DESIGNEE NEWSLETTER
Transport Airplane Directorate

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UPDATE ON THE FAA'S AGING AIRCRAFT PROGRAM

The following is a statement made by Anthony J. Broderick, Acting Executive Director for Regulatory Standards and Compliance, Federal Aviation Administration, on September 27, 1989, before the House Public Works and Transportation Committee, Subcommittee on Aviation:

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 takeoff, pressurization, depressurization, and landing -- since these are the activities which stress an aircraft and its components, consequently leading to fatigue.

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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:

- **FAA inspectors would exercise more "hands on" involvement at airlines during heavy maintenance checks on high-time aircraft to ensure a better understanding of fatigue and corrosion.**
- **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.**
- **FAA's aircraft certification, inspection, and research and development organizations would jointly develop specific programs to promote safety of older aircraft and engines.**
- **FAA would develop agency experts in nondestructive testing and inspection technologies, and set up improved training programs.**
- **FAA aircraft certification personnel would promote, and work with industry to develop supplemental structural inspection documents for aircraft used in commuter service.**
- **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" document 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 aging aircraft 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...

This 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 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 must then 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 of 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 new approach will require the air carriers to make strengthening modifications to basic critical problems as aircraft reach their economic design goal."

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 Inspections 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 AD's, and human factors 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 B-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 between November 1988 and May 1898. The McDonnell Douglas training is scheduled to begin in late October and last approximately six to seven months. The purpose of this training is to familiarize FAA inspectors with the manufacturers' detailed maintenance objectives and specific technical means for dealing with corrosion in its aircraft models.

In December 1989, we issued an AD covering the first 291 B-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 AD's that would mandate extensive structural modifications to older Boeing 727's, 737's, and 747's. 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 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 AD's [initially] affect 115 U.S.-registered Boeing aircraft -- 67 B-727's, 28 B-737's, and 20 B-747's. 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 AD's to ensure the continued operational safety of older McDonnell Douglas jets. The proposed AD's 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-8's, 568 DC-9's, 173 MD-80's, and 204 DC-10's. Additional aircraft would be added as they accumulate time in service and reach the threshold for modification. The proposed AD's 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 [incorporate] the modifications.

Within the FAA, we have taken steps to better coordinate all facets of our aging aircraft program by establishing an Aging Aircraft 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 of 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 in 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...

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

RULEMAKING

AMENDMENTS

Amendments 25-69 and 121-208: Design Standards for Fuel Tank Access Covers. This amendment requires that fuel tank access covers on transport category airplanes be design to minimize penetration by likely foreign objects, and be fire resistent. The amendment also requires that all turbine-powered airplane operated in air carrier service after October 30, 1991, meet these new standards. This amendment was signed by the Administrator on September 25, 1989, and was published in the Federal Register on September 29, 1989. It became effective on October 30, 1989.

Amendments 121-202 and 135-31: Fire Protection Requirements for Cargo or Baggage Compartments. These amendments require upgrade of the fire safety standards for cargo or baggage compartments in certain transport category airplanes used in air carrier, air taxi, or commercial service. Ceiling and sidewall liner panels that are not constructed of aluminum or glass fiber reinforced resin must be replaced with improved panels prior to a specified date. These standards are the result of research and fire testing, and are intended to increase airplane fire safety.

Amendments 121-199 and 135-27, "Airborne Low-Altitude Windshear Equipment and Training Requirements," effective January 2, 1989, amends FAR 121 to require installation of airborne low-altitude windshear warning and flight guidance equipment in airplanes, and amends FAR 121 and 135 to require windshear training for flight crewmembers. This rule is expected to reduce windshear-related accidents by training pilots in avoidance and escape techniques, and by providing a low-altitude windshear warning system with flight guidance equipment in certain airplanes to increase the margin of safety if windshear is inadvertently encountered.

PROPOSED RULES

Notice 89-15: Electrical and Electronic Systems Lightning Protection, was issued on May 22, 1989. This notice proposes to amend Part 25 to add a new standard for transport category airplanes which would provide lightning protection for installed electrical and electronic systems. This proposal is the result of increasing concern for the vulnerability of these systems to the indirect effects of lightning, and is intended to provide specific lightning protection requirements for electrical and electronic systems which perform essential or critical functions. Notice 89-15 was published in the Federal Register on May 30, 1989. The public comment period closed September 27, 1989.

Notice 89-20: Landing Gear Aural Warning. This notice proposes to amend the airworthiness standards for transport category airplane landing gear aural warning systems and the operating rules for using transport category airplanes to update the present requirements. This proposal is prompted by reports of nuisance or inappropriate aural warnings which have occurred in modern transport airplanes that adhere strictly to the present regulations. It is intended to align the regulations with existing design practices, thereby removing the regulatory burden associated with making an equivalent level of safety finding or exemption for those systems that do not meet the existing requirements. This proposal will not affect existing certificated airplanes. Notice 89-20 was published in the Federal Register on August 17, 1989. The pubic comment period closes February 13, 1990.

Notice 89-23: Miscellaneous Changes to Emergency Evacuation Demonstration Procedures, Exit Handle Illumination Requirements, and Public Address Systems, was issued on August 31, 1989. This notice proposes to modify the procedures for conducting an emergency evacuation demonstration by requiring that the flightcrew take no active role in the demonstration, and by changing the age/sex distribution requirement for demonstration participants. This notice also proposes to standardize the illumination requirements for the handles of the various types of passenger emergency exits. In addition, it proposes to add a requirement that would prevent the inadvertent disabling of the public address system because of an unstowed microphone. These proposals resulted from the public technical conference on Emergency Evacuation of Transport Airplanes held in Seattle, Washington, September 3-6, 1985, and are intended to enhance the provisions of transport category airplanes for egress of occupants under emergency conditions. Notice 89-23 was published in the Federal Register on September 8, 1989. The public comment period closes January 8, 1990.

Notice 89-24: Vibration, Buffet, and Aeroelastic Stability Requirements for Transport Category Airplanes. This notice proposes to revise the airworthiness standards of the Federal Aviation Regulations (FAR) for transport category airplanes concerning flutter, divergence, vibration, and buffet. It would clarify the requirement to consider flutter and divergence when treating certain damage and failure conditions required by other sections of the FAR. It would also revise the required safety margins by slightly reducing the safety margin concerning airplane speed for normal configurations, and by providing a minimum safety margin concerning airplane speed for damage and failure configurations. These changes are intended to provide consistency with other sections of the FAR to relieve a design burden which is now unnecessary as a result of advances in technology, and to improve certain safety margins as a result of evolution in the design of transport airplanes. Notice 89-24 was published in the Federal Register on September 12, 1989. The public comment period closes March 12, 1990.

Notice 89-25: Loss of Engine Cowling, was issued September 13, 1989. This notice proposes a requirement for improved engine cowling retention devices. A review of a number of inflight incidents where engine cowlings were lost revealed that the largest single cause of such losses was improper latching of the cowlings. If adopted, this proposal would provide additional design standards to detect improperly latched cowlings and to ensure integrity of the latching system. Notice 89-25 was published in the Federal Register on September 19, 1989. The public comment period closes March 19, 1990.

