

Cost Engineering

August • 1997

The International Journal of Cost Estimation, Cost/Schedule Control and Project Management

Our Vision: Total Cost Management



Air Route Surveillance Radar

*US Department of
Energy/
AACE International
Joint
Agreement!*

See inside for details—

The US Federal Aviation Administration's Airspace System in a Changing World

Sarwar A. Samad, CCE—Chair, Aerospace Committee

Material in this article is taken from the Aviation System Capital Investment Plan, 1995 and 1996 edition

No nation in the world has had a comparable impact on high technology than the US. In fact, the US has discovered the most important technologies that are changing many countries in the world. The best example of this is the supercomputer. In both commerce and the defense industry, supercomputers help scientists to discover and to create new products. The recent Mars landing is another successful example. Aerospace is another successful industry. However, there are alarming signs as we move into the final years of the twentieth century that the US's market share has suffered a calamitous decline for the last decade. The purpose of this article is to talk about the US National airspace system (NAS) and the US Federal Aviation Administration (FAA) and their goals, plans, and projects.

The Federal Aviation Administration (FAA) plays a crucial role in the growth of commercial aviation as well as supporting the defense industry. Indeed, since 1958, the FAA has had a dual mission: promoting aviation and ensuring safety in the industry. The FAA's mission is to ensure the safe and efficient use of airspace; foster civil aeronautics and air commerce in the US and abroad; and to support US national defense. The US has the largest, busiest, and most-advanced aviation operation system in the world. The FAA supplies and operates the US air transportation system and the air navigation system.

Air navigation and air traffic systems need to be corrected and upgraded. Just as cars use highways to travel from place to place, airplanes use airways (highways of the sky) to travel from city to city and from continent to continent. These airways are used daily by thousands of airplanes. Some of the FAA's major activities include handling aircraft takeoffs and landings, en-route airspace management, conducting aircraft safety inspections, ensuring airport security, providing airport improvement via grants, and operating and maintaining the NAS. However, analysts tell us that the number of new orders for commercial airplanes will increase before the end of this century. Market projections predict very high levels of jetliner sales in the next decade. Just as more cars mean more roads, more aircraft mean more airways and more aviation activities. This will result in an increase in aircraft operations and in

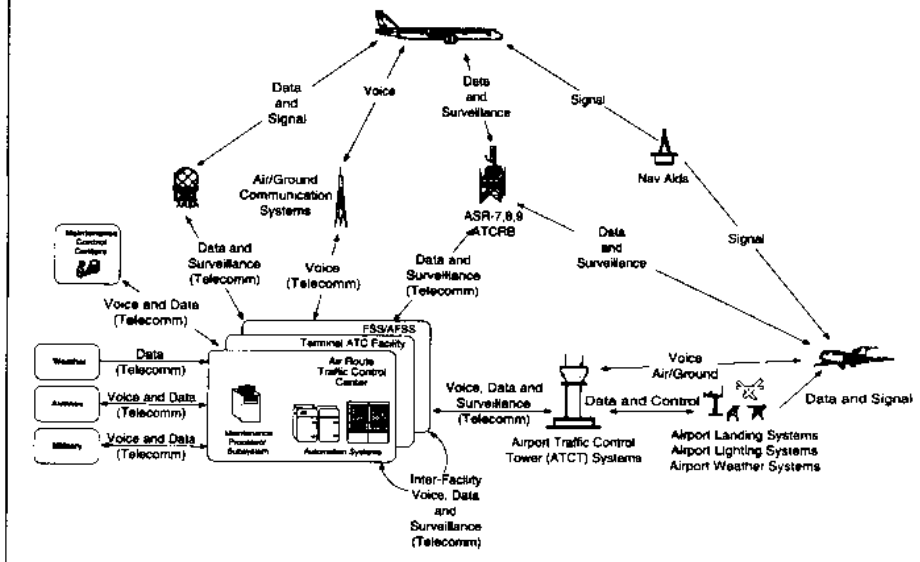
airports' capacity to handle the navigational needs of air traffic. To maintain the NAS at the level needed to meet this expansion, alternatives must be found to meet these challenges.

