STATEMENT OF ANTHONY J. BRODERICK, ACTING EXECUTIVE DIRECTOR FOR REGULATORY STANDARDS AND COMPLIANCE, FEDERAL AVIATON ADMINISTRATION, BEFORE THE HOUSE PUBLIC WORKS AND TRANSPORTATION COMMITTEE, SUBCOMMITTEE ON AVIATION, CONCERNING AGING AIRCRAFT. SEPTEMBER 27, 1989.

Mr. Chairman and Members of the Subcommittee:

I welcome the opportunity to appear before the Subcommittee to discuss with you the FAA's programs to address the issue of aging aircraft. I am sensitive to the public's as well as your concern over this important issue. I look forward to the Subcommittee's continued support as we proceed on what I believe is a comprehensive and aggressive program to respond to the challenge presented by the aging aircraft fleet.

As you know, last year's Aloha Airlines accident involving a B-737 aircraft was the catalyst for focusing renewed attention on the aging aircraft issue. As a result, the FAA has critically reexamined our inspection requirements and other facets of our overall program to ensure that aging aircraft continue to operate at the highest levels of safety.

We concluded that, although we already knew much about inspecting for corrosion and fatigue, we needed to learn more, and we set out to establish an improved framework of industry-government cooperation, began work to develop an accelerated research and development effort to address these issues, and reached some important conclusions about the regulatory way we have dealt with aircraft as they grow older.

Because of widespread public concern about aging aircraft, one point needs clarification. An aircraft's age is not necessarily measured chronologically, although chronological age is the primary factor influencing the state of corrosion. Instead of chronological age, we typically are more interested in the number of cycles an aircraft has flown--a cycle being one take-off, pressurization, depressurization, and landing--since these are the activities which stress an aircraft and its components, consequently leading to fatigue.

One of the first steps we took after the Aloha tragedy was to convene a three day conference, in June 1988, in which internationally recognized experts participated. The conference generated important information and significant first steps were taken toward solidifying industry and government cooperation for improved efforts in this area. As a result of the June 1988 symposium, the FAA undertook a number of new programs to deal with the problems of aging aircraft. It was determined that:

1. FAA inspectors would exercise more "hands on" involvement at airlines during heavy maintenance checks or hightime aircraft to ensure a better understanding of fatigue and corrosion.

2. FAA aircraft certification engineers would make field visits to airline maintenance shops to gain more knowledge of the human factors involved in maintenance and inspection.

3. FAA's aircraft certification, inspection, and research and development organizations would jointly develop specific programs to promote safety of older aircraft and engines.

4. FAA would develop agency experts in nondestructive testing and inspection technologies and set up improved training programs.

5. FAA aircraft certification personnel would promote, and work with industry to develop, supplemental structural inspection documents for aircraft used in commuter service.

6. FAA would develop a "lessons learned" document on engine maintenance.

I am pleased to note that we have implemented five of the six programs, and while we have not issued a "lessons learned" docment to date, this information is being used by our inspectors.

The conference also led to the establishment of a government/industry task force to develop modification programs to keep older jets flying safely. Another outgrowth of this first conference was a commuter airline industry conference on agingaircraft held in April 1989. The commuter conference made 23 recommendations to the FAA which we are now reviewing for incorporation into our commuter aging aircraft program.

We plan to hold a second international aging aircraft conference next week in Baltimore. This second conference will focus on the status of government and industry actions to ensure the continued airworthiness of older aircraft.

The issue of aging aircraft is, of course, one with which the FAA and industry have dealt with since the 1970's. There are several approaches in place which have been used as the primary means of responding to aging aircraft, one of which, adopted by the FAA in 1978, is an an aircraft design concept called "damage tolerance." A damage tolerant structure is one which has been designed to tolerate damage due to fatigue, corrosion, or accident and still be able to continue to carry expected operational loads until that damage is detected either by the problem becoming evident or during a scheduled inspection. Scheduled inspections of such components are based on the fracture mechanics characteristics of the part, and are designed to detect any crack before it reaches

unsafe proportions. Under the damage tolerance approach, we assume that damage is going to occur to a part. That part mustthen be designed to safely accommodate that damage until it can be corrected. In some cases where the damage tolerance approach is not appropriate--landing gears, for example--a specific life use is placed on the component.