ADVISORY CIRCULARS (AC)

AC 25.812-1A: Floor Proximity Emergency Escape Path Marking, was issued May 22, 1989. This AC is a revision of AC 25.812-1, which provides guidance for use in demonstrating compliance with the provisions of Part 25 of the FAR requiring floor proximity emergency escape path markings. Included in this revision of the AC are clarification of acceptable means for marking the emergency escape path, and guidance for meeting other associated requirements, such as the energy supply "critical ambient conditions" requirement and the emergency lighting system "transverse vertical separation" requirement. An appendix has also been added which lists the different types of marking systems approved in different areas of the airplane.

PROPOSED ADVISORY CIRCULARS

AC 25-XX: Electrical Fault & Fire Prevention and Protection. On September 19, 1989, a notice was published in the Federal Register inviting public comment on a proposed AC which provides information on electrically-caused faults, overheat, smoke, and fire in transport category airplanes. Included in this AC are acceptable means for minimizing the potential for these conditions to occur, and means to minimize or contain their effects when they do occur.

AC 25.703-1: Takeoff Configuration Warning Systems. On September 15, 1989, a notice was published in the Federal Register inviting public comment on this proposed AC which provides guidance material for certification of takeoff configuration warning systems (TOCWS) in transport category airplanes. A number of airplane accidents have occurred where the airplane was apparently not properly configured for takeoff and no warning was provided to the flight crew by the TOCWS. Investigations of these accidents have indicated a need for guidance material for the design and approval of these systems. The public comment period closes January 15, 1990.

REPORTS AND OTHER AVAILABLE INFORMATION

MLS NAVIGATION EQUIPMENT

Radio Technical Commission for Aeronautics (RTCA) Document No. RTCA/DO-198, March 18, 1988, "Minimal Operational Performance Standards for Airborne MLS Area Navigation Equipment," contains the RTCA's minimum operational performance standards for airborne microwave landing system area navigation (MLS RNAV) equipment. These standards specify characteristics that should be useful to designers, manufacturers, installers, air traffic service providers, flight standards personnel, and users of the equipment.

Compliance with these standards may be one means of ensuring that the equipment will perform its intended function(s) satisfactorily under conditions normally encountered in routine aeronautical operations. For MLS area navigation (RNAV) systems to be effectively integrated into the U.S. National Airspace System (NAS), airborne equipment should provide standard responses to pilot input upon air traffic controller request.

Coppies of this document may be obtained from RTCA Secretariat, One McPherson Square, 1425 K Street, Suite 500, Washington, D.C. 20005.

[The findings of RTCA are in the nature of recommendations to all organizations concerned. RTCA is not an official agency of the U.S. government, and its recommendations may not be regarded as statements of official government policy unless so enunciated by the Federal government organization or agency having statutory jurisdiction over any matters to which the recommendations relate. Consult with your cognizant ACO regarding use of the recommendations.]

POST-CRASH FIRES

Report FAA-P-8110.3, "Systems and Techniques for Reducing the Incidence of Post-Crash Fuel Systems Fires and Explosions," dated December 1988, describes the study conducted by the FAA on the feasibility of fuel system post-crash fire safety improvements for transport category airplanes, general aviation airplanes, and rotorcraft.

Crash-resistant fuel tank and breakaway fuel line fitting technologies were evaluated for each type of aircraft and, for transport category airplanes, consideration was given to other technologies, including explosion prevention systems, anti-misting fuel, and other techniques for reducing the post-crash fire hazard.

The report concludes that crash-resistant fuel tanks have the potential for improved fuel containment of transport airplane inboard wing and fuselage-mounted auxiliary fuel systems; general aviation airplane fuselage, engine nacelle, and wing tip fuel systems; and rotorcraft fuel systems. The FAA is conducting research and development programs to develop crash-resistant fuel tank design and test criteria, and is considering regulatory proposals for improved crash-resistance of general aviation airplane fuselage, nacelle, and tip tank fuel systems, and rotorcraft fuel systems.

LIGHTNING SIMULATION

Because advanced aircraft constructed mostly of composite materials having low electrical conductivity are susceptible to potentially catastrophic direct and indirect effects of lightning, a program was conducted to investigate experimentally and analytically several lightning simulation test techniques used to demonstrate the adequacy of aircraft lightning protection design and implementation.

A report on this subject has been released, entitled "Lightning Simulation Test Technique Evaluation," DOT/FAA/CT-87/38, dated October 1988. This report documents the results of four separate lightning simulation tests on a specially designed test bed aircraft. The simulations techniques utilized were low-level swept continuous wave, low-level fast rise pulse, moderate-level pulse, and shock-excitation. The test bed was made up of advanced composite materials with built-in lightning protection and electrical equipment installations. This configuration was electrically and geometrically representative of a general aviation heavy single engine aircraft. [This report may be obtained from the U.S. Department of Commerce, National Technical Information Service, 5282 Port Royal Road, Springfield, Virginia 22161.]

COMPOSITES HANDBOOK

The standardization of a statistically-based mechanical property data base, procedures used, and overall material guidelines for characterization of composite material systems is recognized as being beneficial to both manufacturers and governmental agencies. It is also recognized that a complete characterization of the capabilities of any engineering material system is primarily dependent on the inherent material physical and chemical composition which precede, and are independent of, specific applications. Therefore, at the material system characterization level, the data and guidelines contained in MIL-HDBK-17B, dated February 29, 1988, are applicable to military and commercial products, and provide the technical basis for establishing statistically valid design values acceptable to certificating or procuring agencies.

The handbook specifically provides statistically-based mechanical property data on current and emerging polymer matrix composite materials, provides guidelines for the analysis and presentation of data, and provides fabrication and characterization documentation to ensure repeatability of results or reliable detection of differences.

This standardization handbook has been developed and is maintained as a joint effort of the Department of Defense and the FAA. It is oriented toward the standardization of methods used to develop and analyze mechanical property data on current and emerging composite materials.

Copies may be obtained from the Naval Publications and Forms Center, 5801 Tabor Avenue, Philadelphia, Pennsylvania 19120.

REVISED FAA FORM 8130-3, AIRWORTHINESS APPROVAL TAG

Action Notice 8130.20, issued on August 16, 1989, explains the use of the newly revised airworthiness approval tag. For years there has been a variety of export certification documents utilized by the exporting civil aviation authorities for import and export of parts for installation on civil aircraft. Some of these certifications may be in the form of an official certificate, others may be made on industry release notes. This has resulted in some confusion on the part of person(s) who received these certificates as to the acceptability and eligibility of the parts.

Accordingly, a "New Parts Task Force" was organized with representatives from the FAA and some of the Joint Airworthiness Requirements (JAR) countries, including the United Kingdom, Germany, The Netherlands, Sweden, and France. The objective of this task force was to develop a common certification document for use between the countries having bilateral airworthiness agreements with the United States.

This newly devised document, when required by the importing country, is to be used by the FAA or its designees for export of Class II or III products only as defined in FAR Part 21, Subpart L. It would provide evidence of the airworthiness/conformity and information on installation eligibility of newly manufactured products (FAR Part 21) and newly overhauled, rebuilt, or altered products (FAR Part 43).