The driving-force of all technologies is research and development. Indeed, research and development is the only way to modernize any technology, including communications. The FAA is forced by the continuing growth of aircraft operations, the variety of operations, and the sophistication of aircraft to make a transition to new global coordination. The FAA's goal for the remaining years of this century is to manage this transition effectively and to aggressively redevelop the national US airspace system, retaining to the extent possible its unique capabilities. To achieve these objectives, the FAA has to modernize its system. The FAA has developed a set of goals for the national airspace system.

COMMUNICATIONS PROJECTS

The FAA has developed a set of communications projects that concentrate on a voice switching and control system that provides a way to perform the intercom, interphone, and air/ground voice connectivity and control functions needed for air traffic control operations in an air route traffic control center. A data multiplexing network continuation system is being developed that provides modern data communication technologies for cost-effective, point-to-point data transmission. Radio control equipment that provides all of the equipment used to control air/ground radios from remote locations and a weather message switching center replacement system to perform all data handling functions of the US National Weather Service telecommunications are also being improved. Airport comm voice switches, that provide modern voice switching equipment to replace old ones, are another project, as is a telecomm satellite to provide the FAA with a leased satellite interfacility communications network. Finally, a backup emergency comm will replace the old system (circa the 1950s) at air route traffic control centers.

1992 National Airspace System (NAS) Infrastructure



Courtesy of FAA Western Pacific Region Airway Facilities Strategic Plan, 1993 edition.

Figure 1—Ground-Based System

AUTOMATION PROJECTS

These are capable of meeting the challenges of the next century. With the extensive use of automation, human errors will be reduced to a minimum. One of the advantages of using a full automation system is to have a clear and precise channel of communication between the air traffic control tower and the plane during takeoff and landing, as well as to have a reliable automatic surveillance radar. The number of human operators in aircraft approaches, landings, takeoffs, and departures has been reduced. A very sophisticated, new system should reduce the rate of fatalities by at least 10 percent before the end of the century.

Most of the FAA's automation projects concentrate on an en-route automation program, which replaces old equipment and allows continued system growth. A tower automation program will integrate new safety systems with existing systems in a consolidated automation platform with a common computer/human interface. The automated radar terminal system will gather data from surveillance sensors, process it, and present it to air traffic controllers in terminal radar approach control facilities and control towers. A traffic management system to maximize air traffic capacity, minimize delays, and establish a reliable serviceable automation platform is also being developed. The oceanic automation program, which will develop new abilities to increase oceanic air traffic capacity and efficiency and lead to the introduction of free flight in oceanic air space is another automation project. A terminal air traffic control automation project will assist terminal radar approach control facility and air route traffic control center controllers by increasing the traffic flow and fully using all airspace capacity.

WEATHER PROJECTS

The weather projects concentrate on an automated weather observing system to obtain weather data through the use of automated sensors; it will then process the data and disseminate it to pilots by a computer-synthesized voice. A weather radar program to provide weather products for en-route applications and a terminal doppler weather radar system to alert aircraft of hazardous weather conditions and provide advanced notice of changing wind conditions is in the process of being improved. An airport surveillance radar weather systems processor, which will enhance the hazardous weather detection capability of airport surveillance radar, is being modernized.

