
Office of Inspector General

Wide Area Augmentation System

Federal Aviation Administration

Report Number: AV-1998-117

Date Issued: May 13, 1998





**U.S. Department of
Transportation**

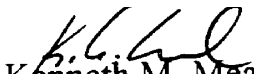
Office of the Secretary
of Transportation

Office of Inspector General

Memorandum

Subject: INFORMATION: Wide Area Augmentation System,
Report Number: AV-1998-117

Date: May 13, 1998

From: 
Kenneth M. Mead
Inspector General

Reply to
Attn of:

To: Federal Aviation Administrator

In June 1997, the Chairman, Subcommittee on Transportation and Related Agencies, Committee on Appropriations, U.S. House of Representatives requested the Office of Inspector General (OIG) to review the Federal Aviation Administration's (FAA) Wide Area Augmentation System (WAAS). Since then, we have been providing oversight of the WAAS Program.

On October 1, 1997, we presented the Subcommittee on Aviation, Committee on Transportation and Infrastructure, U.S. House of Representatives, our observations on WAAS and FAA's plan to use satellite technology for air traffic management. On October 17, 1997, we issued a report to the Secretary of Transportation containing the testimony and recommendations to improve FAA's transition to satellite technology. Since that time, we have focused our efforts on FAA's January 1998, rebaselining of the WAAS Program and its communications satellite plans. We also provided input to the Secretary of Transportation's report to Congress regarding the status and management of the WAAS Program. On April 15, 1998, we sent the attached letter to Chairman Wolf on the results of our recent efforts. A brief synopsis of the information reported to Chairman Wolf follows.

The WAAS Program has technical and program uncertainties. Uncertainties relating to interference of the WAAS signal from unintentional and intentional jamming, communications satellites, and ionospheric variations must be resolved. Because of these uncertainties, FAA is now reconsidering the need for a backup system to WAAS. In our opinion, some type of *back-up system* for WAAS will be needed for the foreseeable future. In addition, the National Airspace System Modernization Task Force is discussing alternatives regarding the future phases of

WAAS. In our opinion, determination of the intended ultimate use of WAAS (whether it will be a primary or a sole means of navigation) is the most critical issue impacting the WAAS Program.

The ultimate decision on whether WAAS will be used as a sole or primary means of navigation will impact FAA and the aviation industry. For example, FAA currently plans to begin decommissioning its existing navigation aids in 2005 and transition to WAAS as a sole means of navigation. If WAAS is not a sole means of navigation, FAA will incur additional expenditures, not currently planned, to acquire, upgrade, modernize, and maintain existing navigation aids. FAA's decision will also impact the aviation industry plans regarding avionics equipage. Furthermore, in our opinion, this schedule is very optimistic given all the uncertainties in the WAAS Program.

The uncertainties of the WAAS Program, coupled with plans to reduce funding for WAAS in Fiscal Year 1999, and the rethinking on the need for a backup system, will impact WAAS requirements, schedule, and costs. Because of significant unresolved issues and the relatively fluid state of program definition, we plan to continue monitoring the WAAS Program. We will monitor FAA's satellite plans and costs and evaluate FAA's process for determining whether a backup system for WAAS is needed and its costs. We will also determine the potential capabilities of each phase of the WAAS Program.

This report contains no recommendations, and a response is not required. If we can answer any questions, please feel free to contact me on (202) 366-1959, or Alexis Stefani, on (202) 366-0500.

Attachment

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Attachment

**U.S. Department of
Transportation**

Office of the Secretary
of Transportation

The Inspector General

Office of Inspector General
Washington, D.C. 20590

April 15, 1998

The Honorable Frank R. Wolf
Chairman, Subcommittee on Transportation
and Related Agencies
Committee on Appropriations
U.S. House of Representatives
Washington, D.C. 20515

Dear Mr. Chairman:

This letter provides the status of our continuing review of the Federal Aviation Administration's (FAA) Wide Area Augmentation System (WAAS) Program. Since our most recent letter to you (November 26, 1997), we have focused our efforts on FAA's January 1998 rebaselining of the WAAS Program and its communications satellites plans and costs. We also provided input to the Secretary of Transportation's report to Congress regarding the status and management of the WAAS Program.

WAAS is being developed to augment the global positioning system to provide navigation and approach capabilities for civilian use. The initial WAAS (Phase I), scheduled to be operational in late 1999, will allow WAAS to be used as a primary system for domestic enroute navigation and nonprecision approaches to airport runways. It will also provide limited precision approach capabilities. Phase II does not provide any additional capabilities for WAAS users. Phase II acquires additional software development, systems engineering, and WAAS hardware including reference and master stations. The final phase of WAAS (Phase III), scheduled to be operational in late 2001, is planned to be a sole means navigation system. This will allow existing navigational aids such as nondirectional beacon facilities and category I instrument landing systems to be decommissioned. Under category I approaches, an aircraft receives guidance as it descends to a height of 200 feet above the ground when the runway's visibility is at least 1,800 feet.