NOTE: The document can be used either as the airworthiness approval tag or as a conformity approval tag, by checking the respective block (Block 2) on the form. "*Conformity approval*" is the examination and testing of parts to determine conformance to data submitted for type design. "*Airworthiness approval*" is when parts conform to approved type design.

When a certificate of airworthiness for export is required by the airworthiness authority of the importing country, the new revised FAA Form 8130-3 will be used for exporting products to any country outside the U.S. or from any facility located in a country producing products under an extension of an FAA production approval holder in accordance with Advisory Circular 21-24, "Extending a Production Certificate to a Facility Located in a Bilateral Airworthiness Agreement Country."

The FAA does not require the FAA Form 8130-3 to be provided for every part exported. If an exporter has an alternate means (*e.g.,* annual certification, certificate of compliance, etc.) to export parts, this is still acceptable to the FAA, unless the importing country specifically requires the FAA Form 8130-3.

Newly manufactured products to be exported must have been produced by a manufacturer who holds a production approval: APIS, PC, PMA, or TSOA, or their approved suppliers. All inspections conducted by FAA representatives in connection with issuance of airworthiness approval/conformity tags, in compliance with program guidelines, will be recorded on FAA Form 8100-1, "Conformity Inspection Record." A copy of the completed FAA Form 8130-3 should be attached to the FAA Form 8100-1.

The FAA Form 8130-3 may also be used by FAA inspectors or designees as evidence of conformity of prototype items to design data undergoing approval by the FAA or the Aviation Authorities of another country. When the form is used for conformance of prototype products, FAA Form 8100-1 may still be required from FAA inspectors or their designees to meet type certification program requirements. Products may be exported with conformity approval only when a legitimate request has been received (i.e., preposition parts).

When export airworthiness approval tags are required for used Class II or III products, having been subjected to maintenance (inspection, overhaul, repair, preservation, or replacement of parts), rebuilding, or modification operations, FAA Form 8130-3 tags may also be used for this purpose. However, FAA inspectors or designees issuing this form should ensure that the provisions of FAR Parts 43, 91, 121, 135, or 145 have been complied with, particularly with respect to: persons authorized to perform the work, use of approved data, work and inspection records, and documentation for return to service. It should be noted that this document is <u>not</u> used for return to service.

Action Notice 8130.20 explains in detail the procedures to be followed when completing revised FAA Form 8130-3. However, in general:

- **The document issued from other countries will be the same format as the revised FAA Form 8130-3, and will be signed by persons/organizations authorized by the aviation authorities of the exporting country.**

- **All entries on the form must be completed in English. Documents used for import to the U.S. may have the language of the country of origin along with English.**

- **This document may be computer-generated by exporters, including a facsimile of authorized designees signatures, and may be duplicated when necessary only after authorization by the local MIDO or FSDO. The format cannot be changed, nor can wording be added or deleted as a result of the duplication method. Some preprinting of information, however, is allowed (i.e., Blocks 1, 2, 3, 4, and Statements 14 and 15).**

- **The original copy must accompany products with the exporter's shipping document(s). When necessary, the document can be folded and put in an envelope for attaching to a part. (Copies of each document should be retained as part of the conformity record.)**

This revised form, Stock #0052-00-012-9003, is available through normal FAA distribution channels (through FAA offices in Oklahoma City). Mandatory implementation of the use of this revised form started on October 1, 1989. Effective that date, local FAA offices were to recover all old FAA Form 8130-3 (9-76) tags and dispose of the them.

Valid airworthiness approval tags issued prior to October 1, 1989, will remain valid.

Industry has already indicated to the FAA that it is concerned about anticipated requirements for increased quantities of FAA Form 8130-3 Export Certifications. Manufacturers are also concerned that many pre-packaged parts, which formerly were exported without Form 8130-3's may have to be removed from their packages and reinspected. Principal Inspectors have been encouraged to work with manufacturers to ensure that DMIR's are involved in production inspection acceptance at appropriate points to minimize any reinspection.

For more information or clarification about Action Notice 8130.20 or the revised form, please contact your local MIDO or FSDO.

TERMINATION OR NONRENEWAL OF FAA DESIGNATIONS

On September 6, 1989, the FAA issued Action Notice 8130.21, "Procedures for the Termination or Nonrenewal of FAA Designees." This action notice explains the procedures followed when a decision is made to propose the nonrenewal or termination of the designation of DMIR's, DER's, DAR's, DOA's, and DAS'. The specified procedures are intended to ensure that due process is accorded to designees prior to a final decision of nonrenewal/termination of a designation.

Judicial decisions in several recent cases have found that, while the FAA Administrator or an authorized employee may terminate a designation in accordance with established legislation, rules, and procedures, the designee must be provided with adequate notice and an opportunity to respond to the proposed action. In these cases, the courts found that the agency's procedure provided to the designees was insufficient. Action Notice 8130.21 sets forth additional procedures to be incorporated into existing guidance, that will provide for appropriate due process in nonrenewal/termination actions.

- **REASONS FOR PROPOSING TERMINATION OR NONRENEWAL OF A DMIR, DAR, OR DER DESIGNATION:**

Appointments of these designations are issued for a period not to exceed one year and at the option of, and in the sole discretion of the Administrator, may be renewed annually, provided the designee's performance has been satisfactory. FAR 183.15(d) lists specific reasons for termination of these designations; Action Notice 8130.21 adds to that list other reasons considered appropriate. As specified in both references, a designation may be terminated:

1. At the written request of the designee or the designee's employer, or, in the case of a designee employed by a supplier to a production approval holder, at the request of the production approval holder;

2. In the event the designee leaves the employment of the production approval holder or supplier;

3. Upon a finding by the Administrator that the designee has not properly exercised or performed the duties of the designation, or that the production approval holder has not properly utilized the services of the designee.

4. Upon suspension, cancellation, or revocation of the production approval held by the employer, or upon the removal of the employer from the production approval holder's approved supplier list.

5. Upon a finding by the Administrator that the designee has not had sufficient activity to warrant continuance of the designation.

6. In the case of a maintenance DAR, upon suspension, cancellation, or revocation of a mechanic's or repairman certificate held by the designee.

7. Upon a finding by the Administrator that the designee's specific qualifications for a product have lapsed.

8. Upon a finding by the Administrator that the designee or production approval holder has not demonstrated the care, judgment or integrity required for proper exercise of a designation.

9. For any other reason the Administrator considers appropriate.

- **PROCEDURES FOR RECONSIDERATION (APPEAL) OF TERMINATION/NONRENEWAL:**

WHO MAY APPEAL: If a termination/nonrenewal is based on insufficient activity at the organization (production approval holder, supplier, or engineering organization), or on misconduct of the organization, only the organization may request reconsideration; the individual designee employed by the organization may not.

If a termination/nonrenewal is based on misconduct of the designee, the FAA may notify both the designee and organization, but only the designee may request reconsideration. If the designee wishes, it is permissible to have the organization participate in the appeal.

If the designation is terminated or not renewed at the request of the organization, the procedures concerning reconsideration of the termination/nonrenewal do not apply. The decision to have a DMIR, DAR, or DER is entirely within the discretion of the organization.

