at least on a revised on-time schedule, and suggested they might even buy some of the systems that any of you at this table have developed, off-the-shelf solutions.

The question is, are they really off-the-shelf or are we going to be buying systems that need further development to meet the goals of the several elements of AAS?

Mr. ODEEN. Well, from our perspective, Mr. Chairman, we believe our system is off-the-shelf. It is developed, it is owned by the FAA. It is their system, it is certified, and it could, in fact, be implemented in many of the terminal environments very quickly without further development. You can do enhancements which we are doing now to make it even better.

Mr. OBERSTAR. That part—some of the sources that I discussed about having reviewed the success of the High Desert TRACON, said, oh, yes, but it is not robust enough to move ahead so it is going to take more development, more sophisticated software and more capacity.

Mr. ODEEN. We simply just disagree. We do not agree with that. That is just not true. We have a fairly robust system now in operation, the High Desert TRACON. We can expand it without difficulty by adding additional terminals and so on. We have a much more robust system actually deployed in Columbia, the country of

Columbia now, paid for by the U.S. Government for obvious reasons.

We do not think we have a problem. In fact, we have had—we have had discussion with Loral on this issue, and there is certainly interest on their part.

Mr. OBERSTAR. Finally, in your prepared testimony some of you referred to the Carnegie-Mellon Institute process of evaluating a company's capability to manage large systems such as software development systems. And they have kind of a ranking, a rating system. Do you think that would be a good idea, to implement that, to evaluate FAA's progress on AAS from here on in?

Mr. REIS. I would certainly recommend that the FAA adopt that as an evaluation criteria on placing of contracts when you have to do software development.

Like Hughes, I wasn't happy with our software development capabilities in the mid-1980s. We developed the Carnegie-Mellon SEI model and used that to improve our capability. And what we were able to show is, since 1988 until today, we have had a 140 percent increase in our productivity. We don't do software at $500 a line. That I don't consider industry standard. It is not competitive. And I think we got that benefit by using the SEI.

We are now rated by independent audit at over a score of three. There are essentially five levels. And that puts us, as we understand by the people at Carnegie-Mellon, in the top 4 percent of contractors who have been audited for performance against this criteria. I think it is very important that this be used as one of the items when you select contractors to do a software development program.

Mr. OBERSTAR. Is——

Mr. MARBERG. We also use that. We had the same situation as Raytheon in terms of trying to improve our software process, and we found that metric one that is very useful in terms of assessing where you are and then taking the steps to get there.

My only caution would be, like every other metric, it needs to be taken with some degree of care. Our friends at Hughes were first out of the box. So, if we eliminated them, because they have the higher rating than anybody else, I would be happy.

Mr. KRAMP. Many of the procurements that are ongoing today use the SEI rating as one of the criteria during the proposal evaluation process, primarily in the defense arena.

Mr. OBERSTAR. Well, you heard me refer earlier in the day to the numerous rewriting, rewritings of software code, 100 percent. Is that—is there some industry standard by which to measure that performance?

Mr. MARBERG. That is called a problem program, Congressman. That is not an industry standard that any of us could live with. I really question whether anybody could actually do that.

The problem, of course, you have when you have problem trouble reports, you do make changes. And when you enter all that in, it sounds like there has been, again, a lack of process control in the software development area.

We use as a metric, within our own industry, the hundred dollars a line, it is too expensive, and we need to be cheaper than that. I was surprised that the Daschle report listed $500 a line. I wish even more that we had won the program because that is a lot of money for software development.

Mr. OBERSTAR. Well, I thank all of you for your comments and your observations, your insights. And we will from time to time come back to you to get further guidance on and insight into how this procurement is proceeding.

What is extremely important from here on in is that yardsticks be established by which to measure progress, that decisions are made and the program moves forward and, hopefully, with the help of the suggestions offered today at this table, that can happen.

We thank you very much.

Mr. OBERSTAR. Our final witness is Mr. Allen Li, Associate Director, Transportation Issues for the General Accounting Office.

Mr. Li, welcome. Would you like to introduce the members of your team?

TESTIMONY OF ALLEN LI, ASSOCIATE DIRECTOR, TRANSPORTATION ISSUES, RESOURCES, COMMUNITY AND ECONOMIC DEVELOPMENT DIVISION, U.S. GENERAL ACCOUNTING OFFICE, ACCOMPANIED BY BOB LEVIN, JUAN TAPIA, AND RANDY HITE

Mr. LI. Certainly, sir. It is always a pleasure to be before you and this subcommittee.

My colleagues at the table are Bob Levin and Juan Tapia on my left and on my right, Randy Hite. They, along with their teams, have worked hard to produce today's statement.

Before I start, I just wanted to, for the record, let Congressman Mica know that I do have last year's hearing. I have read it from front to back. And the dog-ears show that I have read it.

Mr. OBERSTAR. I just want to observe for the record also that it is easy for you to say it is a pleasure to come before this committee. We are rarely beating up on GAO as we are upon the agencies or the companies.

Mr. LI. I hope we keep it that way, sir.

We appreciate the opportunity to testify at today's hearing on FAA's AAS program. The hour is late, so with your permission, I will summarize our prepared statement.

I recall the deep concern expressed by the Chairman and the Members during last year's hearing. At that time, the subcommittee emphasized the need to identify causes of AAS problems and move forward with solutions, not backwards by laying blame. FAA and IBM were candid in their assessment of where the blame should be placed—clearly, in their court. Commitments were made, and guarded optimism was expressed.

So what happened? Since our testimony last year, FAA and IBM have tried to address schedule delays and cost overruns. However, as you heard earlier, new risks were uncovered.

Two areas in our statement are worthy of emphasis: one, the causes of AAS problems; and, two, the implications of the problems and changes affecting the system.

First, the causes. We believe AAS cost and schedule problems have resulted from several technical and managerial factors. As I pointed out last year, FAA and IBM developed an overly ambitious development and implementation plan, including cost and schedule estimates. This was done despite highly demanding requirements and a complex software architecture.

In addition, FAA did not provide adequate oversight of IBM's performance throughout the course of the contract, especially during the beginning of the development of the key ISSS component. As a result, IBM's lack of progress did not always surface in a timely manner. Furthermore, FAA was indecisive in resolving some basic requirements issues such as electronic flight data strips.

In our opinion, these factors were at the root of AAS's problems, not inadequate funding or Federal procurement regulations as some proponents of the ATC corporation concept might contend.

The second area I will address today is what implications these problems and changes will entail. We see five implications.

First implication. The bulk of benefits to users has been further delayed because the AAS schedule was extended. These benefits are expected mostly from AERA, which was previously scheduled for implementation as part of the last component of AAS, the Area Control Computer Complex. However, the Agency is planning to implement an early version of AERA, albeit limited in capabilities, as part of ISSS.

Second implication. The reduction in the scope of AAS resulting from FAA's limited consolidation and strategic automation plans still needs to be addressed. Additional automated systems will have to be acquired to enhance oceanic, terminal and possibly tower facilities that were planned to be supported through AAS.

Third implication. Unless the development costs or the scope of the system is further reduced or the Congress increases FAA's funding, completing the system as planned will impose major demand on upcoming FAA budgets. Even before factoring in the higher AAS Task Force cost estimate, the annual budget for AAS was scheduled to grow from about $500 million in fiscal year 1995 to over $700 million for each of the following three years. If things remain unchanged, the higher funding levels required to complete the system could crowd out other modernization projects.

Fourth implication. If the 20-month schedule delay projected by the task force becomes a reality, the agency may need to initiate interim measures, such as acquiring a $60 million replacement for equipment in its en-route air traffic control facilities. Existing equipment has been experiencing operational and maintenance problems that may need to be resolved before ISSS is implemented.

Fifth and final implication. If FAA follows the current plan of accepting ISSS before all critical requirements are met, such as continuous operations, the agency faces the risk of additional costs to fix the system.

The problem is one of leverage. Once the system is accepted, it becomes harder for the government to require the contractor to bear responsibility for system performance.

In conclusion, Mr. Chairman, the coming months will be critical from the standpoint of restructuring FAA's automation program. Several key events are on the horizon. FAA will have to decide on how to satisfy its automation needs, both within and outside the AAS project. This decision will have to consider user benefits, both air traffic control and air traffic flow management, and the implications of funding AAS on other modernization projects.

Another key event will be the completed transfer of all AAS contractual responsibilities from IBM to Loral.

In addition, FAA and the contractor plan to begin formal testing of ISSS in June. This should provide insights into whether technical challenges can be met within cost and schedule estimates. To gain governmental acceptance of ISSS, IBM and eventually Loral will have to show that its system can meet FAA's requirements.

From the statement this morning, I am encouraged that the Administrator recognizes these challenges. Given the troubled history of AAS, we believe the administration and FAA must make a strong case for continued congressional support of the project.

The implications we raise today need to be addressed. Accordingly, we are making two recommendations to the Secretary of Transportation.

First recommendation, that FAA defer governmental acceptance of ISSS until all critical operational requirements are met. And, two, that FAA submit a report to the Congress before the fiscal year 1996 FAA budget request is submitted that describes its comprehensive automation plan. The plan should include time frames, funding levels, and all interim and long-term actions necessary to satisfy the needs of users and FAA.

This concludes my statement. We would be pleased to respond to any questions you may have at this time.

Mr. OBERSTAR. Thank you very much.

I think those are two very good suggestions. And I am going to come to those in a moment.

But, first, how much money do you, GAO, estimate, spent to date, is lost or of no value to the future of the program?

Mr. LI. That is a very difficult question to answer. We do know that about $2.6 billion has been appropriated for the AAS project. The majority of that, as you heard, has gone to IBM. Not knowing exactly how the Administrator and his task forces will come out in terms of revalidating requirements, I really don't know what will be discarded from that.

My gut feel, Mr. Chairman, is that much will be kept, that much of the software has been developed, and it is a matter right now of slugging it through and trying to fix those PTRs as you have talked about earlier.

Mr. OBERSTAR. Now, you have just said 2.6 billion has been appropriated.

Mr. LI. Yes, sir.

Mr. OBERSTAR. The FAA testified that, of the appropriated amount, 1.4 billion has actually been paid out.

Mr. LI. I understand that that is for the IBM portion of the program.

Mr. OBERSTAR. IBM portion, okay. And what is the other——

Mr. LI. There are other contractors involved in the program itself.

Mr. LEVIN. There is technical support, there is facility modernization to build the special wings on the enroute centers, for example.

Mr. OBERSTAR. That money is not lost, by any means. So whether there are losses in the program will depend upon the decisions to be made say in the next 90 days?

Mr. LI. That is correct.

Mr. OBERSTAR. When the current CNA review is completed, submitted to the administrator and action is taken—an action is definitively taken or decided upon, at any rate, within the—upon the elements within the Daschle report, then we will know whether—now, scrapping of the ACCC, does that involve loss of——

Mr. LI. It is minimal, Mr. Chairman. Not much money had been used up for ACCC.

Mr. OBERSTAR. About 46 million?

Mr. LI. I believe that is about the right number. The TAAS has—some effort has been expended, but, as you know, most of the monies have been used up for the development of ISSS.

Mr. OBERSTAR. Well, if 2.6 billion has been appropriated and we had originally a $4.7 billion program and the items that Loral addressed this morning total up in their estimate to 2.4 billion from here forward, they are fairly close to the original cost estimate.

Mr. LI. Loral's numbers this morning—this is the first time that I have heard of those numbers. And trying to very closely listen to Loral's testimony, it appears that the $4 billion they are talking about refers only to some portions of the original AAS contract and does not involve some of the other portions like ACCC.

Mr. OBERSTAR. Okay. I assume GAO will monitor very closely the novation process——

Mr. LI. Yes, sir.

Mr. OBERSTAR [continuing]. And the transfer of responsibilities to Loral?

What benchmarks would you set forth from this point forward over the next 90 days that are critical in this novation process to avoid the Federal Government having to shoulder cost responsibilities that properly should be those of IBM—or of Loral as the successor?

Mr. LI. Let me try to answer this. Then I will pass it on to Bob.

I think that the establishment of firm understanding of what requirements still remain open has to be established before that novation process is completed. There has to be a good understanding as to what is the responsibility of the contractor and that which FAA, in changing its requirements, has been responsible for.

Bob, do you have anything else?

Mr. LEVIN. Yes, I think the main thing is we have to have a sense of direction of where this program is going. And we hope that is clearly spelled out. That is the major reason we made that recommendation, to make it clear to everybody, not just on Capitol Hill but throughout the Federal Government, that this is exactly what FAA wants to do. The novation is really just a means of carrying out that plan.

Mr. OBERSTAR. You know, it is a very critical time, though, because this process of deciding what goes to Loral and what stays with IBM's responsibility may involve significant amounts of money. And before the FAA accepts Loral as contractor, they have to be very clear about what is in that contract at that time.

Mr. LI. Mr. Chairman, I believe that with the visibility that this program has had I know that the Administrator and the Deputy Administrator are very much on top of that situation.

Mr. OBERSTAR. I will feel very good if you are on top of it as well.

Mr. LI. Yes, sir.

Mr. OBERSTAR. Because with 655,000 lines of code resulting from 525 change requests as of February 10 of this year and software volatility running at 100 percent, even so computer illiterate a Member as I would say there is something greatly amiss here.

Mr. LI. Well, I will give you one perspective, and then I will ask Randy to give you his perspective.

The use of Ada—and we have talked about that quite a bit for several hours during today's hearing—Ada was chosen a few years ago because of its benefits regarding ease of maintenance. And that is the reason why DOD has chosen it as its primary language for mission-type systems and FAA in their decision-making chose it.

It is true that at the beginning of the project there was not much experience in the use of Ada, and IBM would admit to that today. Its programmers were just not as adept as they are currently. And part of the problem that you see in terms of how many PTRs have occurred is probably because of some of that gestation, and they are finally getting up to speed on it.

Randy, do you have some——

Mr. HITE. I would just add that your observations about the state of the software are correct. I would characterize the software as immature at this point in time. And before the program would be ready to advance into some type of formal testing we would want to see the maturity increase dramatically, meaning you would want to see the number of those PTRs on the decline and the number of change requests declining also.

Mr. OBERSTAR. Well, given—well, throw the word given out. The Daschle report observation, quote, once the government has formally accepted the system, it becomes considerably more difficult to require IBM to bear responsibility for system performance.

For example, in the case of latent defects. That is the point that I am getting at. Does FAA have to require Loral to close all the outstanding PTRs? Does FAA have to require Loral to settle with IBM and come to it with a clean slate? Or can you say in the interest of moving ahead, not delaying it further, we will come to an agreement on these still-open PTRs and proceed rapidly and not wait for those to be closed?

This is a gray area here, but, you know, lawyers ultimately may decide this thing.

Mr. LI. Absolutely, Mr. Chairman. Really, this is the heart of our recommendation that we are making today, which is that they defer that acceptance until after the critical functions are tested.

In the Daschle report, the middle range and the longer term projection do consider that. The one that has the highest risk is the one that does the acceptance prior to having everything tested.

Mr. OBERSTAR. Yes, the shorter term acceptance gives you the higher risk of cost exposure and of system problems.

Mr. LI. Absolutely.

Juan, would you like to expand on that?

Mr. TAPIA. I agree with that.

Mr. OBERSTAR. How long a period of time is that, then, do you estimate?

Mr. LI. Well, according to the Daschle report, we are talking about several months. In Loral's new presentation, they recommend something very similar. They have pushed out the acceptance further on as——

Mr. OBERSTAR. But they say getting ISSS on board in Seattle 1 January, 1995.

Mr. LI. But the difference, Mr. Chairman, is that it is not accepted. And I think that——

Mr. OBERSTAR. Putting it in place but not being accepted?

Mr. LI. That is correct. That is a way of getting experience in the field.

Mr. OBERSTAR. Whose responsibility is—whose legal or financial responsibility is it if we proceed on that basis?

Mr. LI. If the government does not accept the system yet, my assumption—and this is perhaps a big assumption—is that Loral would maintain that responsibility.

Mr. OBERSTAR. Well, what pressure would there be on FAA to accept something before it has been fully tested and cleared? Is there any pressure on the government? Is there any squeeze on the government to do that?

Mr. LEVIN. I think in the past the pressure has been to meet schedule, that it would be a way of saying, yes, we are on time, we are on schedule, even though they were deferring some important functions until later, and saying, all right, we will accept it even though some of those critical requirements aren't already built into the software.

Mr. OBERSTAR. But there is no such pressure here? The system is functioning, it is operating, it isn't—the current air traffic control system is not in a state of collapse?

Mr. LI. That is correct.

Mr. OBERSTAR. So another—beyond January 1, 1995, how much longer will it take before—you may not—that is not possible to—that is not possible to answer. How long would it take before government made a position to accept the contract? That is probably not possible to answer that. Having—having just asked it, I realize it is not answerable. But it could be a year, could be a long time.

Mr. LI. I think there are tradeoffs to be made between how long you want to be able to test a system and when you want to have it fielded. So I think that FAA is making those considerations.

Mr. HITE. If I could amplify on his statement.

I really think you can't tell now because you have got the one factor of correcting all the existing PTRs, the amount of time that is associated with that, and there is disagreement among parties at FAA and with the contractor as to what number of those you need to correct before you go into formal testing.

But I would also submit that once you enter formal testing, rest assured you are going to find more trouble reports.

Mr. OBERSTAR. Yes. Well, if Loral is as good as they say they are and think they are, maybe those 2,000 plus problem reports can be cleaned up in much shorter time than IBM was taking. And given the testimony of the previous panel of $500 a whack being way above industry average, some costs can be saved or shaved in that process as well if Loral, again, is as good as they say they are and does as good a job of riding herd on their team and can cut both cost and time to bring the project to a point of acceptance decision.

Mr. LEVIN. It is hard to know what to believe, I think.

Mr. OBERSTAR. It sure is at this point. You have got a whole row of skeptics up here.

Mr. LEVIN. You have said credibility is at a low point, and I think we have a lot of reason for that. We want to believe that this could be solved, but there is a lot to be understood before we really know when that credibility will be restored.

Mr. OBERSTAR. I am concerned we may run up against a recorded vote, and I would like to conclude your testimony before we do that.

Have you assessed the technology choices facing FAA?

Let me amplify that. If a consensus is developed that the design and architecture should be more open than it has been up to this point, so that new technology can be integrated into the system, have you assessed whether that is the situation?

Mr. LI. We have not done any specific work in that area. As a matter of fact, I guess the concern is that I would kind of question, before the recent events, why one would want to go back and reopen that Pandora's box again.

I think that if the issue now is trying to find out other alternatives and other solutions—are we at a state where we have—the problems are so severe that we need to find other vendors, perhaps, and other solutions? Then that would be something that would be coming out of the task force follow-on reports that the Administrator referenced this morning.

But, no, we have not looked at any opportunities for open systems. We have discussed it.

Randy, you have some views on that.

Mr. HITE. We as an institution, GAO, would certainly advocate the use of open systems. And in the case of AAS, ISSS in particular, the operating system in question is IBM's version of the UNIX operating system, which is open.

But as the panel of industry experts mentioned earlier, there are degrees of openness. And how open ISSS is still an item of question.

Mr. OBERSTAR. Well, if that is the case, if there is a consensus that there ought—that the design and architecture of the system ought to be more open to off-the-shelf items that can be upgraded, then does—does FAA have the authority, does Loral have authority, to go ahead and move in that direction without having to get into extensive contract, legal language rewrite?

Mr. LI. Just off the top of my head, I think that it would involve some sort of recompetition.

If they were to buy, for example stand-alone TRACONs, if this was a new concept to be brought out, I would assume that a new procurement process would have to be undertaken.

Mr. OBERSTAR. That would be terrible. I mean, that would—that could result in an awful lot of delay.

Mr. LI. Well, the other alternative is to use the existing vehicle, which is the TAAS, which they have with IBM/Loral, and perhaps find ways of maybe downsizing that TAAS for smaller TRACONs. But if the intent is to reopen the program to include other small systems that are capable of doing this, my guess is that you would have to go with some sort of reprocurement.

Mr. OBERSTAR. Do you think the whole procurement system that FAA uses and other Federal Government agencies use needs to be scrapped and overhauled?

Mr. LI. Well, I have been trying to follow where the Department of Defense is in their discussions about acquisition reform. The previous panel brought up some very good points regarding trying to have better discussion with the user community in trying to establish those particular requirements.

I don't think we are talking about throwing away all procurement regulations. Federal procurement regulations are there for a purpose. They are there to protect the taxpayer from the standpoint of fraud, waste and abuse. And I do understand sometimes that they are cumbersome, but I do think that there is some way—we have to find some ways better implementing them.

We talked about the design competition phase earlier. The other group, the previous panel did. They talked about the fact that vendors could not talk to the user community because of the rules. I believe that that has to be better understood. They can't talk to one another because there is a concern that what one vendor hears has to be heard by the other vendor. So we have to have a common denominator, common baseline.

So perhaps what is possible, without perhaps abrogating some of the proprietary information discussed is that some sort of closed circuit discussion can come into effect.

What I would propose, Mr. Oberstar, is that when you down select, we can still be in the design competition phase. One vendor can still remain in the design competition phase. And let's not commit to production until those requirements are well-known. We can have those sorts of discussions between FAA and the contractor.

Mr. OBERSTAR. Yes. Well, I appreciate that insight. That is very, very important and thoughtful presentation. And my feelings as well.

