U. S. Department of Transportation
Federal Aviation Administration

DESIGNEE NEWSLETTER
Transport Airplane Directorate

Aircraft Certification Service; Northwest Mountain Region
Edition 16, September 1993

Airbus Industrie Model A340

...see article inside

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The purpose of The Designee Newsletter is to provide designees with the latest information concerning regulations, guidance material, policy and procedures changes, and personnel activities involving the certification work accomplished within the Transport Airplane Directorate's jurisdictional area. Although the information is the latest available at press time, it should not be considered "authority approved" unless specifically stated; neither does it replace any previously approved manuals, special conditions, alternative means, or other materials/documents. If you are in doubt about the status any of the information addressed, please contact your cognizant Aircraft Certification Office (ACO), Manufacturing Inspection District Office (MIDO), or other appropriate FAA office.

The Outlook for Aviation, 1993 - 2000

Aviation has been through some bad times, but trends in the industry point to an improving economic outlook. According to statistics released at the agency's 18th Annual Aviation Forecast Conference, *"moderate growth"* is the forecast for the next 12 years. These figures underline that the early 1990's have not been kind to aviation. In fact, 1991 saw worldwide air traffic record its first-ever decline.

Here's more of what was said at the conference about the outlook for 1993 to 2004, and ways to alleviate its financial troubles:

Implementing FAA's Capital Investment Plan (CIP) to modernize the air traffic system is one way to aid economic recovery, said Joe Del Balzo, then-acting FAA Administrator. "We've got to get on with it, using sustained consistent funding, and a reformed procurement process," he noted.

Already, 23 large U.S. airports report more than 20,000 hours of delay annually, and serious delays should spread to 13 more over the next five years. Estimates are that air traffic delays cost passengers $7 billion annually and will go up another 50 percent in the next 10 years.

"Open Architecture"

Del Balzo said that one reform being considered in the modernization is "for the FAA to fully embrace the concept of an open architecture for our systems, and accept the idea of buying our technology off the shelf." That should create incentives for industry to come up with creative technology and cost cuts, and curb the government's bias toward bigness. "We should describe what we want to accomplish and let the marketplace do the rest," he said.

Also, he said that FAA will use the procurement strategy of *"fast prototyping"* -- an award of cost-plus development contacts before entering into a fixed-price production contract -- to help "iron out the problems before going to full-scale production."

Transition to Satellites

One technology that is revolutionizing air traffic control already is the GPS -- Global Positioning System. A year ago, the use of satellites for control of civilian air traffic was only theoretical. "Today, the transition to that system is already underway," Del Balzo said.

Because of GPS, annual savings due to fewer delays and more efficient routes are projected to exceed $100 million for air carrier and business aviation. By 1996, sales of avionic products for GPS should reach between $500 and $740 million, many times the $6 million of 1990. "Sales of all GPS products -- auto, marine, and aviation -- are predicted to reach $4 billion by the year 2000," said Del Balzo. "Government and industry can and must work as partners to promote out competitive position in world markets."

Today no single country can expect to be the sole arbiter of aviation standards. For a number of years, the FAA has worked with other countries to establish common rules and procedures for aircraft certification and operation. It is important for the FAA to participate internationally to develop future aviation standards that are in harmony with other country's. If that is not done, "the result would be a growing gap between U.S. standards and those of Europe and the rest of the world. And with that gap would come a loss of influence and weakening of the competitive advantage we now enjoy," said Del Balzo.

"... Maybe, just maybe, the future of aviation is ahead of us." -- Sen. Oberstar

"Leaner" Regulations

Along with timely implementation of the CIP and global harmonization of aircraft certification and operation, Del Balzo talked about the continued screening of regulations to cut costs. Though regulatory activity must be responsive to the many stakeholders that the FAA service, "in the end, of course, safety, in the public interest, will always take first priority," he said.

Also, he cited the participation of the 61-member Aviation Rulemaking Advisory Committee (ARAC) in proposing new rules and in suggesting revisions to old ones. "Industry participation helps guarantee that our regulatory decisions are made on the best information available so that we can reduce -- hopefully eliminate -- unnecessary costs," he remarked.