WHEN AND HOW APPEAL IS MADE: The FAA will provide the organization and/or individual designee with written notice explaining the reason(s) for the decision not to renew or to terminate. The notification will be sent 30 days in advance of the intended effective date. This written notification will give the designee or the organization the option to respond in writing or in person within certain deadline (normally a maximum of 2 weeks from the date of the notification).

If the designee or organization chooses not to respond, the termination/nonrenewal will be processed.

If an in-person meeting is requested, in the case of a DMIR or DAR, the meeting would be with the FAA inspector who has made the determination to terminate or not to renew. In the case of a DER, the meeting would be with the local Aircraft Certification Office Manager and the FAA project engineer who recommended the action. At the option of the designee or organization, the reconsideration can take the form of review of material submitted by the designee or organization and terminating office, or another informal hearing at the Division Manager's office. An official record will kept of all proceedings.

If after the conference or review, the Division/Regional Manager concurs with the decision to terminate or not to renew, the designee or organization will be sent a letter containing the decision and reciting the justification. At this point, the decision is final. The designee/organization's legal remedy is then as provided by 49 U.S.C. 1486(a), by

Petition for Review in a United States Court of Appeals. Such an appeal would be required to be made within 60 days.

IMMEDIATE SUSPENSIONS: In cases where a designee or organization is suspected of fraud or any other activity for which emergency action is necessary to ensure safety, field offices may immediately direct the designee/organization to cease all further certificaiton activity, pending further FAA investigation of the matter. Upon investigation of the circumstances of such incidents, the field office will initiate termination action, if such action is appropriate, in accordance with the procedures outlined above.

Action Notice 8130.21 also contains similar guidance for these procedures as they pertain to DOA's and DAS'.

Questions regarding any procedures concerning termination or nonrenewal of any designation may be directed to the cognizant ACO or Manufacturing District Office (MIDO).

TRANSPORT AIRCRAFT SAFETY SUBCOMMITTEE

In recent history, several transport category aircraft have been involved in in-flight incidents that have resulted in the total loss of redundant systems for power-operated flight controls. Despite the extremely remote nature of these failures, their occurrence resulted in the loss of all normal flight control capability for the flightcrew to attempt the safe recovery of an otherwise structurally sound airplane.

The investigation of the United Airlines DC-10 accident (Sioux City, Iowa, in July 1989) by the National Transportation Safety Board (NTSB), and the determination of the causes and contributing factors, is not yet complete. However, it appears that the accident was initiated by an extraordinary engine failure that caused unprecedented damage to the control system of the airplane. This case, and the Japan Airlines 747 accident in 1987, suggest the need for more stringent regulations governing the reserve capability of large aircraft with powered controls under emergency conditions.

Because of these circumstances, FAA Administrator James B. Busey considered it essential that an industry technical task force be established to evaluate the feasibility of providing alternate means of control for transport category aircraft that might experience the total loss of normal flight control capability, regardless of the means or probability of such loss.

The Transport Aircraft Safety Subcommittee was established, chaired by Robert J. Aaronson, President of the Air Transport Association (ATA) of America. The Subcommittee is charged with providing the FAA with advice on the adequacy of current efforts in two general technical areas:

- **aircraft survivability following major in-flight structural damage; and**
- **airworthiness assurance of older aircraft.**

The Subcommittee will establish, through appropriate task forces or similar means, effective communication links to ensure that the views of manufacturers, operators, pilots, maintenance experts, and civil aviation authorities of other nations are considered in reaching its conclusions and developing recommendations. The scope of the Subcommittee's activities includes a review of current knowledge, operational experience, research plans, and current and proposed corrective actions being undertaken by all parties. The FAA has asked the Subcommittee to place emphasis on the assessment of the adequacy of the general research programs (underway and planned) and the implementation -- by regulatory action and voluntary means -- of specific corrective actions.

With regard to aircraft survivability, two major technical areas are of interest to the FAA. First, what are feasible improvements to the backup flight control systems of existing and future aircraft equipped with fully powered control systems? Second, are engine containment designs in use today the best that can be implemented, or are improvements practicable for present and future designs?

With regard to older aircraft, the subject matters of concern to the FAA include the adequacy of the FAA's existing airworthiness assurance efforts in fatigue and corrosion control with emphasis on the planning, conduct, and implementation of research results.

In addition to a general review of the subject matter, at the request of the Subcommittee chairman, specific aircraft and engine types will be reviewed by appropriate expert task forces who will present their recommendations to the Subcommittee for evaluation. The work of the Subcommittee and its subordinate task forces will be reported to the FAA after substantive conclusions have been reached on individual issues.

WINDSHEAR DETECTION

Windshear is an abrupt change in wind speed or direction. It is usually not a serious hazard for aircraft en route between airports at normal cruising altitudes. During landing or takeoff, however, a strong sudden windshear can be deadly for an aircraft. The most hazardous form of windshear during approach and departure is the microburst, an outflow of air from a small-scale but powerful gush of cold, heavy air that can occur beneath a thunderstorm or a harmless-looking cumulus cloud. As the downdraft reaches the surface, it spreads out horizontally, like a stream of water sprayed straight down from a garden hose on a concrete driveway. An aircraft that flies through a microburst can encounter a strong head wind, then a downdraft, and finally a strong tail wind that produces a sharp reduction in airspeed and sudden loss of the aerodynamic lift necessary to sustain flight. This can be a deadly sequence of events for aircraft during final approach or initial takeoff climbs. Windshear also can be associated with gust fronts, larger scale outflows, or cold air from thunderstorms, as well as with warm and cold air fronts.

As it became increasingly clear that low-altitude windshear was responsible for a number of fatal accidents, research efforts were launched to develop detection techniques. Initially, it was believed that gust fronts were responsible for the crashes. In the late 1970's, the FAA developed a ground-based network of wind instruments (LLWAS) designed to detect gust front windshears at airports.

During that same time period, Doppler weather radar, which is capable of showing the three-dimensional structure of storms relative to both wind and precipitation, became a research tool for meteorology scientists. Doppler weather radar allowed scientists to identify and study the windshear features produced by storms. This led to the discovery of the microburst and to an understanding of its structure and life cycle.

Despite the improved features of the enhanced LLWAS, it may not be the optimal solution to the windshear detection problem. For the most part, the sensors are located at the airport and cannot detect windshears that occur above ground or beyond the network periphery. The 1985 Dallas crash, for example, involved a microburst encountered beyond the airport's LLWAS sensors. The microburst was not detected until 10 to 12 minutes after the crash, when the microburst came closer to the airport and penetrated the network of sensors.

Though the enhanced LLWAS will remain a part of the overall windshear program as a supplement to the new Doppler radar systems, and although the FAA's optimal ground-based windshear detection system is TDWR (terminal Doppler weather radar), the FAA is performing a study to determine the benefits of linking the two systems. Properly located, TDWR can monitor the actual approach and departure paths of aircraft high enough from the runway to provide warning in time for corrective action by pilots.

Airborne sensors are desirable because they do not have the coverage limitations of ground sensors, do not depend on ground-to-air communications, and provide early warning directly to the cockpit. The FAA has undertaken a cooperative effort with NASA to develop the systems requirements for airborne windshear sensors that enable the flight crew to reliably detect hazardous windshear along an intended flight path with sufficient time to avoid it. The objective is to transfer technology to avionics manufacturers in order to accelerate development and certification of these sensors. Microwave radar and light detection and ranging technologies are currently undergoing assessment by the FAA and a consortia of manufacturers.