We believe damage tolerance will provide improvements in aircraft design for future aircraft, but it does not apply directly to most aircraft in the current air carrier fleet because they were certificated prior to our adoption of the damage tolerance rule in 1978. Therefore, to address on a more current basis the need to assure that fatigue and corrosion were detected on aircraft in the fleet, the FAA issued guidance information to industry which outlines methods (including fracture mechanics assessment) to assure safety of older airplanes through additional structural inspections. Simply put, we used today's damage tolerance technology to analyze yesterday's designs and develop a state-of-the-art maintenance program for the existing fleet through improved inspection programs.

The number and extent of these additional structural inspections are based on an engineering analysis that assumes the existence of a crack at all critical locations and determines its growth rate and the point at which it would become unsafe. This

approach,which we finalized in concert with industry in 1981, is called the "Supplemental Structural Inspection Documents" (SSID) program. Under SSID, manufacturers are asked to identify all structural components whose failure could affect the safety of the aircraft, and to establish a special inspection program for those components. The FAA through regulatory action then requires the airlines to adhere to the schedules called for in these SSID's.

We have also conducted special airworthiness reviews as potential problems have been identified in the aging fleet. On the whole, these programs have worked well and, over time, have led to a variety of safety improvements, some in the form of airworthiness directives ("AD"s) which impose regulatory requirements on an operator. Nevertheless, we concluded that these measures alone are not enough.

In February 1989, we initiated our "Aging Fleet Evaluation Program" by conducting a review of one major airline's heavy maintenance ("D" check) on a Boeing 737 with 70,000 hours. "D" checks involve a complete stripdown of the aircraft to bare metal to check for cracks and other problems. This review was the first of many "hands on" inspections which we are undertaking to help us evaluate the effectiveness of corrosion control programs, structural inspection techniques, age-related ADs, and humanfactors engineering. This program will be accomplished by

FAA regional inspectors and engineers who will visit air carriers during D-checks of a given aircraft type. This on-going, year long effort, which will become a standard part of our surveillance during which all air carriers are visited, calls for first inspecting 737's, followed by 727's, 707/720's, 747's, DC-9's, and DC-10's.

We are also working on a comprehensive R&D program, which will include areas such as multi-site cracking, corrosion, nondestructive testing techniques and equipment, engine nondestructive evaluations, and engine repair practice evaluations. We are also exploring the feasibility of proof pressure testing of aircraft fuselages. Our objective is to develop handbooks on both damage tolerance and corrosion. A handbook on nondestructive testing equipment may be issued this year.

We have also requested Boeing and McDonnell Douglas to provide training to FAA maintenance inspectors concerning supplemental structural inspection documents and corrosion control. Boeing conducted its FAA training program between November 1988 and May 1989. The McDonnell Douglas training is scheduled to begin in late October and last approximately six to seven months. Thepurpose of this training is to familiarize FAA inspectors with

the manufacturer's detailed maintenance objectives and specific technical means for dealing with corrosion in its aircraft models.

In December 1988, we issued an AD covering the first 291 737's produced by Boeing, including those aircraft which were produced by the "cold bonding" process. This AD requires that the counter-sunk rivets on the top row of lap joints be replaced with oversized button-head rivets. In May of this year, we issued proposed ADs that would mandate extensive structural modifications to older Boeing 727s, 737s, and 747s. This action marked a fundamental change in FAA's philosophy for maintaining the airworthiness of older aircraft. Historically, we had relied primarily on repetitive structural inspections to identify needed repairs due to corrosion, cracking and other signs of metal fatigue. These inspections become more frequent and demanding as aircraft get older and approach the manufacturer's "economic design goal," the point in an aircraft's life at which the cost of maintenance is expected to increase significantly. The new approach will require the air carriers to make strengthening modifications to basic critical structures to prevent fatigue problems as aircraft reach their economic design goal.
We are calling for 74 modifications to critical B-727 structures, 58 modifications for the B-737, and 31 for the B-747. The ADs affected 115 U.S.-registered Boeing aircraft--67 B-727s, 28 B-737s, and 20 B-747s. The estimated cost of modification for

these 115 aircraft is $142 million. Due to the magnitude of the modification program, the FAA anticipates that the work will be staggered over a period of time and generally coordinated with other scheduled maintenance. Accordingly, the airlines will be allowed four years to incorporate all of the changes.