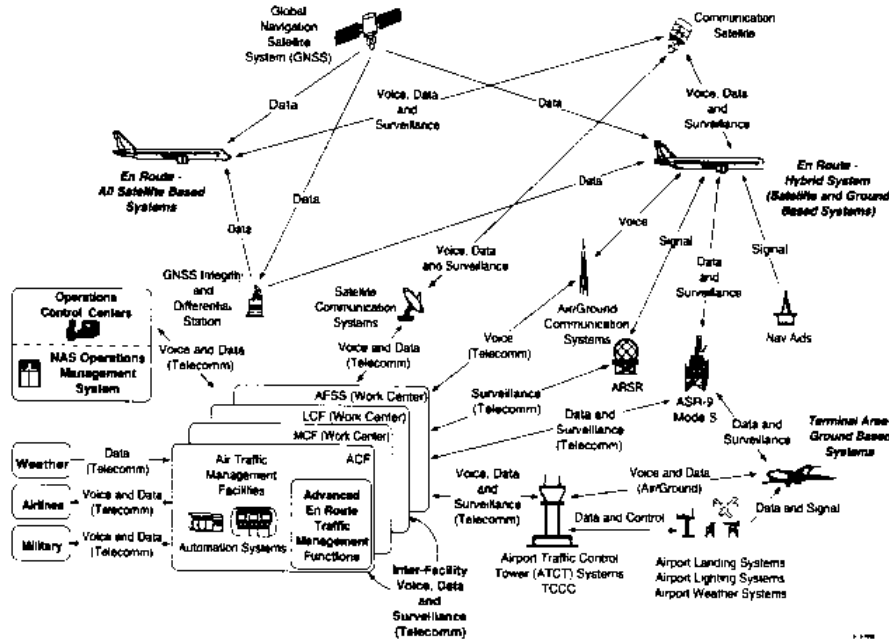
NAVIGATION AND LANDING PROJECTS

These projects include area navigation (Loran-C) satellite navigation and a sustain ground system. Landing projects include a sustain ground system, studying satellite systems, and upgrading visual approach aids.

SURVEILLANCE PROJECTS

Surveillance projects are concentrated on airport surface detection equipment to provide radar surveillance of aircraft and airport service vehicles and an airport movement area safety system to provide a runway accident prevention system at airports with airport surface detection equipment (ASDE-3). A terminal radar program and long-range radar programs to provide economical en-route service due to increased air traffic densities are both being upgraded.

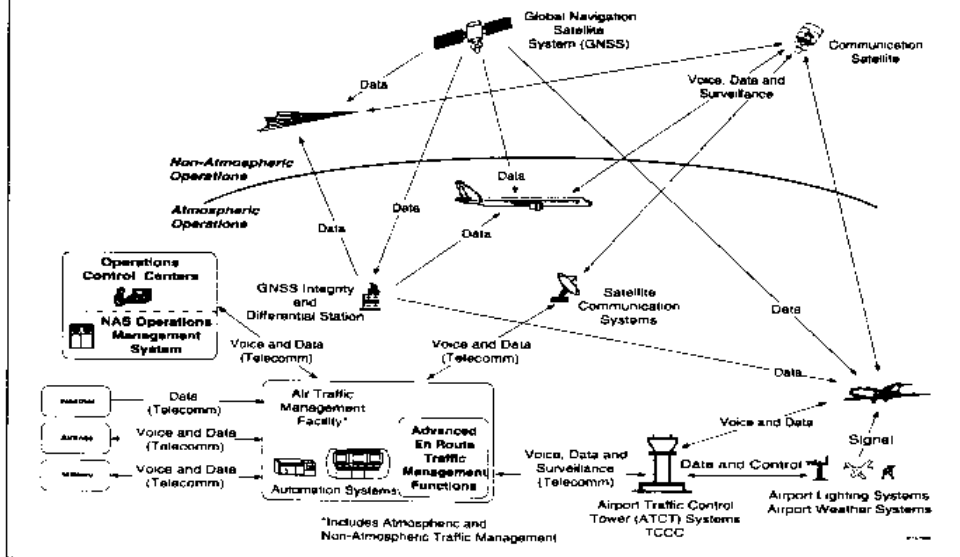
2010 National Airspace System (NAS) Infrastructure



Courtesy of FAA
Western Pacific
Region Airway
Facilities Strategic
Plan,
1993 edition.

Figure 2—Space-Based System

20?? Air/Space Traffic Management System Infrastructure



Courtesy of FAA
Western Pacific
Region Airway
Facilities Strategic
Plan,
1993 edition.