FIELD APPROVAL OF AIRBORNE WINDSHEAR WARNING SYSTEMS

The Transport Airplane Directorate has received a number of reports from Aircraft Certification Field Offices that windshear warning systems are being approved by the field approval method on transport category airplanes.

Basically, there are two types of windshear warning systems currently being installed and approved in transport category airplanes:

- The first type is a system which detects and annunciates a windshear threat and subsequently provides flight guidance commands to the flight crew to manage the available energy of the airplane in the most efficient manner in the escape maneuver. This type of system is required by the recent windshear rule, FAR 121.358, "Low-altitude windshear system equipment requirements."

- The other type of system provides windshear detection and annunciation-only, and an established pilot procedure is used to perform the escape maneuver.

All windshear warning systems with flight guidance provisions, and many of the detection and annunciation-only systems, interface with existing airplane systems and sensors to the extent that an engineering evaluation is necessary to determine that there will be no adverse effects upon the existing approvals of other essential or critical systems. An example of existing essential and critical systems would be the Categories II and III landing systems.

In the remaining detection and annunciation-only systems, an engineering evaluation should still be made to determine that the annunciation threshold is suitable for the airplane/powerplant combination in question.

For the few remaining cases where it could be determined that the proposed installation is identical in all aspects to a previously approved installation, a field approval may be warranted.

PART 25 REQUIREMENTS PERTAINING TO FLIGHT IN ICING CONDITIONS

The Transport Airplane Directorate has been asked for a clarification of the requirements in Part 25 of the Federal Aviation Regulations relating to flight in icing conditions. In particular, we have been asked about the relationship between certain values of cloud liquid water content (LWC), mean cloud droplet diameter [also known as mean volumetric droplet diameter (MVD)], and temperature in Figure 1 of Appendix C of FAR Part 25, as follows:

LWC	Drop Diam	Temp	Yes	No
0.5	20μ	-7^{o} C	X*	
0.5	25μ	-7^{o} C	X	
0.5	35μ	-7^{o} C	X	
0.5	40μ	-7^{o} C	X	

* The "X" indicates that the particular point falls within the envelope of Appendix C.

It should be pointed out, that the graphs of Appendix C of Part 25 are not intended to be an exhaustive description of the atmosphere or all possible icing conditions. The relationships between LWC, MVD, temperature, and altitude presented in Appendix C were observed during numerous flight tests flown over a period of several years, and are a statistical representation of the conditions most likely to be encountered. These graphs are valid only for supercooled water droplets. There are numerous icing situations that occur in nature that do not involve supercooled water droplets and are not covered in the graphs of Appendix C, e.g., freezing precipitation (rain, drizzle, sleet, hail, snow), ice crystals, and mixed conditions. For these conditions that are outside the requirements of Appendix C, operational procedures (avoidance, diversion, rapid climbs or descents) are usually the best way to deal with the hazard.

For an aircraft to be approved for flight in known icing conditions, the critical design conditions, resulting from a combination of atmospheric conditions and the natural characteristics of the airplane, must be determined. An analysis must be conducted to show that the total aircraft, as a system, is capable of safe operation during flight in atmospheric conditions conducive to icing. Sufficient flight tests must be conducted in natural icing conditions to validate the analysis, and ground tests and simulated icing flight tests are often necessary. Due the difficulty in locating suitable natural icing conditions during a flight test program, good engineering judgement must be applied to determine if the flight test data, together with wind tunnel and simulated icing test data, are sufficient to validate the analysis.

Two sources of information relating to aircraft icing approval are Advisory Circular 20-73, and the Aircraft Icing Technical Handbook (three volumes), Report No. DOT/FAA/CT-88/8-1, available from the the U.S. Department of Commerce, National Technical Information Service, 5282 Port Royal Road, Springfield, Virginia 22161.

DE-ICING AND EMI

An important consideration in the certification of Electro-Impulse De-Icing (EIDI) systems is electromagnetic interference (EMI) and electromagnetic compatibility (EMC). When the capacitor bank in an EIDI system discharges, a large pulse of current travels down a transmission line to the coil. The coil is one source of radiation; another source is the cabling to the coil.

The problem of electromagnetic emissions outside the wing is particularly severe when the wing is constructed of composite materials. Testing investigated the EMI/EMC environment inside and outside of both a composite and an aluminum wing. (Refer to: Report DOT/FAA/CT-88/31, "Electromagnetic Emissions from a Modular Low voltage Electro-Impulse De-Icing System," dated March 1989.)

Measurements of the radiated electric field indicated that emissions from the aluminum wing were well within the standards set by RTCA/DO-160B, Section 21. Results of some of the tests with the composite wing were within standards, while others were not. Standards were exceeded in the frequency band from 150 kHz to 30 MHz. Conducted emissions on the low voltage EIDI power feed cable were brought within RTCA/DO-160B, Section 21, standards with the addition of an isolating line choke at the bus insertion point.

A 2.2 volt signal was measured on an open circuit, unshielded telephone wire run behind the de-icing module. The EMI signal was a voltage spike which occurred simultaneously with the discharge of the coil. A 2.2 volt spike would be adequate to create a transmission error on a digital transmission line. But this EMI signal was reduced to insignificant levels by either terminating the cable with 50 ohms or through the addition of shielding.

(The DOT/FAA report referenced above may be obtained from the U.S. Department of Commerce, National Technical Information Service, 5282 Port Royal Road, Springfield, Virginia 22161.)

ICING: CURRENT RESEARCH

The FAA is studying ways to reduce the effect of icing on aircraft safety. One objective is the collection of the technical data necessary to develop certification standards and flight procedures for icing conditions for all categories of aircraft. Efforts in support of this objective include atmospheric icing characterization; development of improved certification guidance for anti-icing and de-icing equipment and calibration standards for icing instrumentation; and investigation of technologies associated with the detection of ice accumulation on an airplane on the ground, including snow and ice particles that refreeze following de-icing with glycol-based fluids.

A second aspect of this program has the objective of providing pilots with a more timely, accurate delineation of actual and expected icing areas by location, altitude, duration, and potential severity. This research will study the ability of the new generation of remote sensors to detect icing conditions, evaluate current icing forecast techniques, test promising new methods, and provide the technology transfer necessary to implement the best techniques into day-to-day operations.

CLARIFICATION OF FAR 25.851(A)(5) AND 121.309(C)(4): THE LOCATION OF HAND FIRE EXTINGUISHERS

The respective sections of FAR Parts 25 and 121 concerning the location of hand fire extinguishers in the passenger cabin, are not identically worded. Section 25.851(a)(5) requires that the requisite number of extinguishers be "*conveniently located in passenger compartments.*" Section 121.309(c)(4), as recently modified by Amendment 121-188, requires that the requisite number of extinguishers be "*conveniently located and uniformly distributed throughout the compartment.*" The underlined portion was added by the referenced new amendment. Therefore, the Part 121 requirement appears to have an additional requirement beyond that of the Part 25 requirement.