Earlier this month, we announced another major step in our Aging Aircraft Program, by issuing proposed ADs to ensure the continued operational safety of older McDonnell Douglas jets. The proposed ADs would mandate structural modifications and continued detailed inspections of 1,163 McDonnell Douglas aircraft currently in service with U.S. airlines. The changes are designed to eliminate the potential for structural fatigue problems as the aircraft reach their economic design goal. Affected would be 218 DC-8s, 568 DC-9s, 173-MD-80s and 204 DC-10s. Additional aircraft would be added as they accumulate time in service and reach the threshold for modification. The proposed ADs call for 52 modifications to critical structures in the DC-8, 56 to the DC-9 (MD-80) and 33 to the DC-10. We estimate the cost to be approximately $82 million. The airlines will have four years to complete the modifications.

Within the FAA, we have taken steps to better coordinate all facets of our aging aircraft program by establishing an Aging Airplane Program Management Team of key individuals who are

concerned with each part of the aging airplane program, running the gamut from transport category aircraft, commuter aircraft, maintenance practices, and testing techniques to human factors.

We plan to investigate the methods, equipment, and procedures used in visual and nondestructive inspection of aircraft structures from both a hardware and human factors standpoint, to develop updated "probability of crack detection" estimates which will provide us adequate assurance that a crack will be detected, reported, and repaired well before it becomes critical. We expect that the human factors investigation will yield results in areas across the board pertaining to the maintenance of airplanes--ranging from the better preparation of airworthiness directives to better coordination of inspection tasks during a heavy maintenance inspection to an assessment of where the most can be accomplished from an inspection and repair standpoint. We expect to develop methods of using current inspection techniques which are less reliant on vigilance and decision-making by the FAA inspector, as well as provide the opportunity for emerging inspection techniques to be beneficially applied in the aviation industry.

We are now reexamining, in conjunction with industry, existing Supplemental Structural Inspection Documents to determine their adequacy in light of recent catastrophic events and the industry's service experience with them. We anticipate developing a similar

supplemental inspection program for corrosion, which would implement for the current aging fleet the basic corrosion requirements we are studying for possible incorporation into future airplane designs.

We are working on a number of fronts to address the aging aircraft issue. This continues to be a high priority issue with us. We are directing our efforts toward immediate corrective action for problems as they manifest themselves in our aging fleet. We are taking long range action towards the improvement of an airplane's tolerance to fatigue damage and corrosion, and in the improvement of inspection reliability including reducing reliance on inspections as a means of limiting the possibility of human error. We have also initiated cooperative efforts with industry in both the transport and commuter environment and are finalizing a comprehensive research and development program covering a variety of key areas.

Before closing, Mr. Chairman, I want to briefly touch on a subject of long-standing interest to this Subcommittee, and that is thetopic of cabin safety. This Subcommittee and its Chairman have been strong supporters of a vigorous cabin safety program, and I believe the progress we have made in recent years reflects that support. Rather than describing in detail the actions we have taken recently in the cabin safety area, I am attaching to my

prepared statement a brief description of the steps we have taken. I believe that our cabin safety program is a success story in which we can all take pride. There is no question in my mind that we have already seen lives saved in recent tragedies by the FAA's fire-blocking layer requirements. That, of course, is the truest measure of success of our efforts.

In closing, Mr. Chairman, I want to thank you for your continued support of the FAA's safety program.

That completes my prepared statement, Mr. Chairman. I would be pleased to respond to any questions you or other Members of the Subcommittee may have.