I hear this so often and from outside. Well, let's be very specific.

Airline executives, they say, why don't we do it like private industry does? And immediately it conjures up in my mind—time and again I hear private industry folks saying, we have done business with, oh, XYZ corporation for years. They have been good folks. We will give them that contract again. Or we will just go out, find so and so. We will give them a contract.

Once in a while they set up kind of a competition, but they invite people in, sort of good old boys and good old folks network. And a lot of companies have gone broke trying to bid on the government because the spec is higher, the requirements are tougher, the openness is required.

They don't have to do that in the private sector. They are dealing with public dollars here, not private dollars. Maybe they feel they can waste in ways that don't require them to be accountable to a public, maybe accountable to a board. We are dealing with a much different kind of thing here.

I would be very reluctant just to wholesale scrap this idea. Let's make some incremental fixes in it, make sure that at least in this case within FAA that it can move ahead.

Mr. Clinger.

Mr. CLINGER. Thank you, Mr. Chairman.

And I apologize to the panel for not having heard your testimony. I have had a chance to, however, review it and just have one inquiry.

On this procurement question, Mr. Li, you are aware, I am sure, that there is an effort working its way through this Congress for procurement reform.

Mr. LI. Yes, sir.

Mr. CLINGER. Which would be government-wide and now it would appear it is going to be—also cover the Defense Department, which, of course, is one of the biggest acquirers we have around the place. Have you had a chance to look at that?

Mr. LI. Not in detail, sir, but I do—my recollection of having studied this over the years, is that one of the primary pushes, primary foundations of this, is to try to provide and use more commercial off-the-shelf equipment.

Mr. CLINGER. That is the objective. That is right.

Mr. LI. And I think that is a good intent.

The Packard Commission of a few years ago, when I was following the Defense Department, had made that recommendation, to try to see whether or not there were opportunities.

The downside of the use of commercial off-the-shelf is that the use of commercial off-the-shelf equipment does not necessarily mean no risk. There is some customization that is going to be required. Some interfaces between that commercial off-the-shelf equipment and whatever you are attaching it to has to be resolved.

So I would caution that the folks that are saying commercial off-the-shelf is the answer, that we have to get into that with open eyes.

Mr. CLINGER. I would agree, but I think you would agree that rather than having to reinvent the wheel every time, which is what it seems to me we have done too often in the past, where we have just sort of totally said off-the-shelf is not for us. We are going to have our own way.

And I would agree with the Chairman that clearly there is a greater issue of accountability when we are talking about public funds, but I also believe very strongly that we can accelerate this process which in too many areas, not just in the FAA, has resulted in escalating costs and time delays.

Well, I thank you all very much.

Thank you, Mr. Chairman.

Mr. OBERSTAR. I thank you, Mr. Clinger, for your thoughts and for your observations.

I have a few other questions I will submit in writing. I ask you to respond in writing for the record.

We had a briefing from Administrator Hinson that the capital investment plan delivered actual and accruing benefits to date of $35.1 billion and that total projected benefits of the capital investment plan will eventually reach $285 billion, some of which are benefits to FAA, some of which are benefits to the user system, the users in the system, airlines and air travelers. Can you do an evaluation of those numbers and give us your read on them?

Mr. LI. Yes, sir, we will.

[The information received follows:]

FAA has calculated that $35 billion in benefits (in 1992 constant dollars) have been realized, or will be accrued, from Capital Investment Plan (CIP) projects that have been implemented. Of those $35 billion in benefits, FAA estimates that about $22 billion will go to system users while $13 billion and benefits to the agency itself. The largest chunk of the benefits (almost 70 percent) come from three projects: the Host Computer, the Traffic Management System, and the Instrument Landing System.

Essentially, FAA calculates actual and accruing benefits by counting up projected yearly benefits estimated in benefit-cost analyses done while those projects were under development, as updated for key assumptions such as the price of jet fuel. Therefore, the reasonableness of the actual and accruing benefits cited by FAA are, to a large degree, dependent on the adequacy of the benefit-cost studies. GAO has not reviewed the benefit-cost studies for those projects accounting for the $35 billion. However, we would note that each of the three projects, which account for most of the benefits, provides equipment which is vitally important in the air traffic control system.

Mr. OBERSTAR. I would like you to elaborate upon your two recommendations to defer ISSS, much along the lines of our discussion, and the acceptance issue and the report to your proposal for a report to Congress by FAA describing its plan as we are going to ask FAA to adhere to a reporting schedule to specifications that we are going to design and ask them to report.

[The information received follows:]

GAO recommends that FAA defer acceptance of ISSS until all critical operational requirements are met because premature acceptance of the system may involve major cost risks to the agency. FAA is developing ISSS capabilities incrementally. Major hardware and software increments, called block updates, are scheduled to be incorporated after completion and acceptance of the basic ISSS. Developing and testing a system as large and complex as ISSS in increments is both reasonable and prudent. 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. As a result, any necessary corrections to achieve needed performance could entail major additional costs to FAA.

GAO also recommends that, before the administration proposes its fiscal year 1996 budget for FAA, the agency submit a report to Congress describing a comprehensive automation plan—including estimated schedules, costs, and user benefits—for both the air traffic control and the air traffic flow management systems. This plan is needed to understand the implications that changes in the scope of AAS will have on the traffic control and flow management systems. For example, as a result of recent changes, FAA plans to acquire about 170 new automated air traffic control systems to support terminal facilities. Also, FAA intends to procure air traffic flow management systems to support traffic management functions at en-route facilities.

Mr. OBERSTAR. Finally, in preparation for this report, our staff did a superb job, and I would like to compliment Mr. Traynham, Mr. Heymsfeld, Donna McLean, Dave Schaffer and all others who have poured enormous amounts of energy and effort into this.

But one of the observations that they developed and that I think just puts this all in very stark relief is that the cost overruns anticipated at this point for this program are 15 to 20 percent of the total capital investment budget for the rest of the century. That is a number of enormous magnitude. That has got to be fixed. It has got to be done before the end of this year. It is going to take everybody's help to do that.

I like what I heard from Loral, but, you know, I think they are in billions that are way over their head that they have ever seen before. And I wish them well, but it is going to take a lot of lifting to get all of them through this very complicated process.

As everybody knows, the subcommittee has begun and reinitiated a process of inquiry, and we will not let it go. We will continue to monitor it ever more closely than in the past.

I also have to observe that I think it is a terrible waste of talent and time and energy to be spending time on developing this corporation idea for air traffic control when such huge stakes are riding on this procurement and this modernization of the capital improvement program. Every energy ought to be trained on making this system work.

I thank all the witnesses for their contribution today.

Mr. LI. Thank you, sir.

Mr. OBERSTAR. The subcommittee is adjourned.

[Whereupon, at 5:48 p.m., the subcommittee was adjourned.]

PREPARED STATEMENTS SUBMITTED BY WITNESSES

STATEMENT OF THE HONORABLE DAVID R. HINSON, FEDERAL AVIATION ADMINISTRATOR, BEFORE THE HOUSE COMMITTEE ON PUBLIC WORKS AND TRANSPORTATION, SUBCOMMITTEE ON AVIATION, CONCERNING THE STATUS OF THE AAS PROGRAM, APRIL [illegible], 1994

Mr. Chairman and Members of the Subcommittee:

I appreciate the opportunity to appear before you today to bring you up to date on the status of my efforts to shape the Advanced Automation System (AAS) program in a way that meets the critical needs of our air transportation system and ensures that the taxpayers receive value for their investment. I have already made several basic changes to the AAS structure, and I am committed to making any other changes necessary to get this program on track. At the outset, though, I would like to emphasize that, even with the problems we have seen with the AAS program, our air traffic control system continues to afford the Nation's air travelers the safest air transportation in the world.

This Subcommittee is well aware of the troubled history of the AAS program, which was conceived more than a decade ago as a way of meeting projected demands on our aging air traffic control system. Employing state-of-the-art technology and using automation to perform many air traffic control-related tasks, AAS is intended to accommodate increased air traffic in a more cost-beneficial way and to provide greater efficiencies and safety in our air transportation system. The underlying need for air traffic control modernization has not changed.

When I came to the FAA, I knew that a big part of my job was to understand what was really occurring with AAS and to see that the program was brought under control. I began my review of the AAS program very shortly after taking office. I learned within a few months that the cost projections for this program, which were presented to you in late

1992, were flawed, and that there was a likely corresponding schedule impact. I notified you and other Congressional committees of that finding, and outlined for you a series of steps I was immediately taking to bring the program under control.

I am dissatisfied with the execution of this program to date. However, I am less interested in affixing blame for past poor showings than I am with shaping and managing a program that will accomplish what we need, and do so in a timely and fiscally responsible way. Last December, I described for you the plan for doing just that. Let me take a few moments to outline for you where we stand in this effort.

My first action was to charter a 45-day review of the financial and schedule status of the AAS program under the direction of the Deputy Administrator and Chief Counsel, to identify further risks to program completion and cost. That intensive review is complete. In brief, the review shows the potential for both additional cost increases and program slippage. It reflects a range of costs from \$6.5 billion to \$7.3 billion for completion of the program, and slippage of implementation dates for the Initial Sector Suite System portion of the program by 9 to 31 months. A particular area of risk identified in the report was to compress testing while simultaneously developing critical functions for AAS.

The critical analysis performed by this group points out that the AAS program, if unchanged, would pose uncertain cost and schedule increases that are unacceptable. This conclusion reinforces the criticality of work efforts now underway: an assessment of technical and managerial issues of AAS by the Center for Naval Analysis (CNA) and an AAS Requirements Revalidation Group comprised primarily of in-house technical staff.

I tasked CNA with conducting an independent 90-day review to assess the organizational, management, and financial concerns associated with the AAS program. As part of this process, CNA will provide me with recommendations on realistic solutions to the problems that have previously plagued this program. I wanted that unvarnished look from an outside group with experience in large-scale software development systems to provide me with options for the future direction of our automation efforts. Although they recently updated me on their efforts, their report is not yet finalized. I can assure you they are deeply involved in their review of the program, and that their recommendations will be important to me in this process.

On a separate track, I chartered a group within the FAA, which includes representatives from DOT, DOD, and CNA, to examine the appropriate operational requirements for AAS, and to scrutinize the previously-established system requirements for current validity. Every aspect of the AAS program is on the table in this review. They are looking, for example, to determine if there is a demonstrable need for the extremely stringent specifications for system availability that were previously set, given technology advances in the last decade, and whether each program segment of AAS is justified. Their review is also focusing on determining the benefits provided by particular AAS requirements, as a means of validating their continued need.

Later this month, I expect final reports from both CNA and the revalidation team. The data they are providing, along with the information developed in the 45-day review, is being integrated and analyzed by a top-level Program Restructuring team under the direction of the new AAS program director. The team is examining all options for program restructuring, and is focusing on both short-term and long-term deficiencies with the air traffic control system. The team is assessing, for example, how best to address short-term problems caused by our rapidly aging automation equipment; determining whether currently planned TAAS and TCCC systems are still needed, or whether FAA's terminal and tower automation needs can be satisfied by existing, commercially available systems; and whether it still makes sense to deliver an ISSS that will be supplanted by ACCC, or whether current technology permits delivery of combined ISSS/ACCC functions. The Program Restructuring team will be guided by several fundamental principles. First, any proposed system changes must be determined to yield operational benefits in excess of their cost. Second, to the extent feasible, high risk activities will be minimized, and use of available, off-the-shelf technology will be a preferred option. Third, we must be able to afford the program changes. Fourth, realistic funding and implementation schedules must be established, and timely implementation of elements of the system that provide high user benefits is favored. The team will provide me with recommendations and options for a reshaping of the program.

My current plans are to make the immediate decisions required to proceed with the program, by the end of May, in cooperation with the Department and OMB. Along the way, as discrete decisions are made on components of the overall program, we will act quickly to effectuate those necessary contract changes. I am, of course, anxious to put in place the right approach and recognize the difficulties of contract administration until we do so, but, in view of the history of this program, I am insisting within the agency that we take the time necessary to ensure that we are doing the right thing in the right way.

I have also taken a number of management steps within the agency to improve the execution of this program. I have changed the AAS program management team, and designated a new program director. We have increased our on site presence and oversight of the contractor's efforts. Immediately after the 45-day review identified the ACCC as the segment of the AAS program having the greatest potential for additional cost growth, we suspended funding for work on the ACCC. We have instituted a number of steps to more tightly control contract cost and schedule. We have also acted to further concentrate senior management attention on the program through frequent status reviews of the program by the Deputy Administrator and me, and through closer integration among senior-level operating officials within the agency on reviewing requirements change proposals to ensure their necessity and cost-effectiveness.

Before closing, Mr. Chairman, I would like to stress that the automation of our air traffic facilities is a top agency priority. I am committed to seeing that we define a workable program, delete unnecessary and unduly costly features, and establish an implementation and funding schedule that we can meet. It is a difficult challenge, given the complexity and enormity of the program, but one that we must meet. I am confident that the steps I have taken to address the programmatic and funding issues will provide me the right kind of data to make the right choices. We will act as expeditiously as we can, and we will keep you and your staff informed of our efforts along the way. I know we all share the common goal of bringing about the critically needed improvements in our air traffic control system, and I appreciate very much the support this Subcommittee has provided the FAA in this effort.

That completes my prepared statement, Mr. Chairman. I would be pleased to respond to any questions you may have at this time..

TESTIMONY OF

MR. ROBERT KRAMP
GROUP VICE PRESIDENT AND GENERAL MANAGER
COMMAND AND CONTROL SYSTEMS DIVISION
SYSTEMS SECTOR, HUGHES AIRCRAFT COMPANY

BEFORE THE

SUBCOMMITTEE ON AVIATION
COMMITTEE ON PUBLIC WORKS AND TRANSPORTATION
U.S. HOUSE OF REPRESENTATIVES

13 APRIL 1994

"REVIEW OF RECENT DEVELOPMENTS IN THE FEDERAL AVIATION ADMINISTRATION'S ADVANCED AUTOMATION SYSTEM PROGRAM"

THANK YOU FOR THE INVITATION TO MAKE THIS PRESENTATION TODAY.

BEFORE I DISCUSS THE U.S. AIR TRAFFIC CONTROL PROGRAM, I WOULD LIKE TO PROVIDE YOU SOME RELEVANT BACKGROUND ON HUGHES AIRCRAFT COMPANY.

IN THE EARLY 1950S, THE SENIOR EXECUTIVES OF HUGHES AIRCRAFT COMPANY MADE A CRITICAL MANAGEMENT DECISION TO INVEST IN THE DEVELOPMENT OF TECHNOLOGIES -- BOTH HARDWARE AND SOFTWARE -- THAT COULD BE APPLIED TO THE IMPLEMENTATION OF LARGE-SCALE, REAL-TIME SYSTEMS FOR AIR SPACE MANAGEMENT. TURN-KEY AIR DEFENSE SYSTEMS WERE THE INITIAL FOCUS OF THIS CORPORATE INITIATIVE.

BY THE EARLY 1960S, THE COMPANY WAS ALREADY THE WORLD LEADER IN SUPPLYING SUCH SOPHISTICATED SYSTEMS, A DISTINCTION WE BELIEVE WE STILL POSSESS TODAY. DURING THE PAST 35 YEARS WE HAVE SUPPLIED MORE THAN THREE DOZEN SUCH SOFTWARE INTENSIVE SYSTEMS TO THE UNITED STATES, CANADA, JAPAN, NATO, THE UNITED KINGDOM, GERMANY AND NUMEROUS OTHER VALUED ALLIES.

WHILE EACH ONE OF THESE SYSTEMS IS UNIQUE, THEY TEND TO SHARE COMMON CHARACTERISTICS. 1) EACH SYSTEM REQUIRES HUNDREDS OF THOUSANDS TO OVER ONE MILLION LINES OF NEW SOFTWARE CODE. 2) EACH SYSTEM IS MADE UP OF SITES SPREAD

THROUGHOUT A NATIONAL OR CONTINENTAL AREA. 3) EACH SYSTEM IS CUSTOMIZED FOR THE SPECIFIC USERS. 4) TODAY, WITH THE TREMENDOUS INVESTMENTS MADE IN THE COMMERCIAL COMPUTER INDUSTRY, THE SYSTEMS ARE GENERALLY HARDWARE INDEPENDENT. 5) FINALLY, ANY COMPANY BUILDING SUCH SYSTEMS MUST GO THROUGH A LEARNING CURVE. HISTORY SHOWS THAT IT IS IMPOSSIBLE FOR A CONTRACTOR TO COMPLETE A LARGE, COMPLEX SYSTEM ON TIME AND ON BUDGET WITHOUT HAVING FIRST SERVED AN APPRENTICESHIP WITH TURN-KEY SYSTEMS OVER A PERIOD OF MANY YEARS.

AT HUGHES, BECAUSE LARGE-SCALE TURN-KEY SYSTEMS ARE PART OF OUR CORE BUSINESS, WE HAVE INVESTED GREATLY IN IMPROVING OUR PROGRAM MANAGEMENT, SYSTEMS ENGINEERING AND SOFTWARE PROCESS CONTROL NEEDED FOR SYSTEMS OF THIS COMPLEXITY. SOME PEOPLE WILL TELL YOU THAT HUGHES NOW HAS IN PLACE TO SUPPORT ITS AIRSPACE MANAGEMENT SYSTEMS, THE BEST SOFTWARE PROCESS CONTROL IN THE BUSINESS. WE CERTAINLY FEEL THAT IS THE CASE. SEVERAL YEARS AGO, WHEN THE SOFTWARE ENGINEERING INSTITUTE OF CARNEGIE MELLON UNIVERSITY BEGAN GRADING COMPANIES ON SOFTWARE PROCESS, HUGHES WAS ONE OF THE FIRST TO BE EVALUATED. WE TOOK THAT INITIAL EVALUATION SERIOUSLY, LEARNED FROM IT AND PUT IN PLACE A MULTI-YEAR PLAN OF IMPROVEMENT EFFORTS. TODAY, THE HUGHES SOFTWARE PROCESS IN FULLERTON, CALIFORNIA IS VIEWED AS THE MODEL FOR THE AEROSPACE INDUSTRY.

IT WAS ABOUT 15 YEARS AGO THAT HUGHES AIRCRAFT COMPANY MADE ANOTHER LONG RANGE MANAGEMENT DECISION, THIS TIME TO FOCUS TECHNOLOGY AND RESOURCE TO PROVIDE COMMERCIAL AIR TRAFFIC CONTROL SYSTEMS. WHEN YOU TAKE A CLOSE LOOK AT THE TECHNOLOGIES AND PROCESSES REQUIRED TO BUILD EITHER AIR DEFENSE SYSTEMS OR AIR TRAFFIC CONTROL SYSTEMS, YOU WILL SEE MANY SIMILARITIES. IN FACT, EXCEPT FOR SPECIFIC OPERATIONAL USES, THE WAY YOU GO ABOUT BUILDING EITHER TYPE OF SYSTEM IS NEARLY IDENTICAL.

TODAY, HUGHES HAS SUCCESSFULLY COMPLETED A NATIONAL AIR TRAFFIC SYSTEM FOR THE REPUBLIC OF KOREA AND A BACKUP SYSTEM FOR PORTIONS OF GERMANY. THE COMPANY IS ACTIVELY BUILDING SYSTEMS FOR SAUDI ARABIA, BELGIUM, SWITZERLAND AND CANADA. THE SYSTEM IN CANADA CLOSELY MATCHES IN MANY WAYS THE REQUIREMENTS FOR ADVANCED AUTOMATION CONTAINED IN THE U.S. SYSTEM UNDER DEVELOPMENT. ON THE AIR DEFENSE SIDE, HUGHES IS CURRENTLY ACTIVE IN BUILDING SYSTEMS FOR ICELAND, TAIWAN, KUWAIT AND SAUDI ARABIA.

IT IS THE LAST PROGRAM, PEACE SHIELD, THE AIR DEFENSE SYSTEM FOR SAUDI ARABIA, THAT I WOULD LIKE TO ELABORATE ON FOR A FEW MOMENTS. WHILE HUGHES WAS AN ORIGINAL BIDDER FOR THE $1 BILLION PROGRAM AND ULTIMATELY LOST OUT IN THE COMPETITION, WE ARE NOW UNDER CONTRACT TO COMPLETE THE SYSTEM. THE ORIGINAL SUPPLIER WAS ULTIMATELY TERMINATED IN JANUARY OF 1991 AND A RECOMPETITION WAS CONDUCTED.

HUGHES WAS PLACED UNDER CONTRACT TO BUILD THE PEACE SHIELD SYSTEM IN JULY-1991. HUGHES IS 33 MONTHS INTO THE PROGRAM AND IS ON SCHEDULE TO DELIVER THE PROJECT 6 MONTHS EARLY IN MONTH 48.

ONE OF THE PRIMARY REASONS FOR OUR SUCCESS ON PEACE SHIELD, WE BELIEVE, IS THE HIGH LEVEL OF MATURITY WE HAVE REACHED IN OUR PROGRAM MANAGEMENT, SYSTEMS ENGINEERING AND SOFTWARE DEVELOPMENT PROCESSES. WE HAVE INVESTED GREATLY IN THESE AREAS DURING THE PAST FIVE YEARS AND OUR EFFORTS ARE PRODUCING IMPRESSIVE RESULTS. DETAILED PLANNING INVOLVING OVER 75,000 INCHSTONES ALLOWS THE PROGRAM AND TECHNICAL MANAGEMENT TO ASSESS PROGRESS AND REDISTRIBUTE PERSONNEL AND CAPITAL RESOURCES AT THE EARLIEST DETECTION OF PROBLEMS. FURTHER, THIS REVIEW AND ADJUSTMENT IS DONE JOINTLY WITH THE CUSTOMER ON A CONTINUOUS BASIS.

