STATEMENT OF THE HONORABLE DONALD D. ENGEN, FEDERAL AVIATION ADMINISTRATOR, BEFORE THE HOUSE COMMITTEE ON SCIENCE AND TECHNOLOGY, SUBCOMMITTEE ON TRANSPORTATION, AVIATION, AND MATERIALS, CONCERNING THE FAA'S RESEARCH, ENGINEERING, AND DEVELOPMENT PROGRAM FOR FY 1988. MARCH 25, 1987.

Mr. Chairman and Members of the Subcommittee:

I am pleased to have the opportunity to appear before the Subcommittee today to discuss the FAA's Research, Engineering, and Development Program. With me are Edwin Harris, FAA's Associate Administrator for Development and Logistics; Martin Pozesky, Acting Deputy Associate Administrator for NAS Programs; and Neal Blake, Deputy Associate Administrator for Engineering. Later during this hearing, they will provide the Subcommittee with a more detailed presentation concerning our R,E&D efforts and the current status of the NAS Plan.

As this Subcommittee is aware, an R,E&D program that is well planned, properly executed, and adequately funded is vital to the advancement of aviation safety. Over time, the FAA's R,E&D program has developed many important products which have demonstrably enhanced the safety afforded the travelling public. Aviation has presented dynamic challenges in the past. As we have met those challenges, new challenges have arisen. We continue to face challenges in the current air transportation system, and yet must look ahead to meet future demands that will be placed on the agency's services. For example, weather continues to be a

significant factor in aviation: the broad rivers of air in the troposphere still present challenges of detection and understanding; and terminal areas may experience periods of reduced visibility, windshear, and freezing precipitation. The troubled world situation requires additional research efforts to further improve the security of our air transportation system from terrorist threats. Moreover, the continued increases we are experiencing in air traffic levels mean that we must continue to improve system capacity while striving to reduce the threat of midair collisions. The balanced R,E&D program we are pursuing is designed to meet those challenges and others in a positive and methodical way.

Over the next 2 to 5 years, the majority of the FAA's R,E&D activities will enhance and improve the NAS Plan efforts to totally modernize our air traffic control system. We are also looking now for our R,E&D activities to focus on new initiatives that build upon the foundation laid by the NAS Plan.

One of the major research and development initiatives that supports our NAS Plan activities is the development of the Advanced Automation System (AAS). The Advanced Automation System is the cornerstone of the NAS Plan. In addition to increasing system capacity, the higher levels of automation introduced through the AAS will allow more reliable and safer services to the users of the National Airspace System. AAS features such products

as new controller work stations with state-of-the-art color displays, a new distributed computer network with architecture designed for technology insertion and capacity expansion, and new software that will require up to 1.5 million lines of code. The bulk of the AAS program's costs have shifted from research and development to the FAA capital equipment program, but we continue to need funds for engineering personnel salaries and other related costs as well as resources to operate our advanced automation support laboratories at the FAA Technical Center.

We also are continuing vital work on an advanced system concept called Automated En Route Air Traffic Control--AERA-3 for short. AERA-3 will significantly increase controller productivity and user flexibility by introducing advanced ATC automation to relieve controllers of many of their tactical control tasks, giving them more time to manage the system strategically .

We are developing a Voice Switching and Control System (VSCS) to perform the intercom, interphone, and air-to-ground communication and control functions needed for air traffic control operations. The VSCS will use "off-the-shelf" technology, adapted to meet FAA requirements. Two competing designs will be evaluated prior to the development of final specifications and award of the production contract. Prototype development, as well as testing and evaluation, will be conducted under two prototype development contracts awarded in October 1986.

We are working to improve the transfer of air to ground digital data by means of the integral data link capability of Mode S. Mode S provides accurate data transmission capability for aircraft position, weather products, and ATC communications. Mode S provides the data link applications necessary to realize many of the NAS Plan's benefits in controller and flightcrew productivity.