At the FAA we can -- and must -- "do whatever is required to help the aviation business through this period of hardship," Del Balzo said.

"There is no simple, single cause of the aviation problems today," said Rep. James Oberstar, chair of the House Aviation subcommittee. In light of the cyclical nature of the industry, Oberstar pointed out that "maybe, just maybe, the future of aviation is ahead of us."

Deregulation Advantageous

"Isn't it time to reregulate?" "Isn't it time for the government to decide how aviation is going to fare?" are questions that Oberstar is often asked. In response, he named some benefits that deregulation of the airline industry has brought: low fares, widely distributed benefits, more markets offering consumers a choice of carriers. "Deregulation saves air travelers $6 billion a year," Oberstar stated. It also gives air carriers the opportunity to fail. Currently, the top 7 carriers control more than 91 percent of the market, with the top four in control of 67 percent.

After deregulation, development of the infrastructure became inadequate, but all that is turning around, he believes. "The FAA is now being given the tools to do the job it needs to do," said Oberstar.

Review by National Commission

A widely representative national Presidential commission is being considered to zero in on the cause and treatment of aviation's ills. "The mandate is to provide a competitive industry as well as a strong industry," said Oberstar. *[See article on this subject on page 7 of this edition.]*

Describing the economic trends as upbeat, John Rodgers pointed out that "the airline industry is very cyclical and has had three bad years in a row," partly because of an extended recession, and partly because of the Persian gulf War. Rodgers is director of FAA's Office of Aviation Policy, Plans, and Management Analysis (APO).

Positive Indicators

Although recent aviation statistics looked promising on the surface, growth came from intense price warfare. The result was $1.9 billion in losses for airlines in fiscal year '92. "We should expect an upturn, however," Rodgers said. Evidence for optimism is that:

- **Air transport has not exhibited all of the characteristics of a mature industry.**
- **Air transport's "more seats than passengers" syndrome is not chronic or long term.**
- **Hubbing is not passe. It is alive and well, Rodgers believes.Growth to be "Modest"**

Even with the proposed fuel tax on petroleum products -- which may fall someplace between 8 and 15 cents on a gallon -- the airline industry can still attain profits. If the fuel tax is adopted, the cost could be recovered by increasing passengers fares between 2 and 3 percent.

Rodgers added that FAA forecasts are in line with the latest economic indicators.

"An upturn will come," Rodgers stressed. "Modest is forecast throughout the industry."

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FAA Aviation Forecasts: Giving the Numbers

For fiscal years 1993 through 2004, agency figures say an annual increase of 3.9 percent can be expected in domestic air carrier revenue passenger miles. Internationally the increase should be 6.6 percent annually over the same period. Growth in domestic enplanements will average 3.5 percent annually.

As to workload, activity at FAA towered airports should increase on an average of 1.9 percent annually over the forecast period. In 1998, tower operations are predicted to exceed the 1979 all-time peak of 69 million, reaching 76.6 million by 2004. The mix of aircraft is expected to increase gradually toward larger jets.

At air route traffic control centers, the number of aircraft handled should increase at a rate of 2 percent annually. In absolute numbers, center workload should go from 36.7 million aircraft handled in 1992 to 46.6 million in 2004.

Several factors resulting from automation will tend to dampen the growth in flight service station workload measures as currently defined. Assuming that the consolidation program is completed before fiscal year 1995, total flight services should begin to increase gradually, growing at an average annual rate of 0.6 percent over the remaining nine years of the forecast. Total flight services should reach 39.4 million by 2004.