HOWEVER, SHOULD PROBLEMS OCCUR, WHICH IS INEVITABLE AS REQUIREMENTS OFTEN CHANGE DURING THE DEVELOPMENT PROCESS, WE ARE ABLE TO DEAL WITH THEM THROUGH OUR ITERATIVE DEVELOPMENT PROCESS. THIS SYSTEMS DEVELOPMENT PROCESS IS ONE WHERE YOU BUILD A LITTLE AND THEN TEST A LITTLE AS YOU GO. THIS ALLOWS YOU TO UNCOVER PROBLEMS IN YOUR OVERALL SYSTEMS APPROACH AT THE EARLIEST POSSIBLE STAGES AND ALLOWS YOU TO TAKE IMMEDIATE CORRECTIVE ACTION. FIVE YEARS AGO WE ESTABLISHED A DEFECT DATA BASE FOR THE SOLE PURPOSE OF FINDING OUT WHAT DEFECTS OCCURRED IN WHAT

PHASE OF THE SOFTWARE DEVELOPMENT LIFE CYCLE (DESIGN, CODE, UNIT TEST, INTEGRATION TEST AND SYSTEM TEST). FROM THIS WE WERE ABLE TO DO A PARETO ANALYSIS AND DETERMINE: 1) THE COST OF FIXING DEFECTS IN AND OUT OF PHASE, 2) THE AVERAGE NUMBER OF DEFECTS PER 1,000 LINES OF CODE, 3) UPPER AND LOWER LIMITS OF DEFECTS PER PHASE, AND 4) CLASSIFY THE DEFECTS IN ORDER THAT WE COULD MODIFY OUR OVERALL PROCESS AND THEREFORE, ELIMINATE SYSTEMIC DEFECTS. THESE ARE THE TECHNIQUES HUGHES HAS USED TO KEEP PEACE SHIELD SOFTWARE DEVELOPMENT AHEAD OF SCHEDULE.

IN REGARDS TO THE ADVANCED AUTOMATION SYSTEM, WE KNOW THE REQUIREMENTS AND CHALLENGES WELL. HUGHES AIRCRAFT COMPANY WAS THE OTHER PRIME CONTRACTOR DURING THE 4 YEAR COMPETITION THAT ENDED IN 1988. WE PROVIDED AN ALTERNATE IMPLEMENTATION PLAN THAT WAS BASED ON ARCHITECTURES USING OPEN STANDARDS AND ADVANCED TECHNOLOGIES FOR PERFORMANCE AND FLEXIBILITY, AND A PROGRAM, SYSTEM ENGINEERING, AND SOFTWARE DEVELOPMENT MANAGEMENT TEAM THAT HAD SUCCESSFULLY DELIVERED ALL OF THE LARGE COMPLEX TURN KEY SYSTEMS DEPLOYED THROUGHOUT THE WORLD. ALTHOUGH WE WERE RATED HIGHER IN MANAGEMENT AND TECHNICAL THAN THE OTHER COMPANY, OUR BID WAS ALSO HIGHER IN COST. THE FAA SELECTED THE OTHER BIDDER.

WHAT DOES HUGHES BRING TO THE AAS PROGRAM?

UNMATCHED LARGE SOFTWARE INTENSIVE SYSTEM INTEGRATION EXPERIENCE

- UNPARALLELED PROCESS AND METRICS LEADERSHIP
- A FAMILY OF OPEN-SYSTEM ATC PRODUCTS RANGING FROM INSTALLED OPERATIONAL RADAR DATA PROCESSING SYSTEMS TO A SOON TO BE COMPLETED AND INSTALLED ADVANCED AIR TRAFFIC MANAGEMENT SYSTEM IN CANADA.
- FAA AND AAS EXPERIENCE
- AN AVAILABLE EXPERIENCED LARGE SYSTEMS MANAGEMENT TEAM

United States General Accounting Office

GAO

Testimony

Before the Subcommittee on Aviation, Committee on Public Works and Transportation, House of Representatives

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ADVANCED AUTOMATION SYSTEM

Implications of Problems and Recent Changes

Statement of Allen Li,
Associate Director, Transportation Issues,
Resources, Community, and Economic
Development Division

GAO/T-RCED-94-188

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,[1] 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. I for a list of related GAO products.)

In summary, we found the following:

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[1] 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,[2] 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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[2] 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.[3] In July 1988, FAA awarded a contract

[3]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.[4] 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.[5] 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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[4]Cost estimates do not include research, engineering, and development costs that totaled $436 million.

[5]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.[6]

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.

[6]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.[7] 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

[7] 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.

<u>FAA Changed AAS Requirements and Was Not Decisive in Resolving Requirements Issues</u>

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.[8] 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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[8]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.[9] 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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[9]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

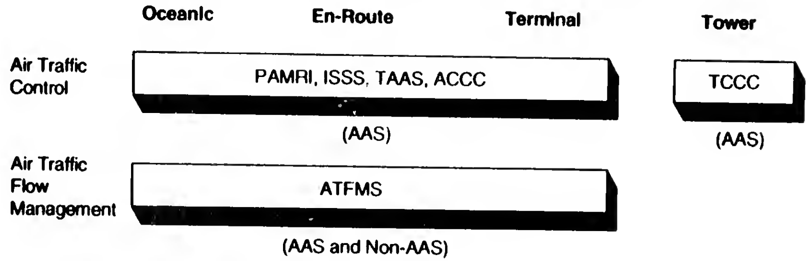
-- defer governmental acceptance of ISSS until all critical operational requirements are met and

-- 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)

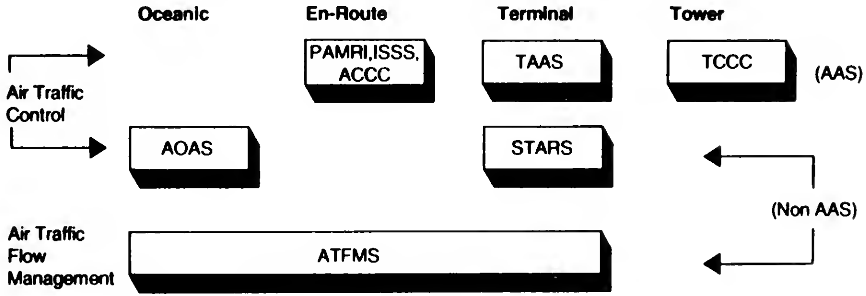


ACRONYMS

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)



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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: FAA.

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).

Air Traffic Control: Continuing Delays Anticipated for the Advanced Automation System (GAO/IMTEC-90-63, July 18, 1990).

FAA Encountering Problems in Acquiring Major Automated Systems (GAO/T-IMTEC-90-9, Apr. 26, 1990).

Federal Aviation Administration's Advanced Automation System Investment (GAO/T-IMTEC-88-3, Apr. 12, 1988).

Air Traffic Control: FAA's Advanced Automation System Acquisition Strategy Is Risky (GAO/IMTEC-86-24, July 8, 1986).

GAO Questions Key Aspects of FAA's Plans to Acquire the Multi-Billion Dollar Advanced Automation System and Related Programs (GAO/IMTEC-85-11, June 17, 1985).

In order to understand the AAS program, it is essential that we recognize that ATC systems are unique as compared to other types of computer-based systems. The unique character of ATC systems results from two factors:

1. Safety is the primary mission of the system,
2. The transition from an existing ATC system to a new system has to be done without interruption of existing ATC services. We cannot "turn-off" today's ATC system while we upgrade it.

Within that context, how does the AAS Program meet the needs for Terminal Automation in the United States?

The Terminal Advanced Automation System Segment of the AAS program has the following characteristics:

- o A distributed architecture that is scaleable from very large sites to small to medium sites using
- o A relatively open hardware platform using an industry standard local area network and modern commercial computers
- o Software written in a modern higher level language that is transportable to other hardware platforms
- o A state-of-the-art color raster workstation

We believe the TAAS architecture is fundamentally sound and will provide a good platform for the evolution of Terminal ATC systems well into the next century. The scaleability of the system is especially attractive since it ensures commonality amongst the various sites. Commonality in this context translates into lower life cycle cost.

However, there are two major issues that need to be addressed by the FAA and Loral. These are the key functional and performance requirements of the system and the schedule for delivery to the field.

There needs to be firm commitment on the part of the FAA and Loral to achieve closure on requirements. There are still a number of requirements in the TAAS specifications that don't make sense or may in fact be impossible to achieve. For example, the basic up-time (or availability) for TAAS in its most basic level of functionality is specified to be 0.9999999. This means the system may be "down" no more than three seconds a year. Today's terminal automation systems achieve availabilities of 0.99995. However, we solve the problem of down time by having a totally independent back-up system made up of different components (analog radar). It is very unlikely that two independent systems will fail at the same time. For example, there have been no operational failures of the automation system at the New York TRACON since mid-1991. A similar solution, based on a simple back-up ought to be applied to TAAS.

With regard to schedule, it is in the best interests of all users of the system, civilian and military, to implement TAAS as quickly as possible. We believe that the best way to do this is an incremental approach that provides well defined sets of functionality in a series of deliveries (or builds). An incremental approach starts with the functional and performance characteristics of today's terminal system and builds off of that baseline.

Under this approach, we believe the first phase of TAAS implementation can be completed by the end of 1996 or even earlier. This first phase would incorporate the TAAS baseline hardware and only that software needed to provide the performance and functionality available today at existing terminal facilities.

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Additional TAAS features like electronic flight strips, flight plan processing, final approach spacing tool (FAST) and other functions could then be added as software upgrades to the existing TAAS baseline.

The recent TAAS rebaseline proposal from Loral provides an incremental approach to TAAS deliveries. We fully support this approach and strongly recommend that the FAA adopt it.

Unisys believes that the TAAS architecture provides an excellent foundation for the Terminal Automation Systems for the busiest airspace in the world. We believe it is in the best interests of all users to get this system into the field as soon as possible. We urge the FAA and Loral to take the management actions required to achieve this goal.

Thank you again for the opportunity to testify; I am prepared to answer any questions you have.

STATEMENT BY

PHILIP A. ODEEN

PRESIDENT AND CHIEF EXECUTIVE OFFICER

BDM INTERNATIONAL, INC.

BEFORE THE

PUBLIC WORKS AND TRANSPORTATION COMMITTEE

SUBCOMMITTEE ON AVIATION

OF THE

UNITED STATES HOUSE OF REPRESENTATIVES

SECOND SESSION, 103RD CONGRESS

APRIL 13, 1994

WASHINGTON, DC

Mr. Chairman and Members of the Committee, I am Phil Odeen. I am appearing today as President and Chief Executive Officer of BDM International, Inc., an information systems and technology company. I appreciate this opportunity to discuss BDM, our air traffic control (ATC) initiatives, and the recent success we share with the FAA and the DoD in implementing and certifying the first and only next generation terminal ATC system in the FAA inventory.

In expressing my views today, I am drawing on over 30 years of experience in both the public and private sectors. I served in the Pentagon for eleven years, including service as Principal Deputy Assistant Secretary of Defense for Systems Analysis. After leaving the Pentagon, I was Director of Program Analysis for the National Security Council. Since my tenure in government, I have been a Vice President of Wilson Sporting Goods, Managing Partner of the Federal Consulting Practice for Coopers & Lybrand, and now President and CEO of BDM. This experience has given me a broad perspective of both the federal and commercial information system practices.

Also, as Chairman of the so-called "Odeen Panel", which was requested by former Secretary Aspin to look at the FY94-99 Future Years Defense Program, I have seen first hand the significant funding problems that confront the federal government. The budget pressures facing the DoD are not unique to that department. Indeed, the FAA is encountering similar budget pressures as well. There are simply not enough dollars to support government missions and maintain a sound industrial base if we conduct "business as usual" and are unwilling to embrace new and more cost-effective approaches.

Before I discuss the capabilities and benefits of the ATC system that BDM has delivered and the FAA recently certified at the High Desert TRACON in Southern California, I would like to provide a brief overview of BDM and our information systems development philosophy.

BDM

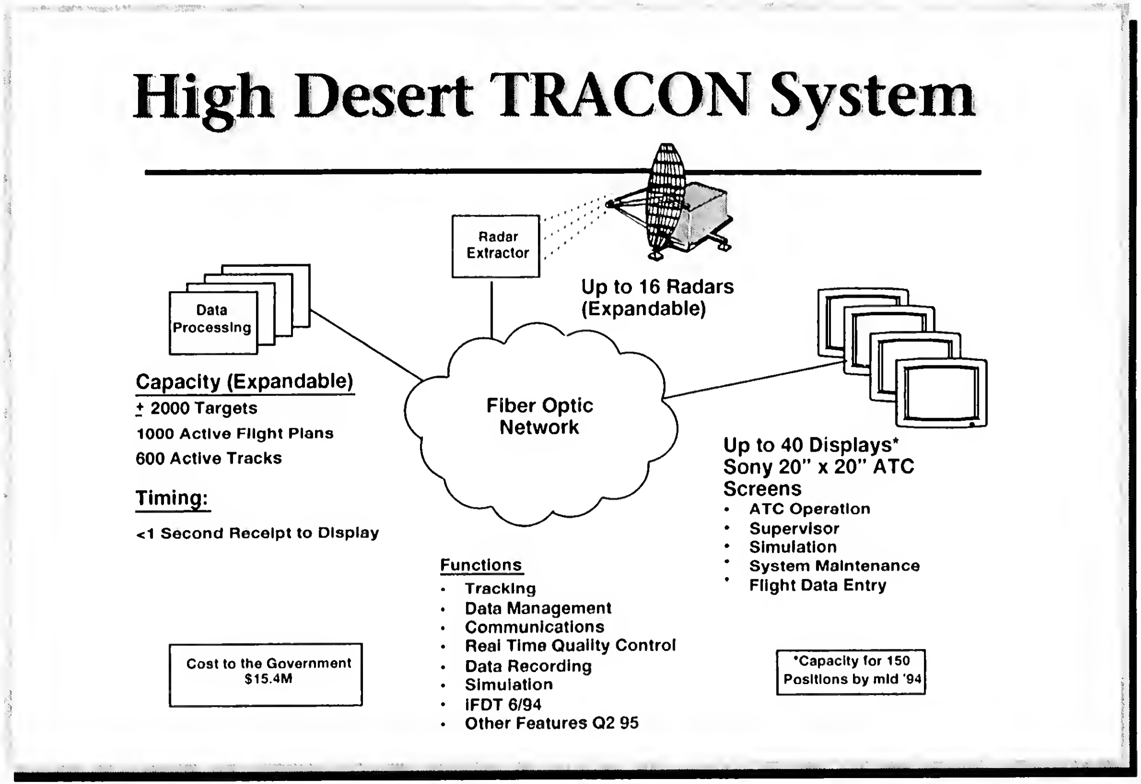
- A new FAA Air Traffic Control automation player with FRESH IDEAS
- With the FAA and the DoD have created a terminal automation SUCCESS story

1562-01

BDM OVERVIEW

BDM International, Inc. (BDM) provides information technology services to public and private sector clients in three principal areas: systems and software integration; computer and technical services; and enterprise management and operations. BDM has approximately 6,500 employees in over 60 locations wordwide. The majority of our employees are engineers, scientists, analysts, and other technical professionals, including many computer software, hardware, and systems experts. Our revenue in 1993 was $558 million, and our vision is to be a $1 billion company by 1997, with a continued focus on information technology and information systems. A major thrust of BDM's efforts over the last several years has been in the development of advanced technology for air and surface transportation systems.

In addition to technology development for ATC systems, our focus on information technology is reflected in several other large systems BDM is completing or has developed. For example, BDM is in the process of completing an Operations Control System for the Washington Metropolitan Area Transit Authority (the METRO subway system). This system will control 256 trains operating simultaneously on 103 miles of track. For the U.S. Air Force, BDM is completing a large-scale information system to automate and manage the Air Force's logistics requirements and spare parts. This $220 million system, known as RDB, tracks all of the Air Force's purchase, maintenance, and repair requirements. Though not fully completed, RDB proved to be of great value during Operation Desert Storm. In 1993, BDM won a $362 million contract with the Department of Defense to integrate 19 computer centers into six "data centers" equipped with modern and more efficient systems. Under this contract, BDM is providing systems and software services, including hardware acquisition, software development, and systems integration. Also, for the Securities and Exchange Commission (SEC) BDM recently developed and installed a $100 million information


High Desert TRACON System
Radar Extractor
Up to 16 Radars (Expandable)
Data Processing
Fiber Optic Network
Capacity (Expandable)
± 2000 Targets
1000 Active Flight Plans
600 Active Tracks
Timing:
<1 Second Receipt to Display
Up to 40 Displays* Sony 20" x 20" ATC Screens
• ATC Operation
• Supervisor
• Simulation
• System Maintenance
• Flight Data Entry
Functions
• Tracking
• Data Management
• Communications
• Real Time Quality Control
• Data Recording
• Simulation
• IFDT 6/94
• Other Features Q2 95
Cost to the Government $15.4M
*Capacity for 150 Positions by mid '94

1562-2

system that enables publicly held companies to submit required financial filings electronically.

BDM's INFORMATION SYSTEMS PHILOSOPHY

BDM has been providing information systems to federal government clients since our founding in 1959. Up until the mid 1980's, BDM's and the industry's information systems philosophy focused on developing custom software as opposed to the utilization and integration of existing off-the-shelf products. Most information systems were "stovepipe solutions" that used proprietary software and adhered to rigid engineering specifications, allowing for little flexibility. In some instances, system functionality was driven by computer hardware capabilities and cost. This approach typically made the client a technology developer in the sense that it had to (1) identify requirements, (2) provide "build to" specifications, (3) develop solutions, (4) contract with industry for the development of the system, and then (5) maintain the entire system (hardware and software) throughout the life cycle. Although correct at the time, this approach usually led to high development costs, significant development risks, rapid hardware and software technology obsolescence, little ability to cost-effectively expand functionality, and significant training and life cycle maintenance costs. The FAA, not unlike other federal agencies, is facing most of these same issues in their current ATC systems. In addition to affordability and cost issues, the FAA realizes that continued deployment of this type of closed technology system limits responsiveness to the user and the ability to easily access other rapidly improving technology.

During the mid 1980's, a revolution in computer hardware, computer software, and telecommunications technologies occurred. Desktop computing increased, new technology was rapidly introduced, and users faced the problem of not being able to implement new and more advanced technology on their computers or interface it to their existing software. This dilemma caused the user community to insist upon hardware and software portability and interoperability. Additionally, government, industry, and

FAA – Driver For Open Systems

Yesterday Technology Developer	Today Technology User
Problem Specific Approach	Enterprise Approach
Static Development	Evolutionary Systems
Custom Software	Commercial Software
Engineering Specifications	Functional and Performance Specifications

1562-03

user groups jointly developed a definition of open systems and defined hardware and software industry standards. Today, open system architecture is defined as software that can be migrated across multiple vendor computer platforms and easily interfaced to other software, and it includes hardware that can be upgraded over time with little software or system impact. Because of this technology revolution and the development of industry standards, today user requirements drive system solutions not hardware or software limitations.

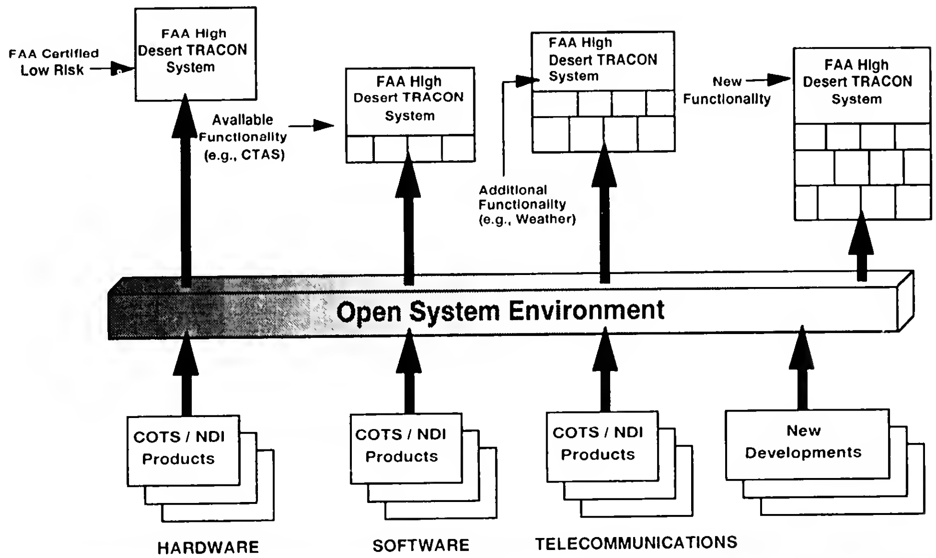
BDM recognized the benefits of this technology revolution and quickly adopted an open system architecture philosophy. We view it as a way to bring clients more flexibility at lower cost, enhance BDM's competitiveness, and enter new markets. This is particularly important for a mid-size company that is attempting to enter new system development markets. In some federal government environments, mid-size companies are not viewed as being viable, large information system integrators. Without a long legacy, some agencies are far more comfortable with significantly larger contractors. Through an open system architecture approach, we believe we can bring computer system innovations, which are typically spawned by small to mid-size companies, to our proposed clients at a cost that can overcome their predisposition to use larger, often less flexible contractors with long client histories.