As I mentioned earlier, hazardous weather is a significant threat to the safety of flight for all aircraft, particularly in the critical takeoff and landing phases. A central objective of the NAS Plan is to reduce the risk of weather-related accidents. Our research and development efforts support this objective. Our R,E&D budget for FY 1988, for example, devotes over $18 million to weather-related programs.

We are developing a central weather processor to improve the collection, processing, and dissemination of significant weather information. The development of the prototype and its software will continue through FY 1988. I expect it to be delivered to the FAA Technical Center for test and evaluation in FY 1989.

In addition, the FAA is participating jointly with the Department of Defense and the Department of Commerce in the development of a common-use Next Generation Weather Radar--NEXRAD--to probe weather fronts and provide information on interior storm circulation for

en route applications. We also are developing a Terminal Doppler Weather Radar (TDWR) System that will detect microbursts and wind shear. This radar will be located on or near an airport's operating areas, and will afford a high degree of additional protection to system users.

Both of these programs have matured to the point where the basic research is almost complete and the systems are moving into the production phase. The remaining research and development tasks consist primarily of software enhancements and the development of advanced algorithms to enhance weather products.

The activities I have described so far constitute only the significant research and development activities that directly support our National Airspace System Plan, amounting to just over 50 percent of our total budget for FY 1988. While the NAS Plan does account for many of our "big ticket" research projects, we must also press on with other critical research programs to increase capacity and improve safety.

The FY 88 budget includes advanced concept studies which concentrate on definition of the operating environment in year 2010 and the nature and magnitude of the demand for NAS services. It includes a study to evaluate alternative methods of air traffic control and alternative approaches to meeting future communications, navigation, and surveillance (CNS) needs. In

structuring this program, the FAA was guided by the future system CNS requirements identified by the Radio Technical Commission for Aeronautics, Special Committee 155.

The FAA and the aviation industry have identified a number of concepts that may increase airport capacity, improve safety, and reduce delays. The most promising of these--independent approaches to dual runways with 3,000 feet centerline spacing--was studied in FY 1987. Using the results of this study, a landing monitor concept will be selected and development started in FY 1988 for these types of runways. Work will also begin on defining and selecting other promising concepts for independent instrument flight rule approaches to other site-specific runway configurations.

The capacity of the ATC System depends to a large extent on the standards used to ensure safe separation of air traffic. The FAA will continue to analyze and validate the current U.S. and international airspace separation standards and as capability increases to develop information that can lead to new standards of separation.

Other capacity improvement initiatives include the development of a concept for an Advanced Traffic Management System that will efficiently allocate traffic demand to available system capacity, and an Automatic Dependent Surveillance System to improve the

monitoring and control of aircraft over oceanic airspace. Another research study explores air traffic control concepts to accommodate user-selected approach paths. We should look ahead to alternate means of geopositioning accuracy and traffic control.

Two of our research projects address the problem of runway incursion incidents. We are developing improved automation tools to alert the controller of potential conflicts on airport surfaces, and we are exploring enhancements to the Airport Surface Detection radar to provide automatic radar tracking and target classification.

To further reduce the threat of midair collisions, we have developed the Traffic Alert and Collision Avoidance System (TCAS). TCAS will provide collision avoidance protection against all aircraft equipped with the existing ATC Radar Beacon System transponder. This transponder is carried by all commercial aircraft and 65 percent of all general aviation aircraft in the United States. TCAS-II is being implemented now. TCAS-II provides traffic advisories to pilots as well as ascend or descend instructions. A prototype TCAS II unit has been certified for use in a Piedmont B-727, and Piedmont has now flown its first revenue flight using such a TCAS unit. Fourteen additional commercial quality TCAS units are in production. These TCAS units will be flown on United, Piedmont, and Northwest Airlines' aircraft beginning in mid-1987. I plan to issue later this year a Notice

of Proposed Rulemaking which would require the installation of TCAS II on airline aircraft.