This is, in fact, not the case. Advisory Circular (AC) 20-42C, Hand Fire Extinguishers for Use in Aircraft, states in Section 7.g.(1):

"In general, locate hand fire extinguishers adjacent to the hazardous area (i.e., galleys, accessible baggage or cargo compartments, electrical equipment racks, etc.) they are intended to protect."

Section 7.g.(2) goes on to discuss where to locate extinguishers if no clearly defined hazardous area exists. But such hazardous areas have been identified. Service history shows that the majority of fires in the passenger cabin originate in either the galleys or lavatories. In order to preclude a possible degradation in their effectiveness, the required extinguishers should be located in the vicinity of the galleys and lavatories. The term "*uniformly distributed*"" in FAR 121.309(c)(4) should, therefore, be interpreted to mean "*uniformly distributed with respect to the hazardous areas.*"

In the case of airplanes such as the various models of the Boeing 737 and the McDonnell Douglas MD-80 series, most, if not all, of the galleys and lavatories are located at the forward and aft ends of the cabin. For both models, Parts 25 and 121 require a minimum of three extinguishers. Additionally, Part 121 requires that two of the extinguishers must contain Halon 1211. To satisfy the location requirements of both FAR 25.851(a)(5) and 121.309(c)(4), one Halon extinguisher should be installed at each end of the cabin and the third extinguisher, containing a different agent, should be installed at either the forward or aft end of the cabin.

The phrase "*uniformly distributed throughout the compartment*" is most appropriate for airplanes with more than two pairs of floor level exits, *e.g.*, Boeing 747, McDonnell Douglas DC-10, and Airbus A-300, since the galleys and lavatories will tend to be distributed throughout the cabin of those airplanes. With such cabin arrangements, it is imperative that the requisite number of extinguishers is distributed throughout the cabin wherever the likely sources of fires are located.

WEAR LIMITS FOR TRANSPORT CATEGORY AIRPLANE BRAKES

On May 21, 1988, an American Airlines DC-10 aborted takeoff at the Dallas/Ft. Worth Airport. Eight of the 10 brakes were worn near their approved wear limits and failed during the attempted stop. As a result, the airplane ran off the end of the runway. This accident has prompted the review of the methodology used in the determination of the allowable wear limits for transport category airplane brakes.

The FAA and the Aviation Industries Association (AIA) of America have been working together to develop a dynamometer test plan that could be used to validate appropriate wear limits for airplane brakes. The AIA submitted the final version of their proposed test plan to the FAA, and the proposal has been reviewed and approved. The test plan was developed to contain definitions, ground rules, procedures, brake pre-test conditioning requirements, and other pertinent factors such that any appropriate brake wear limits proposed by an airframe or brake manufacturer could be satisfactorily validated on the dynamometer by following this procedure.

The following dynamometer rejected takeoff (RTO) test procedure may be used for the determination of acceptable airplane brake wear limits. These test guidelines may be used to verify or decrement the Airplane Flight Manual (AFM) brake performance limits, but not to improve existing limits:

A. ACCEPTABLE TEST BRAKES.

1. Either airplane-worn or mechanically-worn brakes may be used. "*Mechanically-worn*" is defined as not being airplane-worn, *e.g.,* machined or dynamometer-worn. If mechanically-worn brakes are used, it must be shown that they can be expected to provide similar results to airplane-worn brakes.

2. Each test brake shall be subjected to a sufficient number of type of stops to ensure that the brake's performance is representative of in-service use.

B. WEAR STATE OF THE TEST BRAKE.

1. Degree of Wear: The degree of wear of the test brake shall be 100 percent. "*One hundred percent worn*" is defined as that degree of wear which the applicant intends to allow before the brake is to be removed for overhaul. At the overhaul limit, the brake will not be fully worn out, but will contain sufficient braking capability to meet the stopping requirements discussed in Section C., below. The chosen test brake shall be such that the wear-in conditions produce a brake ready to perform the RTO test at the correct wear setting. If a brake to be tested is worn less than 100 percent, an acceptable method of extrapolation to the fully worn state must be provided prior to the test.

2. Definition of Degree of Wear: The "*degree of wear*" shall be defined in terms of the linear, axial direction dimension relating to the allowable wear of the brake as commonly determined by noting wear pin extension.

3. Distribution of Wear (Applicable only to mechanically-worn brakes): The proportioning of the wear through the brake for the various friction pairs shall be based on either:

a. service experience on the test brake or an appropriate equivalent brake, or

b. dynamometer wear test data.

C. ENERGY LEVEL AND STOPPING REQUIREMENT. It will be acceptable to conduct the dynamometer test with an initial energy value prior to the RTO test that is analogous to that used for the airplane certification flight test of that brake, including, if desired by the applicant, the effects of:

1. engine reverse thrust, excluding the one engine presumed to be failed, and

2. the demonstrated transition times achieved in flight test.

D. POWER LEVEL. The test shall be conducted at either of the conditions below, provided that the test is conducted at the condition which more closely represents the actual braking conditions obtainable on the airplane. The intent of these procedures is to simulate actual airplane conditions as closely as possible:

1. The maximum brake pressure; or

2. The maximum tire drag or brake torque consistent with the airplane's hydraulic system and any antiskid and/or torque limiter pressure limitations that would occur on the airplane during an equivalent RTO operation.

E. FINAL CONDITION DEFINITION.

1. A full stop demonstration is not required for the worn brake RTO test. The test brake pressure may be released at a dynamometer speed of up to 20 knots to facilitate a detailed post-test inspection of the brake. The dynamometer test may be started at a slightly higher speed so that the test may be terminated at 20 knots or less, provided that the data submitted for each test show that the energy absorbed by the brake during a test that is terminated at 20 knots or less, is equal to the energy that would have been absorbed if the test had been started at the proper speed and continued to zero ground speed.

2. There shall be no wheel burst as a reusult of this test.

F. DATA REQUIREMENTS.

1. As a minimum, the following technical data shall be obtained for each dynamometer test conducted

- *Brake torque (or force)*
- *Brake pressure*
- *Time*
- *Road wheel speed*
- *Road wheel distance*
- *Dynamometer inertia equivalent*

2. The absorbed dynamometer kinetic energy and resultant braking force shall be computed based on measured data. Additional data may also be obtained to aid in interpolating and extrapolating test results.

3. A test report shall be prepared which, as a minimum, shall include:

a. A detailed description of the test article (*e.g.*, component part numbers, individual disk measurements, wear pin measurements, etc.);

b. The test procedures; and

c. The test results.

G. INTERPRETATION OF DATA. Any adjustment of energy levels, resultant braking force, or allowable wear from the dynamometer test shall be based on a review of the test data, inspection of brake hardware after test, and subsequent analysis.

1. An extrapolation of wear data, energy, and resultant braking force data up to 5 percent of the test values shall be permissible.

2. An interpolation of data up to 20 percent of the test values shall be permissible to establish energy and performance levels from multiple dynamometer tests which are within this range from the target condition.

H. ACCEPTANCE OF PRIOR TESTS. Worn brake RTO tests which have been conducted successfully prior to the adoption of this procedure may be acceptable. These tests need not be repeated solely to gather test data specified here.