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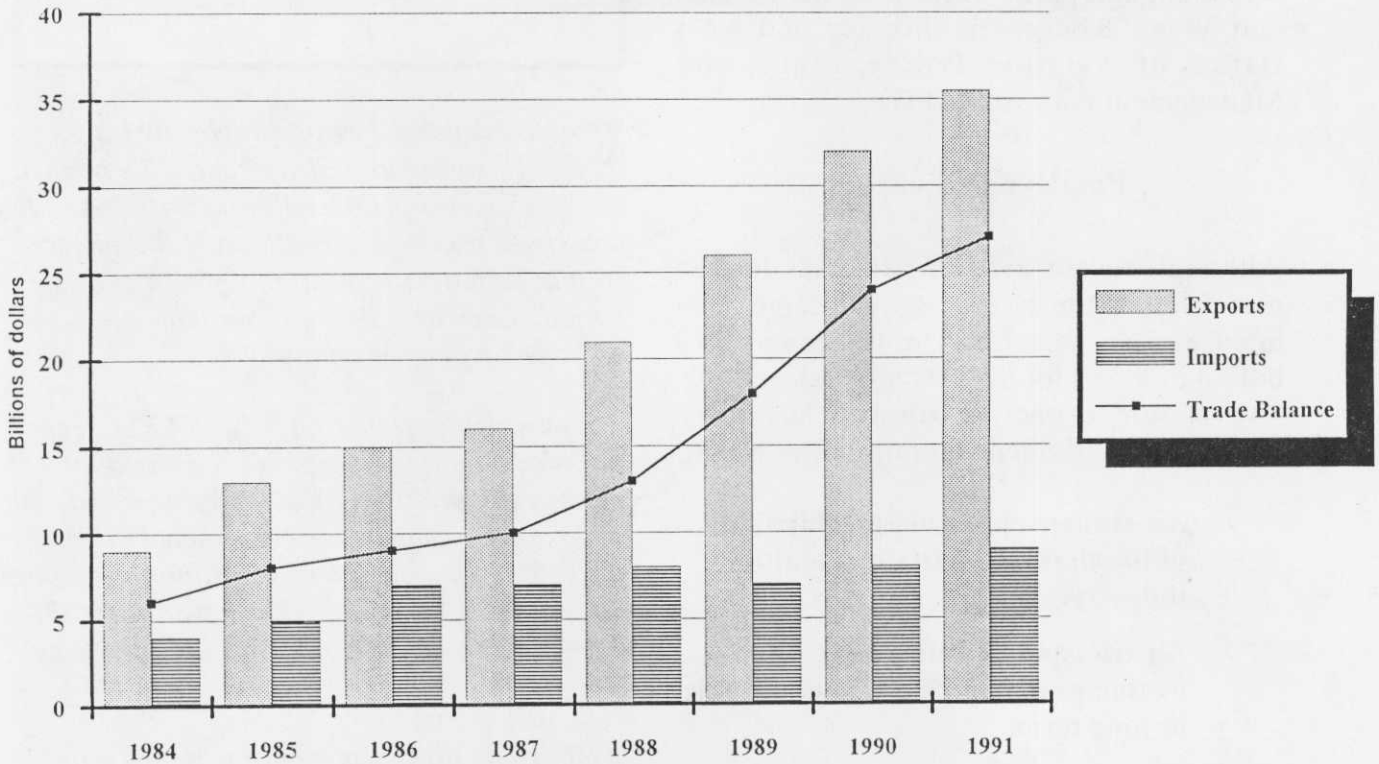
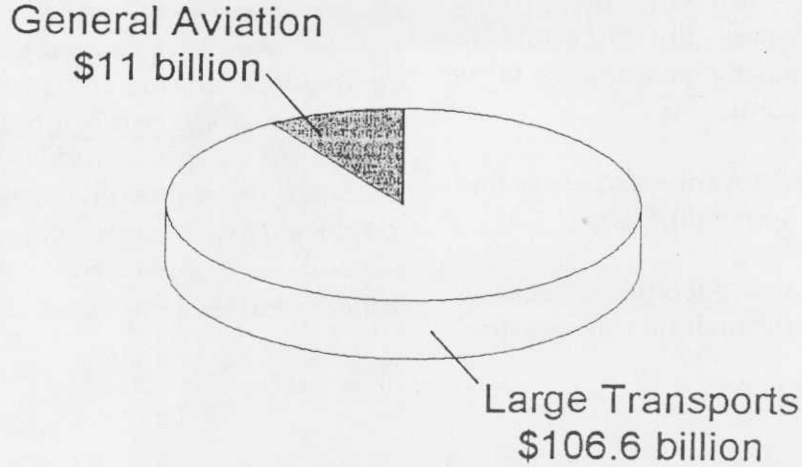
U.S. Civil Aerospace Exports, Imports, and Trade Balance



Annual Civil Aviation Economic Activity



SPECIAL TOPIC:

National Commission to Ensure A Strong Competitive Airline Industry

On April 7, 1993, President Clinton signed into the law the establishment of the National commission to Ensure a Strong Competitive Airline Industry, H.R. 904. Establishment of this commission was based on the following findings by Congress:

1. The nation's airlines must be part of an intermodal transportation system that will move people and goods in the fastest, most efficient manner.