HIGH DESERT TRACON ATC SYSTEM DEVELOPMENT APPROACH

This open system architecture was utilized by BDM in its recent development of an ATC system for the FAA and the DoD. The FAA and the DoD identified core requirements and additional capabilities and developed functional and performance specifications and acceptance criteria. "How" was BDM's job. The result of this innovative joint effort is the first FAA certified ATC system that shifts the FAA from a technology developer to a technology user.

The FAA and the DoD charged BDM with developing an ATC system that could evolve as commercial hardware, software, and telecommunications technologies

System Evolution



1562-04

evolved. The BDM approach was to develop a modular, open system computer architecture, utilize as much commercially available hardware and software as possible, and strictly adhere to computer industry hardware and software standards. This approach resulted in an ATC system that was developed, integrated, FAA certified, and implemented at three locations for a cost of $15.4 million in under four years - - requirements through commissioning. Two planned upgrades are included in this cost and are on schedule for full implementation.

Reasons for Success

In addition to utilizing a mix of appropriate project management and information system development methodologies, the two basic reasons for the success of this program were that it was project oriented and had a focused objective. This initiative had a small dedicated team of FAA Air Traffic and DoD Range Management individuals, FAA and DoD controllers, and BDM personnel. All participants were involved throughout the total program. The team had localized, on the spot decision making authority, and it was un-encumbered by too many non-essentials. The initiative focused exclusively on delivering an agreed upon set of basic capabilities with the intent of fielding a system in a reasonable amount of time, and, once fielded, one that could easily accommodate system enhancement. This approach was necessary to obtain controller acceptance and enthusiasm as well as maintain program momentum.

Benefits to the FAA and the DoD

The FAA, the DoD, and the BDM Team are very proud of our accomplishments. The High Desert TRACON System is the latest successfully delivered modern terminal ATC System in the FAA. If implemented system-wide, it can provide the following risk reduction benefits.

Reduced Cost Risk

- Affordable Implementation Costs - The development is completed. Implementation is driven by hardware, installation,

Reasons For Success

- The program was project oriented
  - Dedicated personnel, excellent teamwork
    - FAA
    - DOD
    - Developers
  - Un-encumbered by too many non-essentials
  - A small team
  - Localized, on the spot, decision making authority
- Focused objective
  - Constrained to basic capability
  - Program improvement plans
- A mixed, as appropriate, development methodology

1562-05

and adaptation costs. Depending upon the number of controller positions in a facility, the cost of implementing this system ranges from $700,000 to $7 million. BDM has estimated the cost to implement this system in an average terminal environment to be approximately $3 million per facility.

- Reduced Life Cycle Maintenance Costs - The FAA can take advantage of new hardware and software maintenance approaches. System hardware can be maintained through a centralized FAA maintenance organization or third party maintenance providers, and hardware can be upgraded every three to five years for less than the cost of maintaining the current hardware. Most of the system software can be maintained through a central maintenance organization and distributed via standard telecommunications lines. As a result, significant on site maintenance cost savings for hardware and software can be realized through this approach.

- Reduced Life Cycle Equipment Costs - The system can evolve incrementally with technology. The FAA can buy what it needs, and hardware costs will be driven by individual facility air traffic requirements. While it is essential to keep the software baseline consistent throughout the National Airspace System, hardware can be sized by facility to meet individual requirements and upgraded by facility to meet expected air traffic increases.

- Reduced Long-Term Development Costs - FAA research and development advancements, BDM pre-planned product improvements, and other industry technologies can be cost-effectively integrated into this system. If developed under

Benefits To The FAA And The DOD

Cost	Technical	Schedule
• Affordable implementation costs	• FAA certified	• Installed within six months
• Reduced life cycle maintenance costs	• Meets or exceeds terminal requirements	• Accelerated field deployment by one year
• Reduced life cycle equipment costs	• Ability to introduce earlier cost saving benefits to the airlines	• Meets DoD deployment schedules
• Reduced long term development costs	• Accepted by the users	
• Reduced training costs		

1562-03

open system standards, technology integration is not a major issue. This flexibility enables the FAA to direct its scarce resources -- people, time, and money -- to only the small, unmet developmental needs of ATC modernization as opposed to complete system design and development.

- Reduced Training Costs - The significant commercial off-the-shelf content of this system enables the FAA to extensively utilize cost-effective vendor provided training. Also, the system user interface was implemented in a manner that is consistent with standard display symbology currently in use by the FAA. All vendor supplied training classes have been approved and assigned course numbers by the FAA Academy.

Reduced Technical Risk

- FAA Certified - The system has been operational since June of 1993 and was certified in January of 1994. Under the guidance of the FAA Headquarters and the FAA's Technical Center, the system was tested and fully commissioned.

- Meets or Exceeds Existing Terminal Requirements - The system can handle both the small TRACONs and the large Metroplex Control Facilities (MCF). It provides baseline functionality and brings the controller extended capability. Development is essentially completed, and all software and documentation are owned by the federal government. With the addition of four functions, which will delivered later this year and early next year, the major developmental hurdles will have been met.

High Desert TRACON System

Where

- FAA small to Metroplex Control Facilities
- DoD facilities

Why

- Affordable
- Manageable
- It works today

• Ability to Introduce Earlier Cost Saving Benefits to the Airlines - A 1993 Volpe National Transportation System Center study showed that the airlines can achieve significant dollar savings by implementing enhanced ATC functionality in the terminal environment. Currently, the FAA has several controller productivity/airline cost savings projects under development or undergoing limited deployment. One particular FAA program highlighted in the study, the Center-TRACON Automation System (CTAS), showed that the airlines can save $1.9 million per year per terminal facility on fuel savings due to the ability to expedite aircraft arrivals and departures. Adding this functionality to just the top 50 TRACONs equates to airline savings of almost $100 million per year. Current terminal ATC systems do not easily or cost-effectively accommodate these new features. However, the High Desert TRACON system can readily include CTAS because the functionality is developed under an open system architecture. As a result, airline fuel savings benefits and increased air traffic capacity can be accelerated with earlier CTAS implementation.

• Accepted By the Users - The system enjoys enthusiastic FAA Western Region, DoD range management, controller, and union support. This is particularly important because the San Diego TRACON is scheduled for the first implementation of a terminal ATC system under the AAS contract. Existing Western Region acceptance of a system -- in this case the High Desert TRACON system -- can greatly assist deployment.

Reduced Schedule Risk

- Installed within Six Months - The system can be implemented, adapted to particular environments, and installed within six months. BDM would recommend installing the system in a "shadow (not intrusive) mode" at several locations to further test the system for nationwide usage. Also, since the system has been operational in an FAA environment since June of 1993, we believe the FAA Technical Center's testing schedule can be shortened.
- Accelerated Field Deployment by One Year - The schedule calls for the first implementation of a reduced capability TAAS in San Diego in October of 1996. By utilizing the High Desert TRACON system with full terminal functionality, we believe the schedule can be accelerated by one year.
- Meets DoD Deployment Schedule - The DoD funding for the automation of 50 DoD terminal facilities is dependent upon TAAS meeting the FAA's operational test and evaluation date of October 1996. The High Desert TRACON system is ready today and will allow the DoD to move forward expeditiously.

The FAA, the DoD, and the BDM Team have created a real success story and a win-win environment for the FAA, the DoD, and the American taxpayer. We are hopeful that the High Desert TRACON system will be adopted by the FAA for system-wide implementation because it effectively addresses the FAA's cost, technical, and schedule issues. **IT IS AFFORDABLE, MANAGEABLE, AND IT WORKS TODAY.** BDM is ready and prepared to assist the FAA in this important endeavor.

ATTACHMENT

THE HIGH DESERT TRACON SYSTEM DETAILS

BDM HIGH DESERT TRACON ATC SYSTEM HISTORY

BDM has been involved in related ATC technology programs since 1979. Until 1987, most of BDM's ATC involvement was in operational test and evaluation activities and system development for DoD classified systems. Starting in 1987, BDM began working with the FAA and the DoD at Edwards Air Forc., ..se (AFB) in the civil aviation and military range management environment. Edwards AFB, located in Southern California, is equal to about one third the land mass of California and is one of the DoD's six major range and test facilities. This airspace is controlled by one Navy and one Air Force range management complex and the FAA's High Desert TRACON. The High Desert TRACON is a FAA Level IV TRACON staffed by FAA controllers.

During 1987, BDM was commissioned to develop a system to interface with the ten Edwards AFB long and short-range radars in order to facilitate the most effective use of airspace by civilian and military operations. This project was successfully completed and subsequently led to the development of the preliminary requirements for a new FAA TRACON system, two DoD range management systems, and a DoD classified ATC system. In mid-1988, BDM was fully funded to develop the DoD classified ATC system. The system was developed, implemented, and commissioned in January of 1991 for approximately $5 million in under 30 months. It was the first operational system in the world that utilized the Sony large display monitor, commercial off-the-shelf graphics drivers, and, most importantly, an open system computer architecture. In 1990, the FAA and the DoD contracted with BDM to utilize the classified

ATC system as a baseline and develop a complete FAA certifiable ATC system and two range management systems. The systems at the FAA High Desert TRACON, the Air Force Flight Test Center, and the China Lake Navy facility were operational in June of 1993 and were fully commissioned in January of 1994.

SYSTEM COMPONENTS

The BDM developed software, which the FAA and the DoD jointly own, consists of modules to (1) read radar data directly from radar data lines, (2) process radar data, (3) apply tracking algorithms to radar data, (4) interface to a relational database management system for flight plan processing, and (5) provide a user interface for ATC system maintenance, training, and simulation.

The 230,000 lines of BDM application software was written in C language, which was chosen because it has broad industry acceptance and usage, and because it has more productivity enhancement tools available. The development team used structured design analysis and design tools. Use of these formalized software development techniques provided a solid design and complete software modularity.

The system design uses a dual-redundant architecture to eliminate single point failures and to increase overall system availability. The architecture is based on the use of client/server technology for distributed computing. Software is divided into logical pieces that can run on separate processors, distributing and balancing the load. The individual processors are networked together by a redundant fiber optic network. These major processors are:

- Central Computer System - Functionally similar to the AAS back-end processors.
- Graphic Display Processor - Functionally similar to the AAS common console.
- Radar Data Extractors - Functionally similar to the AAS PAMRI (Peripheral Adapter Module Replacement Item).

To reduce time to final delivery, the FAA, the DoD, and the BDM Team chose to use commercial off-the-shelf hardware and software as part of the solution. The joint government and industry team integrated the following components with the ATC software:

- Commercial Computer Workstations - equivalent to the AAS-IBM processors;
- UNIX Operating System - equivalent to the AAS IBM UNIX based AIX Operating System;
- X-Windows Graphical User Interface (GUI) Software;
- Sony High Resolution Display Monitor - same as AAS;
- Tech-Source Display Generator used to drive the Sony Display;
- Emerald Electro-Static Touch Panels for quick access to user functions;
- CTI Trackball for user input; and
- UNIFY Relational Database;

SYSTEM CHARACTERISTICS

- Radar Data Extraction - The High Desert TRACON System can process radar data from up to 16 long-range and short-range radars. It is expandable to handle up to 72 radar inputs and currently processes data from a mixture of 10 enroute and terminal radars.
- Data Processing - Due to the flexibility and expandability of the system, the number of aircraft that can be tracked is driven by the size of the computers. Larger computers mean more processing capability. The system was designed to handle 2,000 targets, 1,000 active flight plans, and 600 active tracks. Larger capacities have been demonstrated, and this expandability enables the system to handle even the largest FAA terminal environments.

- Display - The system will currently accommodate up to 40 controller workstations. By mid-1994, BDM will have completed an internal research and development program that will allow the system architecture to accommodate up to 150 controller positions. Again, this exceeds any present FAA terminal requirements. The workstations can be software adapted to system maintenance functions, supervisory activities, simulation and training exercises, and flight data entry.
- Functions - The major ATC functions are all included in this system. It incorporates tracking, data management, communications, real time quality control, data recording, and simulation. Additional functionality of interfacility data transfer will be added by mid-1994, with mode C intruder alert, minimum safe altitude warning, and conflict alert expected to be completed by April of 1995.
- Additional Capabilities - With the previously mentioned functions, the system meets or exceeds current FAA terminal requirements. It also incorporates additional controller productivity enhancing capabilities such as: color; better track prediction; enhanced simulation and training functions; the ability to accommodate the display of additional information; enhanced system maintenance capabilities; and the ability to process multiple terminal and enroute radars.

SYSTEM COST

The FAA High Desert TRACON system, the Air Force Flight Test Center system, and the Navy China Lake system -- developed by BDM -- cost a total of $15.4 million. This is from requirements through commissioning and includes all training and documentation. The FAA committed $4.4 million and the DoD contributed $11 million to the development and implementation of these systems.

The $15.4 cost for the system includes the following components:

- Hardware: three complete ATC systems including 15 central computer systems, 31 graphic display processors, three radar data extractors, fiber optic local area networks, and sparing
- Software: functional ATC applications, commercial operating system, and data base manager
- Training and User Guides
- Documentation: tailored 2167a plus FAA order and standards
- Four Additional Functions: to be implemented over the next year

C. Dale Reis - Raytheon Company

AAS Program Congressional Testimony

Introduction

Good morning. My name is Dale Reis. I'm a Vice President of Raytheon Company and the General Manager of Raytheon's Equipment Division which is responsible for a major portion of the FAA's Advanced Automation System. The Equipment Division also leads other FAA and international ATC activities for Raytheon. I welcome this opportunity to share some of Raytheon's perspectives on the state of technology in air traffic control automation systems based on our almost 40 years of experience in the field. In addition to describing our involvement in the AAS program, I will review the evolution of systems and requirements leading up to AAS and recent changes that are likely to alter the direction of the program.

Raytheon is a major, diverse, international technology-based company which ranks as the seventh largest contractor to the Department of Defense. Our Beech Aircraft subsidiary is a leading supplier to the general aviation industry. We are also one of the few systems integrators of turnkey civil air traffic control systems in the world. We serve both domestic and international markets. Raytheon's air traffic control systems capability grew out of our radar experience in World War II and today we have ongoing FAA and international ATC contracts with an aggregate value approaching $2 billion. A major part of the FAA's air traffic control automation system operating today was designed, built and installed by Raytheon in the 1970's and 80's. Outside the United States there are 34 countries using Raytheon ATC systems. We have current contracts with Canada, Germany, Norway, India, Netherlands and Oman for our equipment.

Much has changed since the inception of AAS in the early 1980's that should clearly affect the new direction of the program. Traffic increases at half the projected rates, consolidation concepts that have diminished, facility backup that has now been minimized, system availabilities of .9999999 that may no longer be required; all major factors that drove the original AAS design. Technology changes have been equally significant: open system architectures, satellite-based surveillance, micro-computers that exceed the power of yesterday's mainframes, transportable software approaches that reduce the development and integration risks. These are available technologies that were simply not available at the time of FAA conception of the National Air Space (NAS plan) but today offer immediate solutions to many of the AAS problems.

We all recognize that the AAS program is at a difficult stage. The promised benefits to the air traffic controllers, airline and general aviation community and general public appear to be in jeopardy. However, I believe there are some immediate actions that can be taken to correct the course of AAS and still offer early cost savings, increased safety and operational benefits. In this regard, I will discuss Raytheon's recommended road map for AAS in greater detail later in my testimony but let me quickly summarize.

We have defined two alternative concepts. The first approach would use much of the present Initial Sector Suite System (ISSS) and then introduce Non-Development Item (NDI) solutions for early field deliveries to address serious obsolescence issues with the existing controller workstations (Plan View Displays [PVDs]) and the backup channel

(Enhanced-Direct Access Radar Channel [E-DARC]). Plan View Displays (PVDs) would be replaced with the new AAS common consoles upgraded to a demonstrated and proven multi-channel display controller, referred to as DCX. In addition, it would allow the new common consoles to interface to both the existing Enhanced-Direct Access Radar Channel (E-DARC) and National Air Space (NAS) host. It would also provide X-Windows to enhance future software upgrades. E-DARC would be replaced with a proven and modern automation system based on an open system architecture such as Raytheon's fielded *AutoTrac* product. This would provide a redundant backup channel for both Radar Data Processing and Flight Data Processing with modern computers for continuous operation. Finally, we propose a transition to Area Control Computer Complex (ACCC) and the addition of Automated En-Route Air Traffic Control (AERA) functions by adding a second open architecture string to allow the replacement of the AAS/ISSS equipment. This approach was first briefed to the FAA and IBM in mid-1993 and to the Center for Naval Analyses (CNA) in February 1994.

Later, in response to the CNA's request for a total system solution, we prepared a second Initial Sector Suite System (ISSS) alternative. This alternative is also based on the principle of Non-Developmental Items (NDI). As in the first alternative, it would replace the existing Plan View Displays (PVDs) with common consoles using the DCX display controller. This alternative would also replace the current Initial Sector Suite System (ISSS) architecture with a fully functional dual channel architecture based on an NDI open system to assure system availability and transition to a fully open system architecture for the future. This alternative would require enhancements to address FAA specific requirements; we have estimated this to represent less than 12% of our existing automation software. In addition to addressing obsolescence issues and offering X-Windows, this approach would allow the low risk integration and earlier introduction of third party software applications such as Automated En-Route Air Traffic Control (AERA), Center TRACON Automation System (CTAS) and improved weather analysis. These are critical to bringing early cost benefits to the airlines and flying public. This approach is the correct technical answer. However, we are not in a position to assess the status of the AAS/ISSS (Advanced Automation System/Initial Sector Suite System) software. Assuming this software is on a stable and predictable path, we support the incremental approach of the first alternative.

Automation is the heart of any ATC system. It is networked to all ground and airspace control elements including radars, navaids, voice communications, satellites, weather, aircraft, remote facilities and others. Secure communications between these elements is vital. Raytheon not only produces the automation system and other elements such as ground and air surveillance radars but has the proven capability to integrate them with communication links into a fail-safe total system. We have integrated communication networks into many of the ATC systems that we have delivered. For example, the system we are delivering to India is a total turnkey project that ties together every ATC hardware and software element including many remote sites, multiple sensors and our own Mode-S data link.

There has been a significant change in the development of ATC automation systems since AAS started. The rest of the ATC world began purchasing systems in the 1980's based on the Non-Developmental Item (NDI) approach. By the end of the 1980's almost all international ATC tenders were based on the principles of NDI and open system architecture. The cost, schedule and risk savings are demonstrable. For example, we were awarded a contract in early 1991 to provide an NDI open system to

Norway that offers similar capabilities to those required for the Initial Sector Suite System (ISSS) - it will be controlling air traffic by early 1995; we will meet that schedule. NDI and open systems are now the worldwide preferred approach.

Let me give you some specifics on Raytheon's ATC background and experience with the FAA. I believe it will illustrate our long term commitment to the United States air traffic control community and advancement of technology. It will also provide testimony to the enduring quality of our original designs, all of which have operated over twenty to thirty years without substantial re-design or upgrade.

Raytheon's Air Traffic Control Experience

Raytheon prides itself on its technical leadership and meeting contractual commitments. We are a systems engineering company and have established rigorous hardware and software development processes and procedures to assure our programs are kept under control. Our track record with the FAA and other ATC customers speaks well for our disciplined systems engineering and program management.

Raytheon has been a systems engineering and technology leader in ATC for over 40 years. We have provided systems to the FAA that include ARSR-1 and 2 radars in the 1950's, Radar Bright Display Equipment and 1300 enroute Plan View Displays (PVDs) in the 1960's, the primary backup Direct Access Radar Channel (DARC) in the 1970's and the Enhanced DARC (E-DARC) and Terminal Doppler Weather Radar (TDWR) in the 1980's. We also provided major systems to Germany and Canada.

Our German system has been controlling traffic for over 13 years without a system outage. Systems being provided under the mid-1980 Canadian contracts provide a nation-wide network of radars and displays. The dual channel automation systems were designed with common software and hardware that were sized for enroute, terminal and tower applications.

We are proud of our performance on Terminal Doppler Weather Radar (TDWR) and believe it should serve as a model for other FAA programs; systems were delivered six months ahead of schedule with no increase in contract price. In fact, we received the maximum incentive fee for our achievement. A critical factor to success on this program was strong program management and systems engineering on behalf of both Raytheon and the FAA.

In 1956, the Civil Aviation Agency (CAA), after experimenting with using military radars for air traffic control, awarded a contract to Raytheon for 23 ARSR-1 long range radars. This was the first step in establishing continuous radar coverage throughout the continental United States. Between 1957 and 1960, an additional 10 higher powered radars, ARSR-2's, were ordered. By 1964, the nation's airspace was almost entirely covered by Raytheon long range radars.

The early radar controllers' displays could not store the screen image from sweep to sweep except in the screen phosphor afterglow. This meant operations rooms had to be almost totally dark so controllers could see the targets in their sectors to maintain aircraft separation. Raytheon had a solution to the phosphor fade problem with a device called a scan converter. In 1961, the Civil Aviation Agency (CAA) awarded Raytheon a contract for Radar Bright Display Equipment systems, designated RBDE-5, to be installed in all of the 20 continental U.S. enroute centers. These systems employed Raytheon dual-gun scan converters which allowed the approximately 700 controller consoles to be viewed in normal room lighting. So, by 1966, the entire nation benefited by Raytheon air traffic control radars feeding Raytheon bright display systems installed and operating at every enroute center.