These worn brake dynamometer test guidelines are a *recommended* test procedure and, as such, represent one means, but not necessarily the only means, of determining acceptable maximum brake wear. It is possible that a situation unique to a given brake design, installation, or application may require different test procedures, and this test plan should not be considered to be the only acceptable means. The FAA would consider any deviation to these guidelines if it can be shown that the proposed procedure is appropriate and would produce equivalent results.

On any given airplane model there may be many different brake configurations that are quite similar, and identified by different "dash numbers." It may be acceptable for the manufacturer to demonstrate acceptable brake wear limits on one brake representative of a brake family, and extend that brake wear limit to others of the same family by analysis. However, each case will have to be evaluated on its own merit.

There may be some situations in which a brake modification or brake installation is proposed by an applicant other than the airframe manufacturer or the original brake manufactuer. In these cases, if the brake modification is judged to be a major change involving friction couple (rotor/stator), or in any way could affect braking force or brake energy capacity, a determination of the effects of brake wear in accordance with these procedures must be accomplished. The applicant may claim the same brake wear limit as the original brake manufacturer, and this may be acceptable, but this would have to be demonstrated by analysis or test.

A project to amend Part 25 to include a determination of the effects of brake wear on brake force for new airplanes has been initiated. At this time, it has not been determiend what format for this determination will be. For the present time, any certification project involving new brakes or a substantial redesign of existing brakes (major change) should be conducted as described in FAA Order 8110-8, *i.e.,* airplane flight tests should be conducted using new brakes. An adjustment to the allowable brake wear limits may then be made, if applicable, using the procedures described above.

For additional guidance or explanation concerning these procedures, contact your cognizant ACO.

THE AIRCRAFT EVALUATION GROUP: THE BRIDGE BETWEEN TYPE CERTIFICATION AND AIRCRAFT OPERATIONAL ACCEPTABILITY

The Flight Standards Aircraft Evaluation Groups (AEG) have evolved within the FAA to bridge the gap between type certification efforts and operational activities. AEG Specialists are fully qualified FAA Pilot, Maintenance, or Avionics Inspectors, often having airline, engineering, or flight test backgrounds, who contribute an operational perspective to engineering activities. They draw on engineering evaluations to develop and determine operationally significant items that need to be brought to the attention of field offices prior to reviewing or accepting a particular air carrier's program. Planning and preparation for operational approval take place during type certification, and continue until the airplane is placed into service. The basic function of the AEG is to confirm operational suitability of aircraft from the inception of type certification activities to the operational acceptance of the aircraft, and continues through the service life of the aircraft.

During type certification, the AEG initiates Issue Papers (IP) as part of the Directorate's certification program. The IP's relate to various operating rules on such subjects as forward observer seats, flightcrew sleeping quarters, and Master Minimum Equipment Lists (MMEL's). The IP's provide an opportunity for the manufacturer to address forthcoming operational issues in a timely manner. The manufacturer may choose to address the issue by complying with an appropriate solution to correct a situation, or by taking corrective action by requesting a meeting for consultation, or by rejecting the issue through non-compliance. Following publication of the IP, work can then begin to resolve any open items, or identify non-compliance prior to operation of the aircraft. In addition, as part of the certification process, AEG pilots are also involved in the review of Aircraft Flight Manuals.

Three subject matter review boards are established by the AEG's during the type certification program. These are:

- **Flight Standardization Boards (FSB) which evaluate and determine appropriate training, experience, and training device requirements to ensure flightcrew competency in the aircraft;**
- **Maintenance Review Boards (MRB) which define the aircraft's maintenance program inspection requirements; and**
- **Flight Operations Evaluation Boards (FOEB) which establish the master document from which an operator can establish allowable in-**

operative equipment limits (Master Minimum Equipment Lists).

Following type certification, the AEG's provide support for continued airworthiness by actively participating in all Airworthiness Directive Review Boards, reviewing Service and Operational Bulletins, revising MRB's as needed, and reviewing Service Difficulty Reports. AEG's act as the Directorate focal point to follow the aircraft operationally and provide liaison between field offices, FAA engineering, or the manufacturer for any problems that occur in service. The AEG's objective is to ensure that the integrity of the aircraft operational suitability continues throughout the service life of the aircraft.

FAA DATA LINK PROGRAM

The FAA has initiated an air/ground data link program to enhance the air traffic control system by relieving the congestion of the voice communication channels and reducing voice communications by providing air traffic control messages and other information to the flight deck for display by means of a digital communication system. The principal elements encompass radio frequency media, such as satellite communications equipment, Mode S transponders, and, in some cases, an enhanced version of the AIRINC Communications, Addressing and Reporting Systems, commonly called ACARS.

A Data Link program office (ASA-240) has been formed in FAA Headquarters for the purpose of overviewing and directing the program nationally, and for managing the development of data link avionics hardware and software by private FAA contractors.

The Transport Airplane Directorate is forming a data link advisory circular team to develop certification guidance material for the installed airborne equipment and will work closely with the program office for this purpose. The team will also work with and participate in human factors study groups to identify the special needs and considerations associated with flight deck information display concepts.

TECHNOLOGICAL ADVANCES

The next decade will bring about substantial changes in aviation technology and design as the potentials for greater aircraft speed and efficiency are explored. Developments such as the use of advanced materials for aircraft construction and the emergence of new, high speed aircraft engines will require continuous FAA oversight to ensure that efficiency is not gained at the expense of safety. The FAA will also be charged with developing the systems and operations necessary for realization of the advanced automation concepts planned for the aviation system of the future.

Many new types of advanced materials will be used in the construction of future aircraft. Composite materials, for example, offer superior strength and stiffness properties, as well as lighter weight and resistance to corrosion and other weathering effects. While these materials offer significant benefits in terms of strength and weight, the full implications of their use in aircraft and their "crashworthiness" are of concern. One issue is the increased damage potential of electromagnetic hazards for aircraft constructed of composite materials, especially those using fly-by-wire control systems.

New subsonic engines now beginning flight tests or in late design stages will provide airlines with dramatic improvements in fuel economy. The trend for air carriers is expected to be toward high-speed aircraft operating at higher altitudes and expanded ranges with the same payloads. Supersonic transports with speeds of Mach 2.5 to 3.5 will begin to enter the fleet around the year 2000, with hypersonic (greater than Mach 5) and transatmospheric flight possible by 2010.

The application of advanced technology propulsion systems brings its own set of problems and hazard potentials that the FAA's specialists must be prepared to resolve. These include takeoff noise, sonic boom, and possible depletion of the ozone layer. Wide variations in aircraft operating characteristics will also add to the complexity of the aviation system, especially in congested areas.

Turbine rotor containment is of increased concern because of the rapid growth in turbine-powered helicopter use. Compared to transport aircraft, multi-engine helicopters are forced by design to have turbine engines in close proximity to each other, to critical rotor gearing controls, and to the top of the fuselage, with little space available for shielding or isolation. Consequently, the threat of high-energy metal fragments from uncontained turbine-engine rotor failures requires additional research on protective measures.

By the year 2010, a great number of automation advances are expected to be made. The flow of information to operators and the Air Traffic Control (ATC) system will have been enhanced by widespread use of digital data link communications. Dynamic knowledge of system and airport capacity will have become good enough to permit a great deal more strategic planning than exists in the system today.

