

1. Introduction

Overview

The FAA R&D Strategy will guide the FAA's R&D program over the next 5 years, with appropriate biennial revisions. Given the lengthy period of time typically required to move from completion of research to operational application or deployment of results, a 5-year strategy requires at least a 10-15 year perspective on future evolution and needs of the aerospace system.

The strategy addresses only research to be performed by FAA, singly or in collaboration with others, to meet its specific mission elements, goals, and responsibilities. A broader description of Federal civil aviation goals and research being conducted or planned by FAA, the National Aeronautics and Space Administration (NASA), and the Department of Defense (DoD), is found in the National Science and Technology Council's *National Research and Development Plan for Aviation Safety, Security, Efficiency and Environmental Compatibility* (November 1999).

This document addresses R&D objectives and strategies in a manner independent of the organizational structure and management processes involved in the planning and implementation of specific programs and projects. Project-level information on the current program is found in the FAA *National Aviation Research Plan*, which includes programmatic, budget, and schedule information.

R&D as a Strategic Element in Fulfilling the FAA Mission

The purpose of the FAA R&D program is to support FAA's strategic goals and mission, which embody the overarching Department of Transportation (DOT) strategic goals. In so doing, the R&D program collaborates with and supports the entire aviation community in achieving beneficial outcomes for all system users.

DOT Goals

The DOT has defined five strategic goals in its Strategic Plan: Safety, Mobility, Economic Growth, Human and Natural Environment, and National Security.¹

Safety: Promote public health and safety by working toward the elimination of transportation-related deaths, injuries, and property damage.

Mobility: Shape America's future by ensuring a transportation system that is accessible, integrated and efficient, and offers flexibility of choices.

Economic Growth: Advance our economic growth and competitiveness domestically and internationally through efficient and flexible transportation.

¹ *Strategic Plan 2000-2005*, U.S. DOT, 2000.

Human and Natural Environment: Protect and enhance communities and the natural environment affected by transportation.

National Security: Advance the nation's vital security interests in support of national strategies such as National Security Strategy and National Drug Control Strategy by ensuring that the transportation system is secure and available for defense mobility and that our borders are safe from illegal intrusion.

FAA Goals

The FAA Strategic Plan outlines goals consistent with the DOT goals.²

Safety: By 2007, reduce U.S. aviation fatal accident rates by 80 percent from 1996 levels.

In addition to the reduction in the air carrier accident rate, this goal also has the parallel objective of limiting the number of general aviation fatal accidents to 350 per year by 2007. Increased survivability in air carrier flights is also explicitly identified as an objective. Accident prevention and the analysis and sharing of safety information are key elements of the FAA strategy for this goal, which is a key constituent of the DOT Safety goal.

System Efficiency: Provide an aerospace transportation system that meets the needs of users and is efficient in the application of FAA and aerospace resources.

The key objectives associated with the System Efficiency goal are (1) to enable users of national airspace system (NAS) services to continue to meet their business or personal objectives in the face of increasing system demand and to increase the availability of NAS services and facilities to users; (2) to reduce their costs associated with use of those services, and (3) to reduce costs borne by the federal government in providing the services. Key agency strategies include implementation of Free Flight capabilities, modernization of the NAS, and integration of airport and commercial space requirements into NAS planning and architecture. The System Efficiency goal is supportive of the DOT Mobility, Economic Growth, and Human and Natural Environment strategic goals.

In addition, the FAA has established another goal considered critical to accomplishing its mission.

Environment: Prevent, minimize and mitigate environmental impacts, which may represent the single greatest challenge to the continued growth and prosperity of civil aerospace.

² In legislation signed on November 19, 2001, the President created a new Transportation Security Administration (TSA) within the Department of Transportation. The FAA's responsibilities for aviation security were transferred to TSA, but the FAA is cooperating closely with TSA and will continue to be highly sensitive to security implications associated with evolving aviation technology and operational concepts.

Increased understanding of aerospace system environmental impacts, and identification of means to reduce them to acceptable levels are activities central in meeting this goal. Additionally, this area includes the objective of quantifying and mitigating the environmental impact of FAA activities.

FAA Mission

The FAA mission is to maintain and enhance a safe, secure, and efficient global aerospace system.³ This mission is derived from FAA's legislative charter and fully supports the DOT and FAA Strategic Plans. Its key elements are to:

- Regulate civil aviation and commercial space transportation to promote safety.
- Enable the safe and efficient use of the aerospace system by civil and military aircraft.
- Promote and facilitate commercial space transportation.
- Provide leadership in planning and developing a safe and efficient national system of airports.

In performing this mission, the FAA (1) establishes safety standards; (2) issues certificates for aircraft and components, airmen, and air operators; (3) licenses commercial space launches and launch and re-entry sites; (4) monitors safety; (5) provides approximately 600,000 air traffic services daily, and operates, maintains, and modernizes approximately 25,000 subsystems in support of air traffic management; (6) oversees the federal role in the national airport system; and (7) sponsors related research and education to make the aviation and commercial space transportation systems safer, more modern, and efficient.

The Role of R&D

A solid scientific and technical foundation is required to meet agency goals. Both short- and long-term R&D are necessary to enable ongoing technical and operational innovation and to support informed decision-making in all areas of FAA responsibility. Continued investment in a strong and multi-faceted R&D program is a critical component in meeting the current and future FAA mission in an efficient, timely fashion.

The FAA R&D program is necessarily directed toward specific needs of FAA's various organizations, such as Regulation and Certification, Airports, and Air Traffic Services. It is largely through the activities of these organizations, and the impact of those R&D activities on the aerospace enterprise, that the FAA goals are achieved. While predominantly near-term in nature, a substantial portion of this research includes longer-term components. A comprehensive process is in place for developing a research portfolio in which R&D resources are requested and allocated in accordance with the needs and priorities of each FAA organization.

Activities supported by the research program include:

³ *FAA Strategic Plan*, FAA, 2001.

- Licensing, Regulation, Certification, and Standards Development:

Aircraft

Air Operators

Aviation Agencies

Manufacturers

Aircrew and other aviation personnel

Airports

Commercial Space Transportation

Security

Environment

- Modernization, operation, and maintenance of the NAS.
- Aerospace policy formulation, planning, and analysis.
- Effective response to incidents, special situations, and emerging issues.
- Guidance, coordination, and collaboration across the global aerospace transportation community.
- Identification, exploration, and assessment of emerging technological and operational concepts.

Given the complexity and dynamic nature of the long-term challenges faced in aerospace activities, and the importance of technology (broadly defined) in coping with them, it is particularly important that the pressure of immediate concerns not obscure the need to provide a solid foundation for meeting future needs. The magnitude and complexity of these challenges will require a strong and well-conceived R&D program, based on a very long-term perspective, to develop and validate effective solutions and innovations, whether they involve technology advances, innovative concepts, new operational procedures, or regulations. In addition, it will be critical to establish innovative ways to deploy new technologies into the operational environment to demonstrate applications for effectiveness and position the infrastructure for early deployment.

Thus, it is imperative that the overall program combine required near-term applied R&D with a vigorous and ongoing long-term research program that can define and characterize emerging issues and potential problems, and identify and pursue promising solutions. A program of this nature will enable the necessary major innovations in how FAA missions are performed, now and decades in the future, and will expand the knowledge and tools available to the entire aerospace community for advancing safety, efficiency, and environmental compatibility.