After completing the Radar Bright Display Equipment installation in 1965, Raytheon was awarded a contract for the Computer Display Channel (CDC) program. This major step forward connected the first Raytheon computer driven displays using Raytheon software to IBM mainframe computers to provide controllers at every enroute center with on-screen digital target images and supporting alphanumerics. We produced approximately 1300 Plan View Displays (PVDs) for the CDC program. These units, shipped in the early to mid 1970's, are still used today to control air traffic at all 20 enroute continental U.S. centers plus Alaska and Hawaii.

Raytheon's next major FAA program award was for the Direct Access Radar Channel (DARC) in 1976. DARC was one of the first distributed computer processing systems used in a large system application anywhere. Its' function was to provide backup to the IBM mainframe radar processors at the 20 enroute centers. DARC is still in operation today providing the same backup function to the recently rehosted enroute mainframes.

In the 1980's Raytheon continued to win major FAA system awards. We installed enhancements to the Direct Access Radar Channel (DARC) system (known as E-DARC) and won the Terminal Doppler Weather Radar program which is providing radars to detect wind shear activity in the vicinity of 47 airports around the country. We are proud of our performance on TDWR and believe it should serve as a model for other FAA programs; systems were delivered six months ahead of schedule with no increase in contract price. In fact, we received the maximum incentive fee for our achievement. A critical factor to success on this program was strong program management and systems engineering on behalf of both Raytheon and the FAA. Specifications were frozen early in the program and only critical and well controlled changes were permitted.

Also, in the 80's our Raytheon Service Company won the Technical Services and Support Contract to provide technical services to practically every FAA facility around the country. We also won, with IBM as prime, the development and production awards for the controller display consoles for the entire AAS program including the tower, terminal and enroute segments.

We also provided major systems to international customers in Germany and Canada. In 1977 Raytheon contracted with the West German civil aviation authority to replace all of the enroute, terminal and tower systems throughout that country with modern, reliable systems. Since the first operational system was installed in West Germany in 1980, over 13 years ago, there has never been a system outage caused by Raytheon equipment or software. This excellent performance record was attributable to many factors, not the least of which was strong systems engineering throughout all phases of the program and the use of a triply redundant processing channel architecture. The Germans clearly understood the value of redundancy and backup channels.

In the same mid-1980's time frame that AAS was awarded, we won two major contracts with Transport Canada to supply and integrate new automation and radar systems that are providing nationwide coverage for that country. 24 solid state primary radars, 41 monopulse secondary radars, 7 enroute centers, 2 terminal control systems and 23 tower systems were provided under this modernization program. The dual channel automation systems were designed with common software and hardware modules that were appropriately sized for enroute, terminal and tower applications. This resulted in significant cost savings due to common logistics, training and support. The majority of the radar and automation sites have been commissioned and are operational. Final commissioning of the last sites will occur this summer.

While I will focus on automation systems today, I should note that throughout this same time frame we have been technology leaders in the ATC surveillance radar business. Our U.S. operation and Raytheon Canada Limited and Cossor Electronics Limited of the UK (both Equipment Division subsidiaries) have delivered over 150 primary, 126 precision approach and 400 secondary surveillance radars throughout the world. Our current generation of all solid state radars represent the latest state-of-the-art.

Raytheon prides itself on its technical leadership and meeting contractual commitments. We are a systems engineering company and have established rigorous hardware and software development processes and procedures to assure our programs are kept under control. Our track record with the FAA and other ATC customers speaks well for our disciplined systems engineering and program management. Our experience has shown that failure to follow time-proven rules will normally have a disastrous consequence. For example, lack of signed-off specifications before the start of design and production and rigid adherence to those specifications is a sure formula for overruns. Also, early deliveries of systems to the field prior to completion of operational and evaluation testing at the factory portends a very long history of costly retrofits and contractual disputes.

Raytheon's Involvement and Track Record on the Advanced Automation System

Raytheon is responsible for the common consoles, tower position consoles and Enhanced Direct Access Radar Channel (E-DARC) Systems Interface on AAS. We have met every contractual obligation and milestone, earning almost the maximum of the available award fee for delivery incentives. The measured field test reliability of our AAS equipment has exceeded the original Mean Time Between Failure (MTBF) requirements by a factor of 17. Over the course of the program, we have made substantial private investments to evolve our display controller from its initial 11-board design to a single board design that is compatible with open system architectures.

Our involvement with the FAA continues on the AAS program. Raytheon and IBM Federal Systems Company teamed in the early 80's to win one of the two design competition phase awards. Our team continued into the Acquisition Phase (AP) of the program after the Full Scale Development (FSD) award in late 1988.

The responsibilities within the team were divided quite similarly to the division this same team had on the existing enroute National Air Space system with the exception that IBM chose to develop the display software for AAS. IBM, as prime, was responsible for the system architecture, central and distributed processors, communication network and the software. Raytheon was responsible for the development and production of the common consoles, tower position consoles and the Enhanced-Direct Access Radar Channel (E-DARC) System Interface.

There are approximately 5000 common consoles required on the base contract with an additional 2500 specified as options. The common console is the primary interface between the air traffic controller and the automation system. It has been designed to accommodate both the system performance and controller needs well into the next century. There are 955 Tower Position Consoles (TPC) in the base contract, with approximately 1300 optional TPC's. These consoles meet the special requirements within the airport control tower; i.e., full sunlight readability while using common hardware and software elements from the enroute and terminal common consoles.

Raytheon's full scale development activity on AAS started in 1988 at the AP program award and was completed on schedule in 1990. First article production units and qualification testing were completed on schedule in 1991. 73 preproduction common consoles with Main Display Controllers were delivered to IBM on schedule. A production lot of 350 units for other customers was released in December 1991. Design and development work on AAS associated with the tower position consoles and Enhanced-Direct Access Radar Channel (E-DARC) System Interface (ESI) was completed on schedule.

The equipment developed by Raytheon has met all the technical requirements imposed on AAS and has passed all the rigorous formal FAA testing. In addition, the measured field test reliability of these equipments over the past several years of use significantly exceeded the requirements by a factor of 17.

As the AAS program evolved, Raytheon has continued to support IBM and the FAA by evolving the Raytheon products to take advantage of technological advances and to meet changing program requirements. For example, our original 11-board high performance 2K x 2K display controller, the first of its kind back in 1984, has gone through several design generations to reach the three board Main Display Controller (MDC) configuration we are providing under AAS. We are now offering the FAA and international customers a single board configuration with manyfold increases in performance and reliability. This latest product, named DCX, has also evolved to remain compatible with the current design while providing features for use in modern open systems, a subject I will discuss in greater detail. Most of these upgrades were the result of significant Raytheon investments.

Let me point out that this MDC is an excellent example of using Non-Developmental Items (NDI) to reduce costs and risks. Our original design incorporated the best commercially available software and hardware technology that we licensed from a leading workstation company, Silicon Graphics. With this Non-Developmental Item (NDI) license approach, we were able to save millions of investment funds and quickly bring a product to market.

As a result of program slips, Raytheon has replanned the production phase of our products to match the changing AAS top-level schedules for software design completion, development (DT&E) and operational (OT&E) testing. Raytheon has continued to perform all the AAS tasks assigned, including early production units, on schedule and within the contractual budgets. Raytheon has continued to project a favorable cost variance at the completion of this program. All the equipments have met the performance requirements specified and in many instances exceeded those requirements. As testimony to this program performance, Raytheon has been awarded near maximum of the available award fee on our subcontract for delivery incentives.

Raytheon's View of Requirements for FAA's Future Automation System

Original provisions for the AAS should be reapplied to the redirected program: "avoid special purpose design"; "use common hardware"; "operationally available without interruption"; and "complete FAA Technical Center Testing before site installation". Key System Level Specification (SLS) requirements (systems availability, consolidation of terminal/enroute and facility backup) that drove system sizing and architecture are no longer appropriate and should be revised.

Today's FAA Air Traffic Control System, which integrates enroute, terminal, and tower control functions, is the largest real-time control system in the world. This system has evolved over many years and Raytheon has contributed to this evolution in areas of radars, displays, and automation systems.

The need for replacing or upgrading this system was established in the late 1970's and early 1980's. The foundation for the new system was to be provided by the Advanced Automation System Program. Many of the original provisions for the AAS systems sound familiar and are still valid; "avoid special purpose design", "use common hardware", "operationally available without interruption", "complete FAA Technical Center testing fore site installation". But somehow, many of these concepts got lost along the way. ɔwever, it is not too late to still capture these concepts and make them a part of the AAS stem. In a subsequent section on our recommended road map for AAS, I will also provide plan for taking advantage of the AAS sunk investments and other available Commercial f-The-Shelf (COTS)/Non-Developmental Item (NDI) technologies to achieve these original ɔals.

The top level technical objectives that were established for AAS were what one ould expect for any large system implementation, namely:

- increased system availability,
- orderly and safe transition,
- higher performance,
- minimum risk (schedule, cost and technical), and
- easily upgradable.

These requirements were translated to a System Level Specification (SLS) which was ıe of the guiding documents for the Design Competition Phase of the program in 1983. ıree key requirements in the SLS included: 1) a system availability that allowed for a down ne of only 3 seconds/year; 2) consolidation of the terminal control function into the ıroute facilities, and; 3) the ability for an enroute facility to backup portions of the airspace an adjacent enroute facility.

As the development of the AAS system has progressed, the perspective on these three ɛy requirements, all of which have a significant impact on the system design, has changed. is always easier to look back. No one could have foreseen all of these changes but it is ıportant now to react to them and select a new direction that reflects today's expanded ıowledge. In the area of system availability, concerns about methods of software upgrade computer complexes has led to the need (not yet directed into the program) for a dual-ıannel system. This requirement is further motivated by the need to provide continuous ɔerations even during periods of system upgrades. The continuous operations requirement, hich has received much attention since early last year, is essential to the transition process FAA Air Traffic Control progresses to higher levels of automation.

The requirement for consolidation of terminal control into enroute centers was ɛtablished for technical and cost reasons. However, reliability concerns relative to ıtastrophic failures resulted in the deletion of this requirement in 1993. In addition, without ɔnsolidation, terminal regions will continue to have their own facilities. This has led to a ıange in the facility backup requirement.

The original requirements, consolidation combined with facility backup, caused ıother key requirement, system track load, to increase by a factor of three. System track ɔad requirements were further increased in the System Level Specification (SLS) by rojecting that the number of aircraft handled would grow at a rate of 4% per year from 981. In fact, the number of Instrumented Flight Rule (IFR) aircraft handled (which is irectly related to track load) has increased at the lower rate of 2% per year. These higher vel requirements in turn drove the design toward extraordinary specifications for each ıcility, such as 8500 flight plans, 60 radar inputs, 5000 aircraft tracks and support of 430 ɔmmon consoles. The net effect of these changes, especially the lack of consolidation is ıat the original system load requirements are no longer appropriate and need to be revised.

One of the difficult requirements that resulted in Initial Sector Suite System (ISSS) omplexity is electronic flight strips. Incorporating this as part of the initial transition has roven to be too large a step. A more conservative approach is one that retains the paper ight strips while providing an evolutionary path toward electronic flight strips. We have sed this approach with our international customers, providing them electronic flight strips

/ith the backup insurance of flight strip printers.

In addition to the above major requirement changes, technology has changed ignificantly since 1983 when many of the AAS design decisions were made. Two key items hat bear directly on the current evaluation of the AAS program are open system rchitectures and its related X-Windows technology. The X-Windows technology, in ›articular, is essential since it allows third party software to be integrated into the Advanced \utomation System with minimal effort and cost.

<u>)pen System Architecture Offers a Solution to ATC Automation Ills</u>

The timing of the AAS program, unfortunately, just missed the open system echnology window. Open system architecture is available and is the solution for AAS. It ›rovides the path for future growth. The international ATC community has uniformly nade it a requirement for their system purchases over the last eight years. The benefits 'iave been great - lower acquisition and maintenance costs, higher reliability, lower risk, ;horter schedules, unlimited growth and ease of software integration and enhancement.

Program risk can be significantly reduced by the use of field proven Non-Developmental Item (NDI) application software. Fully functional Non-Developmental 'tem (NDI) ATC automation open systems exist today that can meet most of the FAA's ıeeds. Raytheon has developed our system with over 750,000 lines of application ;oftware code that represents an investment of approximately $200 million made by the German, Canadian, and Spanish governments, as well as Raytheon and Ceselsa.

A stable, predictable and validated software development process is a vital ingredient to any software program. Raytheon has made substantial investments to restructure its process in accordance with Carnegie-Mellon's Software Engineering Initiative (SEI) guidelines. Our process is rated in the top 4% of all U.S. companies by independent auditors.

Raytheon has sold more open ATC systems than any other supplier - Norway, the Netherlands, India, Germany, and Oman. The first application, Norway, will be commissioned in early 1995, ahead of those elsewhere such as Finland in 1996 and Canada in 1997.

X-Windows has become an important element of open systems. Versus the point design as currently exists on AAS, it provides for the easy and low risk integration of independently developed third party software such as Oceanic, Automated En-Route Air Traffic Control (AERA), Center TRACON Automation System (CTAS) and Real Time Weather Processor (RTWP). The early introduction of X to AAS will assure earlier realization of these features and the associated savings promised to the airlines and flying public. Raytheon has invested in X-compatible products and has offered them to the FAA and IBM.

One of the significant technology changes in the world of processing and computers was the advent of open system architectures. Driven by industry consortia like the Open System Foundation that were formed in the 1980's, commercial products based on common standards and non-proprietary interfaces and operating systems became the norm by the late 1980's. In the international ATC community, open systems have been openly embraced and are a condition on every tender. The associated schedule and cost savings are astounding compared to previous generation architectures.

These open systems offer significant advantages to all users including the air traffic ›ntrol community. Future expansion to accommodate increased system capacity and nctions is guaranteed with each new generation of state-of-the-art Commercial Off-The-ıelf (COTS) products. Early deliveries measured in months rather than years are :monstrable. Project risks are substantially reduced. Logistics, maintenance and reliability e enhanced with commensurate reductions in investment and life cycle costs. Perhaps ost significant, application software is easily portable to new hardware/software platforms.

Similar to the current AAS architecture under development, Raytheon's pre-1990's TC automation systems featured proprietary designs and interfaces that limited the exibility for future growth and enhancement. To a large degree, the timing of the AAS esign Competition and Acquisition contracts from 1983 - 1988 just missed the open system chnology window. The effect was a point design closed architecture that failed to benefit om all of the positive industry developments in open systems. As a result, the system is ifficult to add functionality to and does not provide an easy interface to third party oftware. None of this could have been foreseen by the people who defined the original rogram requirements.

By 1990, open systems became a widely accepted reality. Recognizing the verriding merits, Raytheon has made substantial investments over the last few years to onvert to this modern architecture. Aside from the overall system framework (standard iterfaces and operating software) itself, proven application software written in a modern nguage is the most essential ingredient to a low risk open system implementation. A omprehensive ATC automation system typically features over one million lines of pplication code to perform the basic radar data and flight data processing functions. In ddition, integration of these functions further increases the software complexity. Without a olid integrated software baseline, program risks will be high, increasing in direct proportion o the amount of new software development required. One of the overriding issues affecting AS has been the use of rehosted 20-year old software for the Initial Sector Suite System ISSS) host. In order to transition to Area Control Computer Complex (ACCC) under the urrent program, all of this host software must be rewritten in a modern language to achieve upportability and to allow the addition of new automation features. But there is a better pproach that eliminates the need for this costly software rewrite; let me tell you about the DI software and open system architecture alternative.

With the advantage of hindsight and timing, Raytheon mitigated this risk in our open ystem product line by modernizing software that had been recently commissioned in major TC operations. Our modern radar data processing software is based on Raytheon's systems volved and proven in the U.S. (Direct Access Radar Control [DARC]), Germany (Display of xtracted Radar Data [DERD]) and Canada (Radar Modernization Program [RAMP]) over he last fifteen years. Similarly, our Flight Data Processing (FDP) software is based on the panish system commissioned in Madrid in 1991 by our partner, Ceselsa. This system, vritten in a computer language known as Ada, was rated by Europe's civil aviation tandards authority, Eurocontrol, as one of the most comprehensive FDPs in the world. The ıon-trivial task of integrating the Ceselsa Flight Data Processing (FDP) and Raytheon Radar Data Processing (RDP) software began in early 1991 and was successfully completed in late 1993. This integrated system is designed to control air traffic for enroute, tower and terminal ıpplications using common hardware and software. The over 750,000 lines of application oftware code represent a value of approximately $200 million from German, Canadian, Spanish, Raytheon and Ceselsa investments.

Another vital ingredient to the success of complex software development and ntegration programs like AAS is a stable and validated software development process. Motivated by our own software problems in the mid-1980's, Raytheon made substantial ınvestments to restructure our entire process in adherence with Carnegie-Mellon's Software ıgineering Initiative (SEI) guidelines. The result is a software process that is stable, edictable and rated in the top 4% of all U.S. companies by independent auditors. We have lvocated that SEI ratings become a significant evaluation criteria in future FAA ocurements.

The result of our efforts is a low cost, Non-Developmental Item (NDI), ATC ıtomation system that can meet the majority of civil aviation user requirements throughout e world with few modifications. Our experience has shown that over 90 - 95 percent of ır application code is directly transferable to each customer. We are now able to commit ıd to make delivery schedules in the order of 6 - 12 months; unheard of with earlier eneration ATC systems.

To date, we have sold open systems to customers in Norway, the Netherlands, India, ermany and Oman - more than any other supplier. The first application, Norway, will be ommissioned in early 1995, well ahead of other open systems scheduled for implementation ı major air traffic environments elsewhere in the world such as Finland in 1996 and Canada ı 1997.

Our open system approach and software also offer the flexibility to accommodate ıture operational functions such as satellite-controlled traffic or Automatic Dependent urveillance (ADS). We will be delivering a Vessel Traffic Management System to Valdez, laska, this year under a Coast Guard contract. This system integrates voice and digital ommunication links with differential Global Positioning System (GPS) data and multi-radar ata to track the movement of ships in the Prince William Sound, using essentially the same TC processing hardware and software. We have already submitted bids for Automatic ependent Surveillance (ADS) type ATC systems to foreign customers.

We have demonstrated and proven the value of open systems to our various ıternational customers. We have easily ported our application software to four ıanufacturers' computers, giving us and our customers the luxury of on-going competitive ids and access to multiple computer products. These ports were done "overnight", totally ransparent to the application software. In addition, we have been able to offer fully ompatible later generation products whose performance has more than doubled over the ast three years.

Open systems offer other inherent advantages over earlier closed architectures haracterized by their point design network and display software. One is the capability to asily add functionality and to interface to third-party software. We have benefited from ıuge industry investments in this area.

Under the aegis of open systems, the latest generation of Commercial Off-The-Shelf COTS) interface software products has been introduced that provides an easy insertion ath from an application to interactive displays. X-Windows has become the internationally ıccepted standard window "interface" system for workstations like the AAS Common Console.

An important feature of X is its "client server" design that allows application programs "clients") to drive the X "server" resident in distributed workstations, e.g., common consoles over a network. New functions that require user interaction at the workstations can be developed independently and integrated into the overall system with few or no changes to the existing application software. For example, functions such as Oceanic, Advanced En-Route Automation (referred to as AERA), Center TRACON Automation System (referred to as CTAS), and Real Time Weather Processor (referred to as RTWP) are now being addressed under separate FAA projects that should be integrated into AAS as soon as possible. If these projects are implemented using X and the common consoles are upgraded to support X, integration costs and risks are greatly reduced (by as much as two thirds) over point designs as currently exist on AAS, because X-based systems are specifically designed to accept third party software while unique point designs require significant changes to the existing software to accept third party software.

In addition, new X compatible software and support tools are constantly being introduced that offer further development efficiencies and savings. For example, Graphical User Interface (GUI) tools are available that automatically generate user interface software code from high level specification ("objects") input from computer programmers. These GUI tools allow the human interface to be defined and evaluated by the user community early in the development process, avoiding costly redesign and retrofits. Raytheon successfully used these tools on the Norway project. Norwegian air traffic controllers were able to evaluate a multitude of interface options and make their selected approach over a period of several months at early stages in the program. This allowed us to freeze our interface design and to avoid the types of user interface difficulties on the AAS program.

Raytheon has continued to take advantage of the open system advances such as X being offered to the commercial computer industry. Over the last two years, we have upgraded our display controllers and automation system interfaces to be fully X compatible. We are making further investments this year to maintain pace with industry enhancements to assure that our ATC systems are state-of-the-art and offer lowest risk solutions. In this regard, Raytheon is offering a company funded single-board DCX multi-channel display controller for use in the AAS common console. Prototypes have gone through complete testing at Raytheon and will be ready for full scale production this June with deliveries by August 1995, well in advance of AAS schedules. We have already offered this to our foreign customers. The advantages of DCX are higher performance and reliability and most importantly, X-Windows compatibility. It provides the path to open systems and facilitates the integration of third party software like AERA and CTAS. The result is earlier introduction of cost-saving benefits to the airlines, general aviation, and the flying public. DCX has been briefed to both the FAA and IBM.