Figure 3—The System of the Future

FACILITIES PROJECTS

The FAA has many projects under this heading. Facilities projects include increased system capacity through new airports and runways, limited TRACON consolidation to improve airspace management, and NAS facilities occupational safety and health and environment compliance projects. The purpose of these projects is to ensure that all FAA facilities comply with US federal and state regulations and statutes regarding environmental protection, occupational safety and health, and energy conservation. Technical center activities include engineering, development, simulation, and testing and aeronautical center activities. These activities include training, logistics support, and aeromedical research.

MISSION-SUPPORT PROJECTS

This goal concentrates on about 23 projects. Each project provides a certain service. For instance, a technical support service project will provide technical services to supplement regional, FAA aeronautical center, and FAA technical center facilities and equipment staff efforts necessary to implement improvement. Furthermore, a capital investment plan system engineering and development support project will provide expertise in system architecture and system engineering and program management of project implementation.

The NAS plan is incorporated into the aviation system capital investment plan and was developed in the 1980s. The plan includes a wide variety of modernization pro-

grams to change the ground-based system (figure 1) to primarily a space-based system (figure 2) with state-of-the-art electronics equipment and new operational concepts by the year 2010. In the future, the system will be completely space-based (figure 3). This plan includes 100 major projects.

The multibillion NAS infrastructure enhancements are financed by both the public and private sectors. The plan plays an important role in the development of civil aviation and also in the growth of the US economy. In fact, hundreds of contractors and vendors are working to improve the NAS infrastructure, creating several thousand jobs. So far, most parts of the plan have already been implemented. The FAA's airway facilities organization plays a vital role in the operation and maintenance of airport infrastructure.

The NAS projects are classified according to their function in the air traffic control tower/terminal radar approach control system. For example, the air traffic control tower project affects the control of aircraft in flight, between take-off and landing. The aim of this project is to sustain terminal facilities by replacing existing air traffic control systems with new systems that have the capability to ensure safety and handle many functions simultaneously. The project includes modernizing towers and control facilities as well as operational support, and will reduce staffing, training, and costs.

The terminal projects include three systems that have been used in terminal air traffic control: the airport traffic control tower, terminal radar approach control, and terminal radar approach control in the tower cab. Each one of these systems has its own function. For example, the air traffic control towers separate aircraft; the standard space between airplanes is never less than 5 horizontal miles and 1,000 vertical feet. This system also sequences aircraft in the traffic pattern, expedites arrivals and departures, controls ground traffic, and provides clearance and weather information to pilots. The terminal radar approach controls, on the other hand, separate and sequence both arriving and departing flights. The third kind of system serves a function similar to the second system, but is located within the tower cabs of airports.

The flight service and weather projects basically provide very important information to pilots about weather conditions. These projects reduce the operation costs by providing upgraded flight service operations by using automation and by consolidating over 300 facilities to 61 facilities.

The FAA's National Airspace System modernization program will enhance safety and security, technological leadership, productivity, cost, and time. Many recent airplane crashes, including the ValuJet crash on May 11, 1996, have caused many public officials, including Federico Pena, the US Transportation Secretary, to question the FAA's dual mission. Pena said the dual mission "has caused some to believe that the FAA had to make choices between safety and promoting the industry it regulates." Pena told reporters, "Therefore, I am urging that Congress change the FAA charter to give it a single primary mission: safety and only safety."

If the FAA can continue its leading role it will forge a better link between the resources of the US government and the resources of technology. The FAA doesn't need an industrial policy. It needs a technology policy that corrects and upgrades the current system and keeps the US airspace industry both efficient and competitive. ♦

THE EAST TENNESSEE SECTION'S 7TH ANNUAL FALL SEMINAR

Cost Management and Privatization—
Features 10 track speakers; followed by a
2-day, hands-on computer training session.

October 20-22, 1997

For more information, contact
Wiley Byers at 423-576-7957
fax: 423-576-2752
e-mail: wwb@compuserve.com
Internet: www.aace-ets.org

Cost Engineering

*Simply the best advertising choice
for cost profession products and services.*

Call 800-858-COST or 304-296-8444 for a complete media kit!