2. The nation's airlines provide our connections with the global economy. A strong airline industry is essential to our nation's ability to compete in the international marketplace.

3. The nation's airlines are in a state of financial distress, having lost more that $6 billion in 1990 and 1991. These losses threaten the ability of our airlines to accommodate the growing aviation traffic demands for the 1990's, which threaten to undermine our nation's ability to compete in the global economy.

4. Because of the airline industry's financial distress and the absence of government policies to promote competition, there has been a precipitous decline in the number of major airlines. Of the 22 airlines that entered the industry following airline deregulation, only 2 are now operating. The rest have either gone out of business or merged with other carriers.

5. Concentration in the airline industry has advanced rapidly in the past few years. The top 4 major airlines now control 67 percent of aviation traffic, and the top 7 airlines now control 91 percent of aviation traffic. Three major airlines, carrying 19 percent of aviation traffic, are in Chapter 11 bankruptcy and their survival is in doubt.

6. The continued success of a deregulated airline system requires the spur of effective actual and potential competition to force airlines to provide high quality service at the lowest possible fares.

7. Further reductions in the number of major airlines may leave the industry without sufficient competition to ensure a continuation of the benefits consumers have received under airline deregulation.

The functions of the Commission are:

Investigation and Study. The Commission is to make a complete investigation and study of the financial condition of the airline industry, the adequacy of competition in the airline industry, and the legal impediments to a financially strong and competitive airline industry.

Policy Recommendations. Based on the results of the investigation and study to be conducted, the Commission will recommend to the President and Congress those policies which need to adopted in order to:

- **achieve the national goal of a strong and competitive airline system which will facilitate the ability of the nation to compete in the global economy;**
- **provide adequate levels of competition and service at reasonable fares in cities of all sizes;**
- **retard the flow of U.S. air carrier bankruptcies and accompanying loss of jobs for U.S. citizens;**
- **provide a stable work environment for airline industry employees; and**
- **continue to reduce noise for citizens around airports without damaging the economic or competitive positions of the air carriers.**

Consideration of Aircraft Noise Abatement. In carrying out the study and investigation, the Commission will take into account aircraft noise abatement, a priority established by Congress by enactment of the Airport Noise and Capacity Act of 1990.

Specific matters that the Commission will address are:

The financial condition of the airline industry: The current financial condition of the airline industry and how the industry's financial conditions are likely to change over the next 5 years, including:

- **the profits or losses likely to be achieved by the airline industry over the next 5 years;**
- **whether or not any profits realized will be adequate to permit airlines to acquire the capital equipment necessary to meet the demand of the traveling public in a safe and efficient manner, while complying with environmental regulations; and**
- **whether or not any major airlines are likely to fail or sell major assets in order to survive.**

Adequacy of competition: The current state of competition in the airline industry; how the structure of airline industry competition is likely to change over the next 5 years; and whether or not the expected level of competition will be sufficient to continue the consumer benefits of airline deregulation.