We are completing the remaining development efforts on TCAS-III (which will provide left and right turn instructions to pilots in addition to ascend or descend instructions) and to demonstrate its capability in FAA aircraft. Our FY 1988 R,E&D Program level provides funds to complete these activities.

A comprehensive new Wind Shear Training Program for pilots was formally delivered to the FAA on February 26, 1987. This program, developed by an industry team headed by the Boeing Company under a $1.8 million FAA contract, is part of an integrated FAA effort to counter the threat of low level wind shear. We will continue this valuable work in FY 1988 and will also pursue the development of a low-cost, ground-based laser wind shear sensor for use at airports where Doppler radars are not cost effective.

In the area of civil aviation medicine, our programs provide research and support to the Federal Air Surgeon with respect to aeromedical certification and standards, medical accident investigations, health and aeromedical education studies. Through our laboratories at the Mike Monroney Aeronautical Center, we are continuing research into survival measures following aircraft accidents. Our Oklahoma City facility also will continue its important work on the effects of various factors such as altitude,

age, vision, and stress on human performance. The challenge for aviation safety in the future will be to address human factors, both on the ground and in the air.

Fire continues to pose a potential threat to air safety. Historically, 39 percent of fatalities in survivable accidents have been fire-related. Therefore, in past years, most of our research in this area has focused on postcrash fires. As an outgrowth of those efforts, we have issued more stringent Federal Aviation Regulations mandating heat resistant evacuation slides, and we developed and promulgated regulatory standards governing seat cushion flammability, emergency lighting, fire extinguishers, cargo compartment fire protection, and cabin panel flammability. This work will continue, but our main thrust over the next several years will be directed more toward in-flight fire safety.

Criminal acts of sabotage and hijacking continue to pose a serious threat to civil aviation throughout the world. To counter this threat, the FAA has initiated studies on advanced weapons and explosive detection concepts and technology. We also have undertaken a program to upgrade the performance of the current airport concourse screening systems. Studies on improved approaches to detect plastic and composite weapons concealed on people have just begun, while those on improving current systems will yield results in the next year. The development of a prototype explosive vapor detection system to screen people is

well underway, with initial airport testing planned for mid-1988. A study utilizing vapor detection systems for screening passenger carryon luggage is also underway.

Many other equally important initiatives are underway. Together with the international aviation community, we are defining what the future navigation system should be, and we are studying how to modernize our present generation of navigational aids. We are assessing the special needs of tilt rotor aircraft. Last year, the FAA, jointly with NASA and the Department of Defense, awarded a contract to Boeing to examine the feasibility of using the tilt rotor aircraft in civil applications. The study will examine civil airworthiness, flight operations, airport considerations, and air traffic control requirements.

We are also examining how to use the low altitude airspace more efficiently. We are assessing hazardous operational and physical features of airports, including bird and wildlife hazards, and reviewing airport configurations and design. We are conducting research for improved firefighting agents, equipment, and procedures. We are developing ground performance advisory systems to provide information on takeoff acceleration, braking during landing, and turnoff speeds when there is water, snow, or ice on the runways. Our work ranges from human factors research studies for controllers and flightcrews to the potential application of satellite technology in the ATC System.

To fund these important initiatives, the reauthorization legislation currently before the Congress seeks $150 million in both fiscal years 1988 and 1989 for research and development programs. Enactment of the levels of funding in the proposed Airport and Airway Enhancement Act of 1987 will help ensure that the FAA's important R,E&D programs will go forward. In that regard, we would welcome the support and assistance of this Subcommittee in working toward the enactment of those authorization levels.

In closing, Mr. Chairman, I would like to thank this Subcommittee for its many contributions to aviation safety. The FAA and this Subcommittee have had a longstanding, cooperative working relationship, which has fostered the attainment of many important aviation objectives. We look forward to maintaining that same spirit of cooperation with this Subcommittee as we work to improve our Nation's air transportation system.

That completes my prepared statement. I would be pleased to respond to questions you may have at this time, after which Messrs. Harris, Pozesky, and Blake will provide a more detailed presentation of our R,E&D programs.