The ATC system, which is today a balance of strategic and tactical operations, will have shifted to permit more strategic planning and will be far more capable of adapting to changing traffic situations. The ATC process will be far more automatic than it is today, eventually permitting the creation and transmission of conflict-free, fuel-efficient clearances.

Cockpit systems that can simplify and optimize the interaction of pilots with automated systems and digital communications devices will be in widespread use. Many aircraft will fly precisely enough to work within narrow metering "windows" established by air traffic control for more efficient use of airport and airspace resources.

Traffic density will be so high and the vehicles so varied that discipline, by common consent, will increasingly be necessary in high-density airspace to achieve safe and efficient operations for all users. Information flow and traffic management at the lower altitudes will become more critical because of increased numbers of rotorcraft and tiltrotor aircraft. As aircraft enter higher density airspace from low density airspace, they will automatically become part of the controlled system, communicate their intentions if they have not done so before takeoff, and remain controlled to the extent necessary to ensure separation and avoid conflicts.

Control systems for very high altitudes will come on the scene to permit safe management of aircraft operating in the supersonic and, possibly, hypersonic regimes. While the basic process of air traffic control is not likely to change, management of such aircraft will require special handling, probably through the use of large area coverage, very high altitude centers, and international or multinational control.

The concept of visual flight rules operations will remain viable, but will be enhanced by airborne collision avoidance systems that will warn aircraft of impending conflicts and intervene, if necessary, to prevent them. Virtually all aircraft will have access to real-time weather data and other flight information, much of it via digital data link.

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FAA EMPLOYMENT OPPORTUNITIES

The Northwest Mountain Region Aircraft Certification Division currently has a number of vacancies at the GS-5 through GS-13 levels ($19,654 to $51,354 per annum) for qualified aerospace engineers in the following specialties: airframe, systems and equipment, propulsion, flight test, and modifications.

These positions are located in Long Beach, California, and Seattle, Washington. They require, as a minimum, a B.S. degree in engineering for the GS-5 entry level. Further education and/or certification experience may qualify an applicant for higher grade levels.

If you or anyone you know is interested in form information about FAA employment, please contact:

Federal Aviation Administration
Transport Airplane Directorate
Aircraft Certification Service
ATTN: J. R. Staab, ANM-103
17900 Pacific Highway South, C-68966
Seattle, Washington 98168

(The Federal Government is an equal opportunity employer.)

NOTE FROM THE EDITOR

If you would like a copy of any of the previous editions of the Transport Airplane Directorate (Northwest Mountain Region) Designee Newsletter, or if you are a Designee who would like to have your name added to our mailing list, please submit your request to:

Federal Aviation Administration
Transport Airplane Directorate
Aircraft Certification Service
ATTN: Editor (DeMarco), ANM-103
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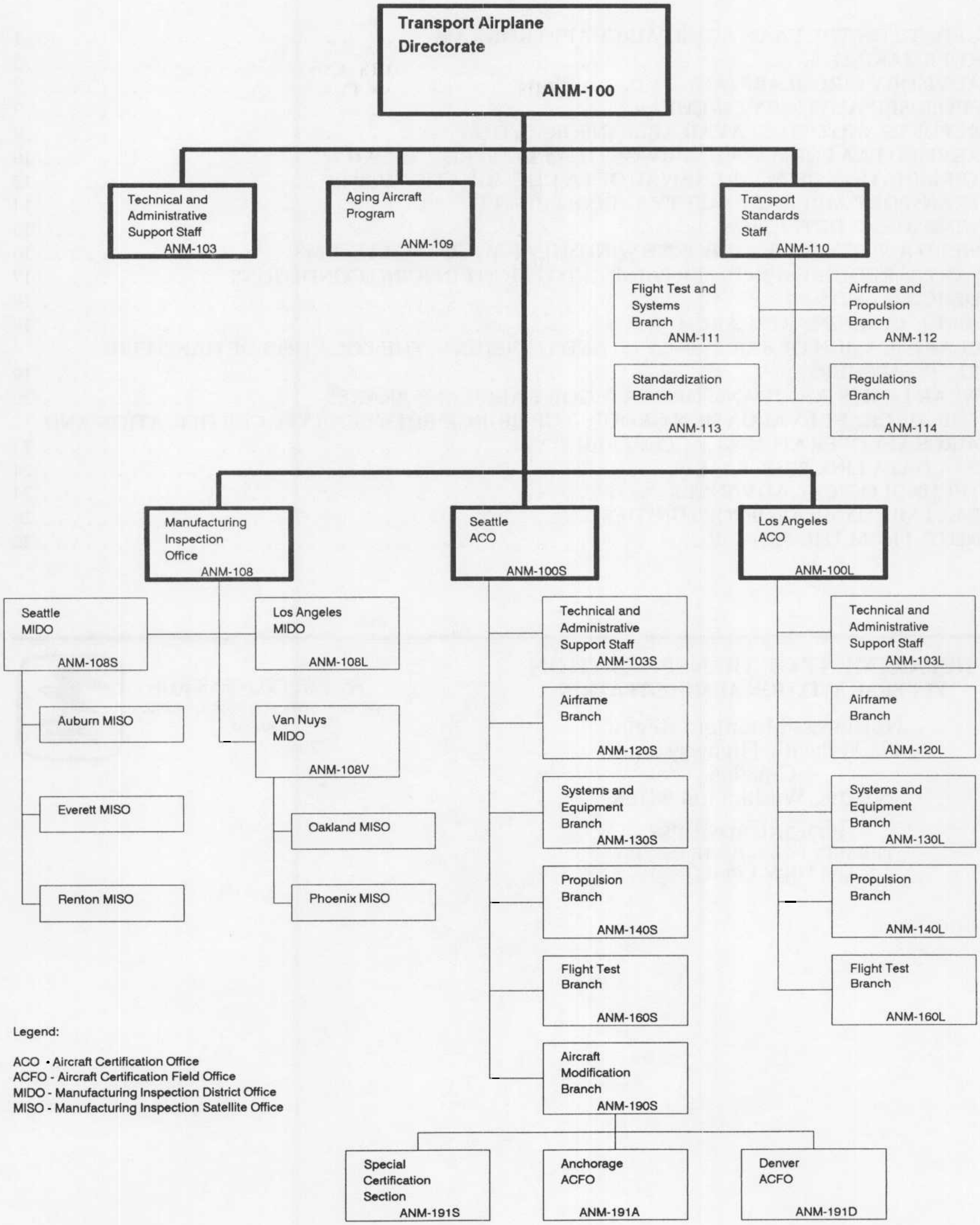

Legend:

ACO - Aircraft Certification Office
ACFO - Aircraft Certification Field Office
MIDO - Manufacturing Inspection District Office
MISO - Manufacturing Inspection Satellite Office

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DEPARTMENT OF TRANSPORTATION
FEDERAL AVIATION ADMINISTRATION

Northwest Mountain Region
17900 Pacific Highway South
C-68966
Seattle, Washington 98168

OFFICIAL BUSINESS
PENALTY FOR PRIVATE USE, $300
FAA FORM 1360-12 (12-71)

POSTAGE AND FEES PAID
FEDERAL AVIATION ADMINISTRATION
DOT-515

U.S.MAIL