Road Map for AAS

The current problems on AAS encompass technical, fiscal and schedule aspects of this very complex program. Potential changes to this program must be evaluated with the same levels of intensity, professionalism and conservatism as displayed in creating and maintaining the NAS plan.

Raytheon believes there are several avenues available to the FAA to perform a "mid-flight correction" that both solve current issues and redirect the program to better match future user needs and technological direction.

Referring to the original AAS provisions to "avoid special purpose designs" and "use common hardware", we recommend that the FAA:

- *First, replan the transition approach to mitigate the effect of current program schedule delays on maintaining the aged current system hardware. Get the hardware into the field. Specifically, as soon as possible, deliver the Initial Sector Suite System (ISSS) common consoles with the multi-channel DCX display controller.*

- *Second, require open architecture enhancements to basic hardware elements of the system now in anticipation of the many years of software improvements and upgrades. Provide an "open" path for the future now.*

- *Third, insist on Non-Developmental Item (NDI) solutions to maximize the benefits* *(technical, fiscal and schedule) to the FAA while minimizing and, in fact, reducing the risks on AAS.*

and·fourth, referring again to another original AAS provision to be "operationally available without interruption":

- *require the transition to a simplified and open architecture that initially replaces E-DARC and provides continuous operations. Raytheon recommends the use of an open system Non-Developmental Item (NDI) replacement.*

This road map is evolutionary. It allows significant portions of the AAS system that are now working to be used to provide direct user benefits in the near term. It maximizes the benefit derived from the AAS effort and sunk costs to date but redirects the program to "open" the system for increased benefits from available Non-Developmental Item (NDI)/Commercial Off-The-Shelf (COTS) solutions.

The current AAS schedule problems have exacerbated the escalating obsolescence/maintenance problems of existing equipment. This issue is compounded by the loss (by retirement) of critical maintenance personnel. Remember many of the systems have been in use since the early 70's! Raytheon believes that an early deployment of the display suite of AAS equipment to replace the existing Display Channel equipment is the first logical step in a properly phased transition.

Deploying the AAS requires a smooth and safe transition from the existing NAS En-Route system. A robust transition plan should ensure that the Air Traffic Controllers continue to control air traffic, unimpeded, and that full transition to the field sites only occurs after rigorous testing to the full satisfaction of the FAA. In addition, planned, parallel operation of existing and new systems should minimize alterations to the existing Host computer system, especially software.

Raytheon has defined a phased program that transitions the FAA automation system to one that meets the original objectives of the AAS program:

First, common consoles with multi-channel DCX display controllers should be delivered to the field as soon as possible, replace aging Plan View Displays.

Second, provide an ***AutoTrac*** - like backup channel with full radar data and flight data processing functionality. This channel will operate in parallel with the existing channel (NAS and E-DARC) and the new AAS/ISSS channel.

Third, once the new AAS/ISSS channel has been thoroughly tested, the existing channel (NAS and E-DARC is decommissioned and a second open system is added.

Fourth, once the dual channel open system is functional, the Advance Automation System (AAS)/Initial Sector Suite System(ISSS) channel can be deactivated.

The final system now features a dual channel open system architecture into which other features such as AERA and CTAS can be integrated. This system can serve as the basis for evolution to Area Control Computer Complex (ACCC) and beyond. This approach to enhanced transition within the AAS program structure was also briefed to the FAA and IBM.

Raytheon firmly believes in a simplified hardware redundancy architecture (multi-channel) as opposed to the current AAS complex software redundancy approach. Our opinion is based on current field experience on Raytheon and other ATC systems.

When asked by the CNA for a "clean sheet solution", Raytheon recommended replacement of the currently contracted AAS/ISSS with a dual channel open system architecture, using common consoles with DCX.

To meet the required reliability of the AAS system, as well as Continuous Operations, Raytheon suggests transition to a system architecture with multi-channel redundancy. Each channel should operate in an autonomous fashion and include full operational system functionality. Within each channel, processing elements and network hardware are also duplicated to further ensure that the system is always operational.

Without backup built into the AAS system architecture the possibility exists for the Air Traffic Controller to lose functionality at his workstation during failures or maintenance activities. This was amply demonstrated after deployment of the current enroute system, resulting in the development and deployment of the E-DARC backup system. Use of backup also enables the concept of "System Continuous Operations" to be met. A simple hardware redundancy (backup channel) approach based on Non-Developmental Item (NDI) systems significantly simplifies the currently complex software and permits much higher utilization of COTS software in the Non-Developmental Item (NDI) system as well as future enhancements to AAS.

Redundant system processing channels are required for a full functionality architecture and to replace the aging CDC system. The multi-channel display controller is part of this solution for continuous operations. Both channels should have full operational capabilities, including Radar Data Processing, Flight Data Processing, and System Control and Status Monitoring functionality. In addition, the two channels must be interconnected so that updated information is always available on either channel in the event of a channel outage. This interconnection ensures that the Air Traffic Controller does not lose critical information during channel switchover.

Our dual redundant architecture for AAS is compatible for use in the enroute, terminal and tower Air Traffic Control applications, identical to the same concept used in our Canadian system. The system design is scalable/expandable such that configuring increased or decreased loads, e.g., radar interfaces, number of display consoles, etc. is accomplished by the simple addition or deletion of processing elements. The software packages that drive each of the processing elements are compatible with this scaling technique. With regards to logistics and life cycle costs: common spares are utilized which lowers spares quantities and costs, and repair costs are decreased due to the number of standard commercial products utilized. This is not a developmental program; we are already offering it to our foreign customers.

In response to questions raised by the CNA study team, Raytheon conducted a "bottoms up" review of the AAS program requirements and compared them to our Non-Developmental Item (NDI) functionality. We estimate that less than 12% of the existing application code would require change to meet the AAS requirements. This would result in a 75 man-year effort over a period of less than two years.

Reducing the Risk and Cost of ATC Procurements
Non-Developmental Item (NDI) - An Alternate Acquisition Approach

The use of Non-Developmental Item (NDI) procurements offer large benefits to the FAA and industry. The international ATC community has successfully used this approach as a normal practice. The same benefits can accrue to the FAA but they must be willing to change. As an example, high level performance requirements, as opposed to the normal practice of detailed design requirements which often drive up non-recurring prices and inhibit industry innovation, should be the focus. The planned LCF TRACON procurement *is an ideal candidate.*

I am not privy to all of the contractual issues that must be resolved but I would expect FAA management to focus on modernizing the common console with some open system attributes and initiate "independent" efforts to address other parts of the program such as ACCC, TAAS and TRACON.. This would open the door to Non-Developmental Item (NDI) open solutions. Finally, I believe it is important to address procurement issues in this environment of COTS and Non-Developmental Item (NDI) open systems.

We in government and industry, can no longer afford to do business as usual in the face of reduced budgets. Non-Developmental Item (NDI) offers an alternative acquisition approach which promises to reduce cost, schedule and risk, while at the same time creating an environment for improved planning and budget control. In this regard, we in the U.S. can learn lessons from our international civil aviation friends. Non-Developmental Item (NDI) is not new to them.

The normal practice in much of the international ATC world has been to issue procurement tenders based on the principles of Non-Developmental Item (NDI). Functional specifications are used to prescribe the essential performance with the accompanying requirement for a demonstrable system. For example, India awarded a contract in March 1993 for two complete airports of ATC equipment: ASRs, ARSRs, ASDEs, navaids, and automation systems -- all under the aegis of an Non-Developmental Item (NDI) competition. They will begin receiving systems in late 1994 with commissioning scheduled in early 1996. I can tell you personally that their price was much less than comparable equipment in the U.S. Why can't we do this?

Other countries or programs which have adhered to the opposite principles of detailed design specifications with large non-recurring and special tailoring to meet their "unique" requirements are the ones that are paying the price in terms of cost, schedule, or performance problems.

Many of the benefits of Non-Developmental Item (NDI) are obvious. Contract schedules and risk are reduced since the development cycle has been already completed by industry. Contractors are induced to build to inventory or buy components off-the-shelf, greatly reducing delivery times.

I believe the same benefits can accrue to the FAA if the FAA allows use of high level performance requirements, as opposed to the normal practice of detailed design requirements which often drive up non-recurring prices and inhibit innovation.

Using functional specifications as the basis, a fly-off demonstration of a limited number of "qualified" competitors could be conducted to measure the performance against those requirements. This fly-off would also enable validation of contractor claims of system maintainability and reliability with which life cycle aspects can be projected. With this data in hand, an accurate cost of the system can be determined prior to procurement. The demonstration also permits early user (controllers and technicians in ATC's case) hands-on evaluation to assure the system meets their basic needs.

Finally, contractor proposals would be evaluated to determine the best value to the government. The proposal evaluation probably will be different than usual. By their nature, Non-Developmental Item (NDI) procurements will not always lend themselves to a perfect apples-to-apples comparison. As a result, the selection criteria needs to include a price performance trade-off as well as placing high weightings on risk, proven performance, and life cycle benefits.

Although we have argued for commonalty across all of the FAA automation programs, overriding schedule issues and priorities have legitimately made Low Consolidation Facility Terminal Radar Approach Control (LCF TRACON) facilities a reasonable exception to the case. The planned and separate LCF TRACON procurement begs for the use of Non-Developmental Item (NDI). There are a number of proven systems "on-the street" that feature commissioned application software that will do the TRACON job. The price of these systems is factors less than the most recent TRACON purchases, and system deliveries can be made in months, not years. We agree with the FAA's NDI LCF TRACON plan and urge them to accelerate this procurement.

The FAA planned to evaluate "qualified" supplier's systems at FAA sites in 1994 as the first step in the Non-Developmental Item (NDI) procurement of TRACONS. However, recent perturbations in the AAS program have placed this effort on a lower priority. I believe this should be changed. The bases for "separating" the LCF TRACON from the AAS program are still sound and valid. These stand-alone systems represent a unique subset of the FAA's future automation requirements. They lend themselves to an accelerated Non-Developmental Item (NDI) competition and need not be hampered by the problems of AAS. They also offer the benefit of a rapid implementation and avoid in the future the historical resort to costly sole source awards under "emergency" justifications.

I understand that the FAA is not convinced that the planned use of a Broad Agency Announcement to conduct the LCF TRACON competition is the proper thing to do. Myself and many of my colleagues in industry consider the BAA approach a cost efficient and legal means to expeditiously make a low risk decision. Let's hope we can get this activity back on track to avoid unnecessary delays.

__Summary__

With the benefit of history, criticism of the AAS program is easy. Some of it is clearly justified and some of it is not. A lot of good things have been produced under the program that should serve as a solid foundation for the ultimate system. For example, over $150 million has been invested in the Raytheon AAS Acquisition Phase subcontract alone for common consoles on ISSS and the air traffic controllers desperately need this modernization. On the other hand, there are features of the current design that should be changed such as its closed architecture point design and lack of backup for continuous operations.

The important thing is to get on with the correct program from here. My recommendations:

- **Revalidate the requirements for AAS and make appropriate adjustments.**

- **Take advantage of the "sunk costs" and associated viable aspects of the current program.**

- **Leverage available Non-Developmental Item (NDI) and open system technologies for a partial solution to ISSS to assure that "throw-aways" are minimized and a growth path to the future exists. Specifically, phase in DCX and an open architecture backup channel for replacement of E-DARC.**

- **Enhance the backup channel with a second open system string to provide a dual redundant open architecture solution that can grow to ACCC and the cost effective insertion of AERA functions.**

- **Learn a lesson from the international ATC community and mandate the use of Non-Developmental Item (NDI)/open systems for all other automation elements. We are exporting ATC systems to the rest of the world under Department of**

Commerce license that are more advanced then those in the U.S. - the U.S. is falling behind.

I wish to thank you for the opportunity to appear today. Furthermore, I pledge Raytheon's support to Congress, the Administration, the FAA, the Air Traffic Controllers, the flying public, and others selected to participate in the future of the AAS program. Raytheon stands ready and able to support you in fielding a successful Advanced Automation System.

Testimony of Bernard L. Schwartz
Chairman of the Board and Chief Executive Officer
Loral Corporation

April 13, 1994

I. Introduction and Overview

Good Morning, I am Bernard L. Schwartz, Chairman and Chief Executive Officer of Loral Corporation. I am accompanied by Mr. Frank Lanza, President and Chief Operating Officer of Loral. I want to thank the distinguished Chairman, Mr. Oberstar, the Ranking Member, Mr. Clinger, and all of the other Members of this Subcommittee for the opportunity to testify on issues critical to modernizing the nation's air traffic control (ATC) system.

In comparison to the many Members of the Subcommittee who have been working on these issues for years, or even decades, Loral Corporation is a relative newcomer. Nonetheless, we believe we bring valuable managerial and technical resources to improving the use and safety of our nation's airspace and we expect to make a very important contribution to this critical effort. In 22 years under its present management, Loral has earned a reputation for bringing energy, creativity, discipline, and most important, delivery of systems on time and on budget for numerous government contracting assignments.

Based upon our long familiarity with Federal Systems Company (FSC) and our intense involvement since December 1993, I believe that, while it will not be easy, Loral can and will bring success to the troubled Advanced Automation System (AAS) program.

As I will discuss more fully in my testimony that follows:

- Loral is fully committed to the success of the AAS program and will apply all of its resources to complete the program on a schedule and at a cost that the FAA and Congress can rely upon.

- The AAS program objectives are important and valid and the implementation of the program can be modified to achieve these objectives at a fair cost and within a reasonable schedule.

- Loral brings experienced management skill and discipline to a large, complex program like AAS.

- FSC is a world-class systems integrator and has put in place a highly-skilled team that under Loral's management will fulfill our obligations under the AAS contract.

- Loral recommends "Fast Track" deployment of the ISSS and TAAS Metroplex Control Facilities to gain the benefits of real-world user feedback. This early evaluation will reduce risk and control program costs.

- Loral has no hardware bias and is committed to ensuring a flexible, open AAS architecture which will easily accommodate future technologies.

- The $1.5 billion considerable investment incurred to date has substantial value as the foundation of the continued program. Our total program cost assessment including investment to date is less than $4 billion.

- Other alternatives to the AAS program create greater risk, will needlessly delay the operational readiness of the system, and are less likely to achieve the FAA's objectives.

Mr. Chairman, you could be wondering and could rightfully ask, why is it going to be different now? The changes of management at the FAA and at FSC have brought a 'can do' realistic approach to fixing this program. Also, with six years of experience and the intense analysis of the past few months, the problems have been identified, the risks analyzed and appropriate corrective steps are now in focus.

II. Loral And Its Commitment To Air Traffic Control And The AAS Program

Because this is my first appearance before this Subcommittee, I would like to briefly describe our Company.

Loral employs 35,000 dedicated and skilled employees, almost entirely in the United States, engaged in engineering, manufacturing, and integration of large scale hardware and software systems. We operate facilities in 25 states. Our aggregate revenues for this fiscal year will be approximately $6.5 billion, ranking Loral among the nation's largest industrial companies. Our backlog will exceed $10 billion. For the past 22 years this management has produced an unbroken record of improved earnings, achieving an annual compound growth rate of 34% in earnings, 28% in assets and 28% in stockholders' equity.

All of Loral's activities are on the leading edge of diverse but related technologies, focusing on defense electronics, space, telecommunications, information systems and systems integration. Loral is a recognized leader in command, control, and communications; electronic and computer based training and simulation; reconnaissance; imaging; data and signal processing; information storage, retrieval and display; tactical missiles; electronic self defense; missile defense and space systems.

In non-defense applications, Loral leads the largest international consortium for the design and manufacture of commercial satellites. We have recently launched a global cellular telecommunications program based on a constellation of 48 low-earth orbiting satellites that will bring modern communication and information to the most remote corners of the earth.

Enhancing Loral's internal growth is a series of eminently successful acquisitions, each of which was a good business fit. That is to say, each was a merger of compatible skills, technologies, programs, thereby reinforcing the strengths of each company. Loral's acquisition of FSC from IBM was consistent with our successful strategy. FSC is a world leader of systems integration and modernization. At $2.1 billion of revenue it possesses the critical mass to win and manage large scale programs, including systems for the Internal Revenue Service, Postal Service, the U.K. Air Traffic Control System, and important military programs as the LAMPS, Merlin, and Sustaining Base Information Services. Its 10,000 employees represent a major systems integration capability. There is a high concentration of software engineers and experts in its population. Although Loral was fully aware of the AAS program and contract difficulties before the acquisition, we had and have the firm conviction that the program is fixable and is a good business opportunity.

Loral has a long record of proven program performance -- in managing complex programs and turning around "problem programs". The record of consistent financial success and growth could not have been achieved without the ability to deliver quality systems on schedule and within budget. That is not to say that we avoid all program problems; that is impossible in our technically challenging and complex systems business. But it is to say that we are good at monitoring performance, at anticipating problem areas, and at focusing management attention and resources to contain and cure the problems before they escalate. "Performance is our best strategy" is the hallmark of everything we do.

For example, we purchased Ford Aerospace Corporation in 1990. Ford had the contract for the Geostationary Operational Environmental Satellite (GOES) described by the Washington Post as "equally bollixed-up." The GOES program is quite analogous to the FAA program in that it was over budget by almost a factor of 3 and it was 2 years late. After a brief comprehensive study Loral produced a new program plan. We delivered the first of five satellites ahead of plan, the remaining deliveries are on schedule, and all within planned cost. We put that program on a sound course through careful management and control and the application of superior technical expertise.

Notwithstanding the size of our company, our top management is personally accountable to our customers. I hope you will regard the appearance of Loral's chief executive officer and its chief operating officer at this hearing as an indication of our personal responsibility and our commitment to this important program. The Air Traffic Control modernization program is the largest government-sponsored civilian project other than the space program. I believe my customer --- the U.S. government --- is entitled to deal directly with the Chairman of the Company on this critical project. Indeed, on this issue of AAS, or any other issue, I invite Members of this Subcommittee to call me; I'll make sure you get the right answers.

As Chairman of the Company I want to personally assure you, the FAA, the air transport industry and the flying public that Loral and all of its resources are fully committed to improving the nation's air traffic control system and the success of the AAS program. I, and the senior managers at Loral, make this pledge to you:

> Loral will exert all of its resources to complete its portion of the AAS program on a schedule and at a cost that the Administration and the Congress can rely upon. We expect to succeed and we expect to be held accountable.

III. Loral's Involvement With The AAS Program

Loral's acquisition of FSC did not close until March. However, we anticipated the need to hit the ground running on the AAS program, and, therefore, reached agreement with IBM that Loral would have operational control, commencing January 1, 1994. This was an obligation we voluntarily assumed because the AAS program required immediate attention.

In January, Loral formed technical and management assessment teams to concentrate on the AAS program. We assigned 30 technical and financial experts from Loral's operations for on-site participation, and consulted with industry, academic and government experts. We have brought fresh resources into this effort: management, contract administration, software engineers, hardware engineers. We moved Loral people into direct on-site operations, consulted with industry, academic and government experts. The objective of our in-depth analysis was not to fix blame for past sins. It was instead to determine a constructive course of action.

We recognized from the beginning that senior management involvement was critical to this effort. Since January 1, Frank Lanza and I have devoted a considerable amount of our energies to this project. We also began immediately to coordinate our efforts with the senior FAA officials. We have supported the FAA's comprehensive review of AAS program costs and schedule conducted by FAA Deputy Administrator, Linda Daschle, and FAA Chief Counsel, Mark Gerchick.

IV. The AAS Program Objectives Are Important And Valid And Implementation Of The Program Can Be Modified To Achieve These Objectives

I would like to share with the Subcommittee Loral's assessment of the current situation based upon our first 100 days on the job.

While there is much uncertainty and some disagreement about how to proceed, there is a remarkably strong consensus among all interested parties -- the FAA, Congress, the air transport industry, the air traffic flight controllers, industry participants and industry competitors -- about the objectives of the AAS program. As we see it, these objectives are:

- Designing and fielding a flexible and efficient air traffic control system that can keep pace with the increasing capacity demands of our national airspace.

- Developing an ATC system that increases air traffic controller productivity.

- Enhancing system safety through increased system reliability and ease of use.

- Maximizing commonality of hardware and software to reduce maintenance complexity, time and cost.

- Creating a solution that embraces open architecture which will provide for continuing incorporation of third-party commercial technologies and ease system modifications required to meet changing capacity demands.

- Promoting the efficient use of our airspace by permitting users to operate with a minimum of constraints, over more routes, and with greater fuel efficiency.

In assessing the current situation and determining how to proceed, Loral has carefully considered these six objectives within the context of schedule, cost and risk. Simply stated, we share the uniform consensus that the program has not performed as it should have since its inception.

A full systems requirements baseline should have been established in the initial competition between IBM and Hughes. It was not. It still was not established in 1988 and, to a limited extent, it is incomplete today. The result of this lack of definition, combined with management failures which were primarily reflected in unrealistic schedules, is a troubled program that is over budget and behind schedule.

But, even with the problems of the past, it is Loral's assessment that the AAS program can fulfill all of its objectives at a fair cost and in a timely fashion. As presently programmed, however, these objectives would be achieved at an unacceptable cost and schedule delay and with undue risk. The solution does not lie in abandoning the present program. I know that answer runs counter to the frustrations with the existing AAS program, and the promptings of a few. But the facts are that to handle the volumes of U.S. air traffic projected during the life of this program requires the kind of program, but not the same program, that has been embarked upon.