On February 24, 1998, FAA program officials exercised over \$112 million of contract line items for Phases II and III. The total price of Phase I and contract line items exercised for Phases II and III exceed \$330 million. Contract line items exercised for Phases II and III primarily include software development and systems engineering tasks. Contract line items have not been awarded for associated hardware valued in excess of \$75 million for Phases II and III.

As you know, WAAS Program cost growth has been the subject of much debate. In April 1994, FAA estimated the life-cycle costs for WAAS at \$1.4 billion. By July 1997, FAA proposed revising the WAAS life-cycle costs to \$2.4 billion. On January 9, 1998, FAA formally approved the WAAS life-cycle cost estimate of \$3.049 billion including \$1.282 billion for satellites. However, this estimate is not solid because of the uncertainties associated with the communication satellites.

A myriad of factors contribute to the difficulty in estimating costs and determining the exact number of communications satellites needed. These factors include: (1) types of satellites to be used (payload capabilities, life expectancy, and size), (2) orbital location (geostationary, medium, or low earth orbit), (3) vehicle used to launch the satellites, (4) whether FAA will have priority over other users of the satellites, and (5) whether the satellites will be purchased or leased.

For example, the Department of Defense's National Reconnaissance Office estimates that if a large launch vehicle is used, launch costs per satellite would be \$80 million. Conversely, if a smaller launch vehicle is used, the costs would be \$25 million per satellite. Satellites in a low or medium earth orbit pass in and out of view more frequently than those in a geostationary earth orbit. Thus, more satellites in these lower earth orbits would be needed to provide the required coverage.

FAA has only limited experience in acquiring satellites. On January 8, 1998, FAA issued a Request for Information for qualified vendors to provide approximate costs for communications satellites services. Responses to the Request for Information have been received and FAA will use data in these responses to refine their satellite cost estimates.

The U.S. House of Representatives Conference Report on the Fiscal Year 1998 Department of Transportation Appropriations (Report 105-313) directed the Secretary of Transportation to report to Congress on the WAAS acquisition program. We reviewed the report prior to its submission and made numerous suggestions to improve the report's clarity and content. Most of our suggestions were incorporated in the report submitted to Congress on February 11, 1998. We were pleased to see that the report disclosed key WAAS technical and program uncertainties, including those relating to communications satellites.

Before FAA can achieve a full "buy-in" to the total WAAS project from stakeholders, uncertainties relating to interference from unintentional and intentional jamming, and ionospheric variations must be resolved. Because of these uncertainties, FAA is now reconsidering the need for a backup system to WAAS. In our opinion, a back-up system for WAAS will be needed for the foreseeable future.

It is unlikely that a back-up system can be eliminated until experience with WAAS shows that it is capable of providing almost flawless performance over a sustained period of time. The type of back-up system selected will have a direct bearing not only on costs to the Government, but also on avionics costs to general and commercial aviation users. FAA has estimated that it would cost over \$166 million annually to maintain its existing nondirectional beacons, very high frequency omnidirectional range/distance measuring equipment, and category I instrument landing systems. These costs are not included in the current estimate of the life-cycle costs of the WAAS Program.

Subsequent to the rebaselining of the WAAS life-cycle costs, WAAS Program officials were informed that funding for Fiscal Year 1999 may be reduced by \$20 million. The impact of this proposed funding cut is expected to cause a slip in the WAAS Program of about 6 months.

On March 30, 1998, Vice President Gore announced that a second civilian signal would be provided by the global positioning system. However, the actual structure of the signal for aviation use will not be determined until August 1998. Until a decision is made on the structure of the second signal for aviation purposes, the associated impact of the cost and schedule to the WAAS Program can not be determined.

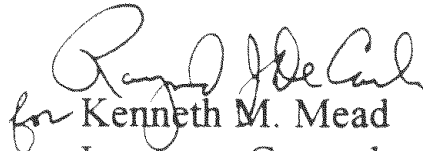
Most of the WAAS user benefits come from the expansion of category I approach and landing capabilities to airports not having that capability today. Key recipients of these benefits are the regional airline and general aviation communities. However, benefits to commercial carriers are not well defined.

In our opinion, the technical and program uncertainties coupled with plans to reduce funding for WAAS in Fiscal Year 1999, and the rethinking on the need for a backup system, will impact WAAS requirements, schedule, and costs. In addition, the Administrator's National Airspace System Modernization Task Force is discussing alternatives regarding the subsequent phases of WAAS. In our opinion, determination of the intended ultimate use of WAAS (whether it will be a primary or a sole means of navigation) is the most critical issue impacting the WAAS Program. FAA must forge a consensus with the aviation community and establish the planned use of WAAS. This decision will impact not only the WAAS contract and costs, but also the schedule for decommissioning existing navigational aids.

Because of significant unresolved issues and the program being in flux, we plan to continue monitoring the WAAS Program. We will monitor FAA's satellite plans and costs and evaluate FAA's process for determining whether a backup system for WAAS is needed and its costs. We will also determine the potential capabilities of each phase of the WAAS Program.

If I can answer any questions or be of further assistance, please feel free to contact me on (202) 366-1959, or Raymond J. DeCarli, Deputy Inspector General, on (202) 366-6767.

Sincerely,


for Kenneth M. Mead
Inspector General

OIG Report Number: AV-1998-117, April 15, 1998