The key to assessing the current situation is that there appears to have been an overriding concern that technology would pass this program by. This is an understandable concern, but not one which should have fundamentally impacted the program. The effect, however, was for the FAA to try incorrectly to keep its options open too long. Today, it is obvious that with open architecture incorporation of enhanced technology is not a concern.

In sum, it is important to freeze the system requirements once the revalidation process is completed by the FAA. With such discipline imposed on the process, the program can go forward on an orderly, predictable, successful basis.

<u>PROGRAM ASSESSMENT: STRENGTHS</u>

- The technical team devoted to AAS is highly-skilled and the organizational structure promotes effective teamwork and communication among all interested parties. No other company in the world has the vast array of engineers knowledgeable about air traffic control. Replicating this mature organization would be a Herculean task and would consume needless time.

- The program will produce a safe and operationally reliable air traffic control system that will meet system needs well into the twenty-first century.

- The system architecture will meet program objectives: the system is robust, and with our suggested modifications, will be truly open.

- The $1.5 billion considerable investment incurred to date has substantial value as the foundation of the continued program. Our total program cost assessment including investment to date is less than $4 billion.

- The software development effort has matured to the point that the task of correcting the remaining problems is well-defined and does not require material modification.

There are, however, program weaknesses which must also be considered. The most critical are set forth below:

PROGRAM ASSESSMENT: WEAKNESSES

- Management controls on cost and schedule have been inadequate.

- Current program schedule creates excessive risk
  - Before system stabilization
  - Without operational experience input.

- Inadequate provision has been made for continual technology insertion of newly developed, commercial hardware and software.

- The current schedule for follow-on site deployment is unrealistic and at high risk.

V. Loral Management And The In-Place FSC Team Are Capable Of Fulfilling The AAS Contract

The AAS program requires greater management controls and a more disciplined approach to meeting cost and schedule commitments. It is Loral's responsibility to impose these controls and discipline, and we are already at work on creating the management structure and process to achieve our objectives. Loral has a well deserved reputation for managing complex programs and installing the controls necessary to ensure that cost and schedule commitments are fulfilled. We are confident of our ability to put the AAS program on the proper course as we have done with other programs.

It is also critical to recognize the quality and uniqueness of the technical staff working on the AAS program. More than 2,500 people from 40 companies are contributing to the program today. These dedicated and well-motivated people are meeting the challenges of the unusually complex and demanding AAS program requirements. The AAS has been designed to meet stringent performance and availability requirements. For certain critical functions, the system can be down for no more than three seconds per year. The system requires that more than 2 million lines of software code must be written, tested, debugged and integrated to create a high-availability, fault-tolerant system. The Initial Sector Suite System (ISSS) provides the enroute air traffic controller with new workstations and is the AAS segment that has received the most attention so far. This segment alone contains more than 16,000 functional requirements. While the technical challenges are daunting, we have concluded that the technical staff devoted to this effort is well on its way to meeting the challenge.

We seriously doubt that any other company or team of companies can match the technical resources and capabilities which are currently focused on the AAS program. In fact, Loral viewed these unique capabilities as a "crown jewel" when we made the acquisition of FSC. As you may recall, FSC was awarded the AAS contract in November 1988 ater a four year "bake-off" with Hughes, that is a competition based on actual products and operational performance, not written proposals and marketing claims.

VI. Loral's Recommendations

Based on the program strengths and weaknesses, our recommendations are that the following changes be made to the AAS program:

- Focus the program's efforts by concentrating on ISSS and the TAAS Metroplex Centers.

- The schedule and approach for ISSS test and deployment should be modified to incorporate what Loral calls "Fast Track." This approach will increase user and operational input into the final design and reduce program risk. It will reduce cost by eliminating multiple redundant test cycles as well as the need for constant changes.

- The schedule and approach for Metroplex test and deployment should also be "Fast Track" for early deployment permitting FAA and DOD evaluation.

A. Focus Program Efforts by Concentrating on ISSS and TAAS

It is readily apparent that one of the initial flaws in the program was attempting to do too much too soon. It was overly ambitious to attempt at one time a total revamping of the air traffic control system from towers, to terminals, to enroute centers as well as facility consolidation. Loral is recommending that the program be concentrated where there is the most need, in ISSS and TAAS Metroplex. Programs such as the Area Control Computer Complex (ACCC) which provides for combining enroute and terminal radar functions should be deferred. In addition the program for the Local Tracons in the non-Metroplex areas should be stretched out. The reason is simply to keep focused on the primary objectives.

B. Modify ISSS Test And Deployment To Incorporate "Fast Track"

The current test and deployment schedule for ISSS creates undue risk. The current plan projects that the ISSS system would be accepted in September 1994. That acceptance would be prior to the incorporation of important software upgrades referred to as Block Updates 2, 3, and 4 in ISSS. This approach creates a significant element of risk because the FAA would be accepting a system that is not fully developed and before critical operational suitability requirements have been demonstrated.

As an alternative, Loral recommends that current testing activity be stopped, the system be deployed early to Seattle for informal user evaluation, and formal acceptance testing commence after the system has attained greater maturity and stability. This "Fast Track" approach provides for rapid feedback from the ultimate users to ensure that the final system meets their needs. Loral's experience with other large systems development efforts is that the best feedback comes from the ultimate users. Getting that feedback as early as possible greatly reduces the risk of fielding a system that does not fully meet user needs. Loral's Fast Track proposal eliminates the multiple formal and operational tests, does not require the FAA to accept the system based on incomplete software, and allows early user feedback.

FAST TRACK MODIFIED ISSS CONCEPT

PROCESS:

- Stop current developmental test and evaluation/operational test and evaluation activity at Atlantic City.

- Continue to use Atlantic City as development site, functional testing on Block Updates 1, 2, and 3 and debugging.

- Deploy system to Seattle 1/95 for "Shadow Mode" functional operation with real radar. This early deployment will function as enroute beta site #1.
  - Hands on operational experience
  - Early user feedback
  - Confirmation of automatic advanced enroute center.

- Following completion of a one year "Shadow Mode" operation in which controllers utilize actual radar data, operational readiness will be completed by 4/97 at Seattle with well trained controllers.

- Focus near term effort on completing Program Trouble Reports and ensuring system stability.

- Start developmental test and evaluation/operational test and evaluation on 9/95 (contains block update 2 and block update 3) on enroute system #2 and deploy to Salt Lake City, testing complete 10/96, operational readiness complete 3/98.

- Loral will review system hardware and software for Local Tracons to achieve cost savings by exploring third-party commercially available products.

DEPLOYMENT SCHEDULE:

- Following Seattle operational readiness determination, the current development schedule calls for an unachievable "waterfall" deployment providing for establishment of a new enroute center every month.

- Loral instead recommends a planned pause of 6 to 9 months following the first 3 sites, e.g., after Denver, Seattle and Salt Lake.

- This time will be used to validate and fine tune the system prior to final deployment based on real-world controller hands-on experience and feed back.

- Incorporate changes before Atlanta.

- Proceed with final deployments based on stabilized, reliable, accepted configuration at a rate of five centers per year.

This early deployment will allow hands-on experience 12 months earlier than under the current plan and will also allow FSC resources to be devoted to closing the large number of outstanding Program Trouble Reports prior to any formal test and acceptance. It will also facilitate further improvements, such as implementing early user benefits (e.g., AERA, CTAS, etc.), which will then be incorporated as available.

The results of Loral's fast track proposal are demonstratable and markedly superior to the current situation.

FASTRACK RESULTS

- Sensible concept.
- Low risk implementation.
- Assures cost containment.
- Seattle is operational by 4/97, followed by Salt Lake City and Denver.
- Produces reliable system to meet requirements.
- Allows for continuing product improvements.
- When deployed - it works!

C. The Schedule and Approach for TAAS Test and Deployment Should Also be Fast Track

One essential point which has been lost in the AAS debate is that the Terminal Advanced Automation System (TAAS) does not suffer the same infirmities that have bedeviled ISSS. The reason is straightforward. TAAS was begun after ISSS; its development benefitted from the mistakes of ISSS.

TAAS provides the FAA modern hardware, software, and additional automation for terminal air traffic controllers. TAAS solves the FAA and DOD needs for modernization of terminal air traffic control at the large Metroplex Control Facilities (MCF) and the Local Control Facilities (LCF).

Metroplex Control Facilities (MCF's):

MCF allows for the consolidation of terminal air traffic control operations at multiple major airports into one Metroplex Control Facility. This provides for tighter coordination between major airports and increases flexibility in the definition of the airspace.

It also provides more accurate radar data processing than the current terminal control facilities. An MCF will be able to process both long range and short range radars. Existing terminal facilities are compatible with short range radars only. MCF also provides a multi-radar data processing capability which provides for significantly more complete radar coverage. When an aircraft is tracked by multiple radars, the system uses the radar returns that are most accurate. Thus, MCFs provide for increased safety in areas with high aircraft traffic counts yet still allows for more efficient routes into and out of major airports. No available system can provide the same reliability to process data from more radars utilizing a commercially based open system architecture to allow for the addition of early user benefits.

MCF architecture is designed to process up to 60 radars, up to 430 controller work stations, and 5000 tracked aircraft at one time. By comparison the existing New York TRACON handles up to 6 radars, with no options for multi-radar data processing, and only 58 controller work stations. MCFs, utilizing the same displays develped for the ISSS, provide the controller all digital color displays, enhanced traffic alerts, and much improved weather area visibility. The MCF displays allow the controllers to filter the data on their display to concentrate on the traffic for which they are responsible.

It also provides digital recording of controller displays for incident analysis and search and rescue operations as well as increased security provisions for access control.

Development of the MCF is well along. The software development will be completed in two months. The schedule performance since System Critical Design Review in March 1991 has been excellent. TAAS is also installed in the FAA's Development and Demonstration facility. Early evaluation by both FAA and DOD controllers has been very positive. The major schedule issues, dependence on ISSS software development, are behind us -- of the 220,000 lines of software required from ISSS, TAAS is currently integrated with 219,000.

The limited consolidation activity currently provides a two phased deployment of TAAS to the Southern California Metroplex. Phase I of the Fast Track will be utilized primarily for operational evaluation in side-by-side operations with the existing system in San Diego. The installation activities are underway at the FAA's technical center today. Phase 1 software development will be complete in two months. Installation at the Southern California TRACON will start mid-1995 and will complete the formal evaluation at Southern California TRACON in October 1996. Phase 1 formal testing is also designed to reduce risk for the full MCF System or Phase 2.

Phase 2 of the Fast Track will provide the capabilities required for full functionality. Phase 2 consists of two more software builds and a second formal test program at the FAA's technical center. Phase 2 will be operational at the Southern California TRACON no later than February 1998.

The common hardware and software with the MCFs and the Enroute Centers will significantly reduce the FAA's maintenance requirements. The common software approach will also provide the required flexibility to incorporate the best technologies into other segments of the AAS program.

Basically the present program for TAAS MCF follows the proposed Fast Track program in that early user feedback is provided in 1995 by early deployment to San Diego followed by formal evaluation in Southern California by October 1996. Investment to date is $200 million dollars. Completion of 9 MCFs will not exceed an additional $400 million dollars, which amount is included in our total program cost assessment.

TRACONS (LCF's):

Local Control Facilities are typically much less complex than MCFs. A Local Control Facility provides modernization of stand alone TRACONs. A small TRACON or LCF could be required to process only one radar. The complexity of the air space and the workload requirements are significantly reduced. Therefore, the performance and reliability required could be reduced. There exist several alternative candidates to the LCF, TAAS being only one. Loral proposes to evaluate alternate commercially available small TRACONS hardware and software for utilization in AAS to reduce cost to the FAA.

Fast Track for the ISSS and the MCFs allows substantial savings over the existing proposal and, equally important, greatly reduced program risk. Overall, the FSC portion of these programs can be fully deployed for less than $4 billion, including the $1.5 billion which has already been spent.

VII. Loral Has No Hardware Bias And Is Committed To Ensuring An Open AAS Architecture

One of the critical objectives of the AAS program is to create an open architecture that will promote the early incorporation of new technologies and ease system modifications required to meet changing capacity demands. Loral's technical assessment team concluded that the AAS system architecture provides for a significant amount of flexibility in dealing with future growth and technology enhancements. The architecture is evolvable, scalable, and will be open. The system allows for selective upgrade of processors, interface hardware, display hardware, or software without excessive dependence on specific vendors and without excessive modification of unrelated components.

One change we are recommending is the establishment of a Technology Insertion Laboratory to evaluate rapidly new alternative subsystems and determine their usefulness in the AAS program. The FAA would control the laboratory configuration to ensure an accurate system representation and assessment. This Lab will be able to run current ISSS or TAAS software for realistic performance comparisons, and it will be operational within six months of receiving FAA approval. This Laboratory will ensure that the AAS program has access to the newest and best technology, and equally important, that the newest and best technology has access to the AAS program.

VIII. Other Alternatives

Overall Loral has concluded that the original objectives of the AAS program are achievable within a reasonable cost and schedule environment. Achieving cost and schedule control, however, will require a reduction of existing program risk through the revised test and deployment schedule I have outlined. There are other voices who call for more radical changes to the AAS program. I would like to suggest three points which I believe are critical in assessing these alternatives.

First, any alternative must include credible support for a claim that it will reduce costs, shorten the schedule, or reduce risk. Much of the AAS development effort has already been completed. Admittedly, this effort was plagued by numerous problems, most critically a clear, definable baseline of system requirements. For the most part, these initial stage problems are behind us. Other alternatives must clearly demonstrate that they will not encounter similar difficulties.

Second, any alternative must demonstrate that it will fulfill the objectives of the AAS program or explain why those objectives are no longer valid. These objectives include not merely replacing the old equipment with more modern equipment, but also fundamentally changing the architecture of a system that has been acquired bit-by-bit over time. The full potential of the AAS program is to achieve a flexible system that is evolvable, scalable, and open. The system architecture also emphasizes commonality of hardware and software. Loral's assessment confirms the FAA's original determination. Only a design integrating enroute and Metroplex control facilities can meet the evolving capacity demands of our airspace, increase controller productivity, enhance system safety, reduce maintenance costs, permit early incorporation of new technologies, and provide user benefits through a more efficient use of the airspace.

Third, any alternative must credibly explain how it intends to match the unique technical resources that are currently focused on the AAS program. We believe these capabilities are unmatched anywhere in the world. Equally important is a rigorous assessment of the manner in which alternative approaches will effectively utilize the valuable work to date arising from the FAA's investment of over $1.5 billion in the AAS program. While integration, test and deployment are extremely challenging tasks and much work remains to be done, we should be careful not to underestimate the extent of progress to date.

These points lead us to be very skeptical of the claims being made by those of our competitors who are now seeking a wider role in the ISSS and MCFs. We believe that such alternatives pose great risks for the program and could result in degrading system performance. With regard to claims that are based on so-called commercially available, off-the-shelf solutions, I would remind the proponents of such claims that no other air traffic control system in the world has comparable requirements for capacity, availability, or functionality. There is no evidence to demonstrate that a product which works in a less demanding environment can be readily scaled upwards to satisfy the needs of the United States' airspace.

Let me be clear, however, on Loral's willingness and openness to accept assistance from any quarter which will advance the objectives of the AAS program. The AAS program team already incorporates the contribution of over 40 different companies. Loral will continue to reach out to all industry participants to fulfill our commitments on this critical program.

IX. Conclusion

A year ago senior management from IBM and the FAA claimed that the problems of the AAS program were behind them. That assessment was incorrect. Today we have a new team at the FAA and Loral's direct involvement in the program. Both these new managements have demonstrated a willingness to shine a spotlight on the problems of the program and to forthrightly and directly confront the challenges. This effort is particularly timely because the six years of prior effort has allowed the new team to quantify clearly the program risks. The revised approach to test and deployment which we are recommending will sharply reduce the schedule risks.

We at Loral are confident that under our management the ISSS and MCF segments can be delivered for less than $4 billion, which includes the $1.5 billion investment to date, and that we can assist the FAA in completing the AAS program for less than $7 billion.

With open communications, disciplined management, and strict accountability for the FAA and Loral alike, this program will become a success.

STATEMENT OF
ROBERT YELDELL, DIRECTOR OF FEDERAL OPERATIONS
TANDEM COMPUTERS, INC.
BEFORE THE SUBCOMMITTEE ON AVIATION
OF THE
HOUSE PUBLIC WORKS AND TRANSPORTATION COMMITTEE

hearing on

Review of Recent Developments in the Federal Aviation Administration's Advanced Automation System Program

APRIL 13, 1994

OPTIMIZING THE USE OF EXISTING TECHNOLOGY FOR THE NEAR-TERM IMPLEMENTATION OF A TOWER INFORMATION DISPLAY SYSTEM.

Mr. Chairman, Thank you for providing Tandem the opportunity to present testimony to the Aviation Subcommittee on issues relevant to airport traffic control towers. We understand the chairman's main focus is to address issues surrounding the AAS program. Tandem's testimony will focus on an important aspect the AAS program, tower modernization. As you and the members of the subcommittee grapple with the issues surrounding the long-term modernization , I would like to suggest that a near term, low-cost, low-risk alternative exists within the FAA today which can provide automation and consolidation of tower functions and will improve safety and aid controllers in the complex job of airport traffic control. The FAA is currently operating an Airport Traffic Control Tower (ATCT) data collection, information display and operational control system. This system, designated the Tower Integrated Display System, provides air traffic controllers with most of the critical and supplementary information required to perform tower cab duties. It combines most of the functionality of the numerous, space-wasting controls, displays, keyboards, etc., into fully integrated , compact daylight readable display screens. The system is in operation at the FAA's Airways Facilities Tower Integration Laboratory (AFTIL) in a successful test bed environment and could be deployed at selected towers across the country within a six month period as a low-risk, cost effective alternative solution to near-term tower modernization. We respectfully suggest congressional support for further deployment of this system. A small investment today in the Tower Integrated Display System would deliver a quantum leap in tower function beyond what is currently available in the tower.

BACKGROUND. The Tower Integrated Display System evolved from the Consolidated CAB Display System(CCDS) which was developed by the FAA, based on verified Air Traffic requirements and needs, in the 1979-1981 time period. The system was directed at providing ATCT personnel with a versatile, standard display configuration that could handle most types of information for the busiest towers as well as the lower activity towers, and was approved by the FAA Administrator at that time for eleven sites. The development contract was awarded in 1981 and two systems, hosted on Tandem Non-Stop Computer systems, were delivered in 1982. The systems were tested and accepted by the FAA. The CCDS program met the ATCT requirements then, and compare favorably with the requirements for 1994 and the next decade. The production contract was waived however, when the requirements for the tower display system were incorporated into the AAS procurement.

In 1989, urgent concerns within the FAA for consolidating information displays in tower cabs precipitated a renewed interest in CCDS. The FAA re-hosted the application on a state-of-the-art Tandem fault tolerant computer system and replaced the custom built CCDS displays with full color, sunlight readable, touch screen commercial off-the shelf (COTS) liquid crystal displays. These displays are driven by industrial quality, compactly packaged PCs functioning as intelligent terminals in a client-server architecture. The Tandem platform employs a standards based SQL relational data base that is kept current of the airport, meteorological, environmental, and aeronautical systems data via a fiber-optics interface through COTS programmable logic controllers. Other digital data such as flight data and NOTAMS interface directly. The system provides for remotely monitoring the maintenance conditions of the NAVAIDS and other equipment used by the ATCT, and provides status, alarm, and control information at maintenance positions.

The Tandem host computer is the same model as that utilized by the FAA in two other mission critical applications: the Voice Switching and Control system (VSCS) and the Remote Maintenance Monitoring System (RMMS). The computer is designed for fault tolerant, continuous operation and is fully integrated into the FAA's logistic system with trained FAA maintenance personnel at all locations. By utilizing this proven computer system, the government owned application, and off-the- shelf display technology, the risk and much of the cost associated with fielding an operational tower display system is virtually eliminated.

RECOMMENDATIONS. Modernization of the tower display system has been delayed many years. An FAA developed system, utilizing the latest COTS technology, functions today in a laboratory environment. Congressional support for further deployment of this system in selected towers across the country is recommended, not as an ultimate solution, but as a quantum leap in tower function beyond what is available in the tower today.

ADDITIONS TO THE RECORD

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

The Inspector General

Office of Inspector General
Washington, D.C. 20590

April 11, 1994

Mr. David Traynham
Subcommittee on Aviation
Committee on Public Works and Transportation
2251 Rayburn House Office Building
Washington, D.C. 20515

Dear David:

As agreed on April 8, 1994, in your conversation with Raymond DeCarli, I am providing a statement for the record regarding our involvement and views on the Advanced Automation System.

If I can answer any questions or be of any further assistance, please feel free to call me on 366-1959 or my Deputy, Mario A. Lauro, Jr., on 366-6767.

Sincerely,

Mario A. Lauro, Jr.

A. Mary Schiavo
Inspector General

Enclosure

ENCLOSURE

STATEMENT

OF

A. MARY SCHIAVO

INSPECTOR GENERAL
DEPARTMENT OF TRANSPORTATION

BEFORE THE SUBCOMMITTEE ON AVIATION
OF THE
COMMITTEE ON PUBLIC WORKS AND TRANSPORTATION
HOUSE OF REPRESENTATIVES

APRIL 13, 1994

STATEMENT OF A. MARY SCHIAVO
INSPECTOR GENERAL
DEPARTMENT OF TRANSPORTATION

BEFORE THE HOUSE SUBCOMMITTEE ON AVIATION

APRIL 13, 1994

Mr. Chairman and members of the Subcommittee, I am pleased to submit this statement on Federal Aviation Administration's (FAA) Advanced Automation System (AAS) Program.

Until a few months ago, our involvement with the AAS Program concentrated on providing contract audit services through the Defense Contract Audit Agency (DCAA). Since the AAS contract award with IBM in 1988, the General Accounting Office (GAO) was active in monitoring the project, issuing at least 14 reports which included the AAS Program. In lieu of duplicating efforts, we deferred closer oversight of the AAS Program to GAO. In the October 18, 1993, House Conference Report on the Fiscal Year (FY) 1994 Department of Transportation Appropriations Bill, the conferees directed the Office of Inspector General to monitor FAA's AAS Program on a continuous basis and report as necessary to the Office of the Secretary of Transportation and the House and Senate Appropriations Committees. The conferees cited concerns about cost overruns, schedule delays, and the potential for conflict of interest in FAA's monitoring and management of the program.

Since November 1993, our efforts included obtaining a basic understanding of the AAS Program and a status of program cost, schedule, and management. We have met with AAS Program officials, attended briefings, visited FAA's Development Demonstration Facility and Technical Center, and reviewed various documents at FAA Headquarters. Additionally, we held discussions with members of Administrator Hinson's 45-day review team, Transportation Systems Acquisition Review Council (TSARC) staff members, GAO, and DCAA.

Based on concerns expressed by DCAA audit officials and the magnitude of the costs involved with the IBM contract, we also conducted a review of DCAA audit reports and summarized the types of qualifications, findings, and recommendations made on the IBM contract and its subcontractors.

We issued our first report on FAA's AAS Program on March 3, 1994. In summary, we found that although DCAA has continued to identify numerous deficiencies in IBM's cost estimating system, FAA and IBM have not taken adequate corrective action. Additionally, FAA is not providing adequate technical assistance to DCAA, hindering DCAA's ability to reach definitive conclusions on the acceptability of IBM's methods and assumptions for proposing costs.

IBM'S ESTIMATING SYSTEM AND FAA'S TECHNICAL ASSISTANCE TO DCAA

Since the AAS contract award to IBM in July 1988, DCAA has issued 170 audit reports on the AAS contract and related IBM support systems. Our March report identified two significant areas where improvements are needed. These areas are IBM's estimating system--an estimating system generates cost estimates to develop or buy hardware and software systems--and FAA's technical assistance to DCAA.

IBM's estimating system deficiencies can be grouped into three categories:

First, IBM did not submit current, accurate, and complete cost or pricing data. We found IBM's cost or pricing data provided to support cost estimates did not reconcile to the proposals, costs were improperly classified, and adequate support for proposed costs could not be provided. Also, IBM frequently did not provide requested data in a timely manner.

Second, IBM did not always include current, accurate, and complete cost or pricing data submissions from their subcontractors and did not perform adequate reviews of proposed subcontract costs prior to submitting proposals to FAA.

Third, IBM has submitted unsupported Bill of Materials Confidence (BOMC) factors and incorrectly applied these factors on AAS proposals. For example, IBM applied a BOMC factor to the prices of General Services Administration (GSA) listed items which effectively increased proposed costs by 25 percent. Rather than applying a BOMC factor to

GSA prices, IBM should have adjusted for uncertainties, if any, by adjusting proposed quantities.

Mr. Chairman, IBM has not provided adequate resources and management oversight to proposal preparation. The estimating system deficiencies have resulted in the inefficient use of DCAA audit resources, unnecessary increases in FAA contract administration efforts, and increased risk that optimal decisions are not made. We recommended the FAA Administrator take prompt action to ensure IBM or its successor corrects the estimating system deficiencies.

We also reported that FAA's technical assistance to DCAA needs improvement. FAA rarely provides DCAA with technical evaluations. Technical evaluations are comprehensive analyses of the efforts required to perform the tasks included in proposals. Additionally, DCAA's access to other AAS technical guidance has been limited by a rather cumbersome process. Without adequate technical assistance, DCAA has not been able to reach definitive conclusions on the acceptability of IBM's judgmental methods and assumptions for proposing costs. We recommended FAA provide DCAA with timely and complete technical assistance to enable DCAA to deliver enhanced audit support for making informed decisions.

Subsequent to our report, FAA, the contractor (IBM and Loral), and DCAA met to discuss the deficiencies, and I understand that Loral has agreed to take necessary corrective action to resolve the estimating system issues. FAA's formal response to the recommendations is due next week.

PROGRAM COSTS AND SCHEDULE DELAYS

Our report also identified seven areas which may result in future cost growth or schedule delays.

On December 13, 1993, the FAA Administrator notified Congress that the AAS Program will incur additional costs estimated to exceed $1.2 billion, bringing the total program costs to over $5.9 billion. From our perspective, the program was likely to experience additional cost growth and we identified four potential cost-growth areas. In each case, our report was supported by Administrator Hinson's 45-day review team status report.

First: Schedule - The Initial Sector Suite System (ISSS) schedule for testing, acceptance, and software updates is quite risky. It leaves little margin for schedule slippage and could lead to large cost increases to correct software problems. For example, FAA is deferring the development and integration of mission critical airway facilities and air traffic requirements until after FAA Technical Center acceptance and the limited production decision. On this issue, FAA's 45-day team concluded that the ISSS current plan of acceptance prior to the incorporation of mission critical requirements creates a significant element of risk because the Government will be buying a system that is not fully developed, may not meet critical operational suitability requirements, and will likely entail additional Government expense to make necessary corrections.

Second: Limited Consolidation - Instead of consolidating all terminal functions with enroute functions in an Area Control Facility, FAA's revised consolidation strategy to one of a limited consolidation requires the development of a "stand alone" terminal system. Substantially upgraded software and additional hardware for nine Metroplex Control Facilities (MCF) and more than 170 stand-alone Terminal Radar Approach Control facilities (TRACON) will have to be developed. We note that the $5.9 billion program estimate includes costs for only one MCF. FAA's report indicates that items requiring significant funding that are considered outside the original AAS Program include the building of eight new MCFs and automation equipment (except common consoles), replacement equipment and building renovations at 170 unconsolidated TRACONs, and other related equipment for MCF and upgraded TRACONs.

Third: Continuous Operations - Continuous operations is FAA's ability to maintain updated radar and flight plan information when the automated system is down for an extended period of time, such as unplanned outages and software maintenance and upgrades. While the proposed program replan includes an estimated $350 million to address this issue, until requirements are frozen and costs to design and deploy are finalized, the estimate is a best guess that is subject to increase. Regarding this issue, FAA's 45-day team stated that the technical solution for continuous operations is still uncertain. While IBM has identified a tentative engineering design for enroute continuous operations that will require additional hardware, the longer term solution has not been agreed upon.

Fourth: Other Cost Considerations - We identified three other considerations which should be recognized when viewing the $5.9 billion total program estimate. These are the off loading of costs from the AAS Program, developing and integrating key add-on programs to AAS, and the tremendous funding needs of the program. For example, development of operations such as Oceanic Automation and Traffic Flow

Management were originally part of the AAS Program. However, these projects are now being off-loaded from AAS Program requirements and will be developed and funded as separate projects. Additionally, AAS funding requirements for FY 1996 through 1998 will be nearly double the average funding levels for the prior 5 fiscal years. On off-loads from AAS, FAA's report also notes that AAS was to have provided Tower Computer Control Complex (TCCC) to 258 of FAA's largest towers. The $5.9 billion estimate would provide TCCC to only 150 towers, with the remaining 108 to be added to the list of 200 smaller towers for which there are no defined plans for new automation systems. On integrating key add-on programs, FAA's status report indicates that a number of programs, such as data link services and weather information displays, must interface with AAS to be useful. In some cases, neither AAS nor the interfacing program has estimated costs for integration.

There are large contract delays. FAA's proposed replan recognizes an ISSS delay of nearly 3 years beyond the milestones in the AAS contract with IBM. The other AAS segments are similarly behind contract milestones.

We identified three areas which could lead to additional schedule delays. They are (1) system testing, (2) requirements changes, and (3) the sale of IBM Federal Systems Company. While the latter two are quite obvious and the subject of much discussion, I want to mention the system testing issue. In TRW's (an FAA support contractor) recent assessment of the ISSS development, they concluded that the ISSS schedule has no slack. Any significant flaws identified during testing could result in further delays in deployment of ISSS to Seattle. Another testing issue which puts the schedule at risk is reported problem closure. As of January 1994, the outstanding Program Trouble Report (PTR) balance was over 3,000, which was down from a December 1992 high of 4,002. FAA's status report states that approximately two-thirds of the 3,000 open PTRs for ISSS have no identified means of correction or solution, and a significant number of these will have to be fixed prior to operational readiness at Seattle. In addition, FAA anticipates that a significant number of PTRs will be generated during the operational testing period following formal acceptance.

FAA program officials recently indicated the PTR balance has grown to about 3,500, and includes numerous unresolved, emergency, test-critical problems. Some PTRs require extended periods of time for closure because of the complexity of the problems and the availability of resources. To put this in perspective, IBM estimates that 50 lines of software code need to be developed and 20-labor hours expended to fix a PTR, on average. This means that at present, approximately 175,000 lines of code will need to be developed, integrated, and tested, and about 70,000 labor hours will need to be expended to address currently outstanding PTRs. Because of the large number of outstanding PTRs and little assurance that the rate of new PTRs generated in the next year will be fewer or less time consuming to resolve than past reports, FAA and IBM must manage the contractor's performance more closely and focus the necessary resources on resolving and closing these PTRs on a timely basis. I am concerned the longer these issues remain unresolved, the more it will cost to fix them, and the schedules will be further delayed.

This completes the recap of the report on the initial phase of our review. Before I discuss where we are planning to go from here, it is important to note some of the other reviews and studies of the AAS Program that have just been completed or are underway. The Administrator appointed an AAS review task force to develop and provide a realistic assessment of the likely cost and schedule of the program. The 45-day task force issued its report in March 1994 concluding that the ISSS operational readiness date at Seattle is likely to slip at least another 20 months and the total AAS Program cost is estimated to reach another $1 billion beyond the $5.9 billion announced last December.

Another high-level FAA team has been tasked with reviewing all elements of the AAS Program, particularly a revalidation of the need for requirements and an assessment of the benefits they provide. The review is expected to be completed some time later this month. Additionally, the AAS Program office has established a Contract Administration Optimization Team to conduct an internal program review that will identify cost-saving measures in contract administration. The Center for Naval Analysis (CNA) has also been commissioned to conduct an independent assessment of the organizational, management, and financial concerns raised by the AAS Program. This indepth review will provide recommendations on how to improve management of the program. CNA's report is due this month. The House Survey and Investigations Staff of the House Appropriations Committee has also initiated an inquiry into the AAS Program. Additionally, GAO is conducting their annual review of the status of FAA's modernization program, which includes a review of the AAS Program.

As part of our continuing oversight, we will review the results of the various examinations and studies and closely monitor corrective actions taken by FAA and IBM. Through DCAA, we will continue to audit the AAS contract with IBM. We also plan on reviewing how FAA is planning for the integration of other key programs with AAS, such as the Center TRACON Automation System, Data Link, and Oceanic Automation, and identifying industry alternatives to developmental items or systems. Other objectives will be determined as we continue to monitor this program in response to the concerns at the time. We expect to issue our next report this fall.

~ME3146.XLS

4/22/94

Advanced Automation System
Financial Summary ($M)
(as of 3/31/94)

	FY 83	FY 84	FY 85	FY 86	FY 87	FY 88	FY 89	FY 90	FY 91	FY 92	FY 93	FY 94	Total
Appropriated	30.0	45.9	27.2	12.2	93.4	170.0	210.5	377.9	514.4	449.4	359.5	293.2	2,583.5
Obligated	30.0	45.8	27.2	12.1	93.4	170.0	210.2	372.8	511.7	446.2	351.6	165.5	2,436.3
Prime Contract Obligations						60.0	146.3	242.4	306.6	297.4	243.3	127.4	1,423.4

U.S. House of Representatives
COMMITTEE ON PUBLIC WORKS AND TRANSPORTATION
SUITE 2165 RAYBURN HOUSE OFFICE BUILDING
WASHINGTON, DC 20515
(202) 225-4472

May 13, 1994

The Honorable David R. Hinson
Administrator
Federal Aviation Administration
800 Independence Avenue, S.W.
Washington, D.C. 20591

Dear Mr. Administrator:

Thank you for your testimony at the Subcommittee on Aviation's recent hearing to review developments in the Advanced Automation System. As you indicated, important decisions on the future of this program are still to come, and you need the benefit of further analyses that are underway before you make these decisions. We agree with you that decisions should not be rushed before all the options are fully understood.

We would like to provide you with some of our observations about the future of the program, based on your testimony, the testimony of others, and the comments of Members of the Subcommittee on Aviation in the hearing.

First and foremost, the level of funding identified in the Daschle Report to complete the program as currently envisioned is far more than what we believe can be afforded, given the budget constraints under which we labor. In fact, we believe the $1.2 billion that you identified last December in additional costs is more than we can afford. In your decisions on restructuring and recasting the program and in analyzing the requirements, we believe the agency should be focused on a total AAS program cost of approximately $5 billion.

Second, in order to accomplish this, the contractor is going to have to get the software development and debugging process under control with software development costs brought into line with what is being incurred elsewhere in the industry. In the hearings, a number of witnesses mentioned an organizational or management approach and process developed by the Software Engineering Institute of Carnegie-Mellon that can be used by individual companies involved in large-scale software development to ensure that it is undertaken effectively and efficiently. This is accomplished through a rigorous testing and quality control regime. The testimony in the hearing and briefings we have had indicate that there could well be strong cost-benefit impacts on the program if the AAS software development process and organization were modeled on this approach. As you consider reshaping the program and contract, we would urge you to strongly consider requiring this sort of organizational and process criteria in the completion of the program.

Third, one of the major issues before our hearing was the extent to which the program should be structured to take advantage of existing technology that needs no further development. We had virtually every U.S. company involved in the air traffic control field before us, and it is clear there are a lot of existing capabilities. FAA Administrators since Jim Busey have advocated the use of "off-the-shelf" technology as much as possible. We believe the current predicament in the AAS program offers an opportunity to really follow through on the agency's commitment to use existing technology.

For instance, in much of the terminal area or tower environment it appears that the FAA, should, to the greatest extent possible, ask vendors to bring what they presently have developed to you for an evaluation and procure that which best meets agency and user community needs. We would suggest doing this with clear eyed recognition that not all of your requirement writers' wishes may be met. And the technology may not be as reliable as the agency would presently like, but it would likely be good enough and a great deal better than what is presently fielded in some cases. We believe this approach could go a long way to getting the costs down to a level that can be realistically funded and achieving system deployment on a more timely basis.

Finally, the agency needs to do a much better job of keeping the Congress fully and accurately informed of what is transpiring in this program than was the case after hearings last year. We believe the agency's credibility with the Committee and the Congress as a whole was significantly hurt in the submission of quarterly progress reports that only told about a facet of the program that was seemingly progressing while not reporting on others that were experiencing problems so severe that you eventually called for a wholesale review. We believe steps you have taken and the quality and thoroughness of Deputy Administrator Daschle and Counsel Gerchick's report have been very important steps in rebuilding credibility.

However, the Congress will need fuller and accurate progress reports that provide information on the following in order to understand and be supportive of your efforts to fix this program. We believe the report should be submitted on a monthly basis and have the following format and content.

- A general discussion of what was achieved and what problems were encountered in the previous month;

- The status of resolving program trouble reports during the previous month and how many new ones were identified and their significance;

- A summary of the spending of appropriated funds for the previous month;
- An assessment and analysis of the likelihood to meet future schedule milestones.

Please continue to keep us abreast as you digest the CNA Corporation Report and the agency's internal analyses.

Sincerely,

William F. Clinger, Jr.
Ranking Republican
Subcommittee on Aviation

James L. Oberstar
Chairman
Subcommittee on Aviation

U.S. House of Representatives
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June 30, 1994

The Honorable David R. Hinson
Federal Aviation Administration
800 Independence Avenue, S.W.
Washington, D.C. 20591

Dear Mr. Hinson:

Thank you very much for your briefing yesterday on the status of the Advanced Automation System program. We very much appreciate the approach you have taken so far to get this program moving toward success. At the same time, achieving success appears to be a long way off.

Your briefing assured us that the cost of the program will be approximately $5.4 billion instead of $6.9 -7.3 billion; that there is a new management team and approach being installed; that the system architecture will be more open and flexible; and that the technology will have the same level of capability as always envisioned.

However, we find it difficult to accept that under current plan the first Initial Sector Suite System will not be fielded until sometime in 1998, four years from now. It is difficult to reconcile this lengthy schedule with reforms which should have accelerated the program. In our earlier discussions we were given to believe that the aspect of the program creating the most technical difficulties was the electronic flight data strips. This aspect of the program has now been jettisoned.

You also stated yesterday that your new approach will build the needed redundancy in the system through computer hardware rather than complex software thereby eliminating a lot of development work. We would have thought that these two fundamental changes would assist in bringing the system on-line sooner.

The Daschle Report indicated that if the program was not changed, the first ISSS would not be delivered until sometime in 1998. Now the program has been fundamentally altered with no apparent impact on the schedule.

The Honorable David R. Hinson
Page 2

We were also disturbed that in the terminal area, there will not even be a request for proposals until 1996, with no delivery until 1997, at the earliest. Our Subcommittee hearing convincingly indicated that there is existing technology in this area. It is not clear to us what will be going on between now and 1996, but again, that is a long time, given the state of technology already being deployed in other countries with busy terminals.

We believe if Congressional support is to continue for this very sizable program it is imperative that the users of the aviation system start realizing benefits of this expensive technology soon. Given overall budgetary pressures, coupled with the large annual outlay for this program in the $400 - 500 million range, we simply must begin to see technology that is capable of providing benefits to the users.

We got no sense of this urgency from your briefing. We are not saying that you should rush critical decisions, but you should find ways to permit advanced technology to be deployed sooner than you are presently anticipating.

You have done a lot to instill confidence in your management of this troubled program, and we believe confidence will continue to grow because of your efforts. But at some point, the technology is going to have to speak for itself, to keep confidence in and support for the program. That point needs to come a lot sooner than four years from now, given the delays we have already incurred.

Sincerely yours,

James L. Oberstar

JAMES L. OBERSTAR
Chairman
Subcommittee on
Aviation

NORMAN Y. MINETA
Chair, Committee on
Public Works and Transportation

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U.S. Department of Transportation
Federal Aviation Administration

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Office of the Administrator
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800 Independence Ave., S.W.
Washington, D.C. 20591

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AUG 5 1994

The Honorable Norman Y. Mineta
Chairman, Committee on Public Works
and Transportation
House of Representatives
Washington, DC 20515-6256

Dear Mr. Chairman:

I apologize for the delay in responding to your letter regarding the status of the Advanced Automation System (AAS) program. You are certainly correct in saying that while we are making progress, full success is a long way off. Hopefully, we have restructured our programs to provide new functionality and benefits to all our users and visible indicators of our progress at frequent intervals.

First, I want to clarify a possible misunderstanding. As a result of the recovery process, the old AAS program cost will be reduced. Our initial estimates put the new costs in the range of $5.4 billion. However, the future terminal radar approach control (TRACON) automation system (Capital Investment Plan number 62-25) program has always been external to the AAS and will require approximately $600 million additional. This program will provide new air traffic control automation equipment for the nonconsolidated TRACON's (approximately 180) and any metroplex control facility beyond Southern California TRACON and will be based upon commercially available hardware and software. I just wanted to make certain we were clear on this matter.

I have recently initiated a team to develop all materials required for a competitive procurement for a new terminal area system, including a requirements specification. It has been our experience that when we do business as usual, we would not be able to award a contract for a new terminal system until 1997. We are looking for ways to expedite this process and plan to take every possible step to do so. However, we are limited by the available funding in FY 1994/95; the funds necessary to award a contract will not be available until FY 1996. This approach and schedule are consistent with our needs, as we do have the means to sustain these systems until they are replaced.

As you are aware, a comprehensive audit of the initial sector suite system (ISSS) software is underway. The results of this audit will greatly influence the procurement approach for en route automation. If audit findings result in a restart of the development effort, then 1999 may be a realistic date for fielding a new system. If the audit determines that much of the ISSS code developed to date is useable, a system may be deliverable earlier. This outcome will also determine what interim measures must be taken in the near term to replace critical elements such as the display channel. We will make this decision in September and will provide a complete program plan to you prior to October 1.

In early June, we initiated an activity to reevaluate our automation strategic plans. This was done for the very reasons you stated, the need to make use of currently existing, advanced technology to provide user needs and benefits as soon as feasible. The results of this activity provide input into the automation plan which will be provided to you later this year.

I share your urgency in the need to have demonstrable and fieldable progress. I am questioning every schedule to make certain we are not wasting time. My commitment to you is that I will push each project as fast as it can realistically be accomplished.

Thank you again for your interest and support as we try to restructure our advanced automation program. I hope your schedule will allow us to continue to share our plans and activities with you and that our staffs will continue to work closely together. Your insight has proven to be very valuable to us.

An identical letter has been sent to Chairman Oberstar.

Sincerely,

David R. Hinson
Administrator

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