Legal impediments: Whether or not the Federal government should take any legislative or administrative actions to improve the financial conditions of the airline industry or to enhance airline competition, including whether or not any changes are needed in the legal and administrative policies which govern:

- **the initial award and the transfer of international airline routes;**
- **the allocation of slots at high density airports;**
- **the allocation of gates, particularly at airports dominated by one or a limited number of airlines;**
- **frequent flier programs;**
- **airline computer reservation system;**
- **the rights of foreign investors to invest in U.S. airlines;**
- **the taxes and user fees imposed on U.S. airlines;**

- **the regulatory responsibilities imposed on U.S. airlines;**
- **the bankruptcy laws of the U.S. and related fitness rules administered by the Department of Transportation as they apply to airlines; and**
- **the obligations of failing airlines to meet pension obligations.**

International policy: Whether or not the policies and strategies followed by the U.S. in international aviation are promoting the ability of U.S. airlines to achieve long-term competitive success in international markets, including:

- **the Government's general negotiating policy;**
- **the desirability of multilateral rather than bilateral negotiations;**
- **whether or not foreign countries have developed the necessary infrastructure of airports and airways to enable U.S. airlines to provide the service needed to meet the demand for aviation service between the U.S. and such countries;**
- **the rights granted foreign airlines to provide service the U.S. domestic markets (*"cabotage"*); and**
- **the rights granted foreign investors to invest in U.S. airlines.**

Assessment of the aircraft manufacturing industry: The state of the U.S. aircraft manufacturing industry, and make recommendations to the President and Congress concerning policies that will help foster a healthy, competitive U.S. aircraft manufacturing industry.

Study of incentives for expedited fleet conversion: The possibility of long-term load guarantees and tax incentives for air carriers to expedite the conversion of the commercial airline fleet from Stage 2 to Stage 3 aircraft in advance of the deadlines established by the Airport Noise and Capacity Act of 1990.

The Commission is composed of 15 voting and 11 nonvoting members, including 6 members appointed by the President. Voting members include:

Former Virginia Governor Gerald Baliles, Chair;

Russell Meyer, chairman and CEO of Cessna Aircraft Co.;

Felix Rohatyn, general partner with the investment firm of Lazard, Freres & Co.;

Herbert Kelleher, president and CEO of Southwest Airlines;

Robert Daniell, chairman and CEO of United Technologies Corp.;

Bette Anderson, president of Kelly, Anderson and Associates;

Sylvia de Leon, partner in Akin, Gump, Strauss, Hauer & Feld;

Gina Thomas, managing attorney for international and regulatory affairs for Federal Express Corp.;

Charles Barclay, president of the American Association of Airport Executives;

Abraham Sofaer, partner, Hughes, Hubbard & Reed;

John Peterpaul, general vice president for transportation, International Association of Machinists and Aerospace Workers;

J. Randolph Babbitt, president of the Air Line Pilots Association;

Sandra Pianalto, first vice president, Federal Reserve Bank, Cleveland;

John Robson, Lister Crown Distinguished Faculty Fellow, Yale University; and

Daniel Kasper, director of transportation practice, Harbridge House, Inc.

Non-voting members include five senators and five representatives:

Sen. John Danforth (R-Mo.);
Sen. J. James Exon (D-Neb.);
Sen. Slade Gorton (R-Wash.);
Sen. Patty Murray (D-Wash.);
Sen. Ernest Hollings (D-S.C.);
Rep. Robert Borski (D-Pa.);
Rep. Maria Cantwell (D-Wash.);
Rep. Richard Gephardt (D-Mo.);
Rep. Newt Gingrich (R-Ga.); and
Rep. Bud Shuster (R-Pa.).

The FAA's Office of Aviation Policy, Plans, and Aviation Analysis (APO) has been assigned the agency's lead in this effort.

The Commission is expected to submit a final report to the President and Congress on its activities and recommendations this fall.

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SPECIAL TOPIC:

The FAA/JAA Harmonization Work Program: How it Works

Background

Each year, during June, the FAA and the European Joint Aviation Authorities (JAA) meet to discuss joint harmonization activities for both rulemaking and non-rulemaking in the fields of aircraft certification, operations, and maintenance. The objective of this annual meeting is to provide a forum for the FAA and JAA to review and update the *"FAA/JAA Harmonization Work Program."* During these meetings, progress on specific harmonization initiatives is reviewed and discussed with the intent of joint resolution of problems. Consideration also is given to new areas of harmonization. Harmonization priorities are agreed to, and the focus of the joint program is affirmed by both the FAA and JAA. Other interested civil aviation authorities, as well as organizations representing the U.S. and European aviation industry, are invited as observers to each annual meeting.

The FAA/JAA Harmonization Work Program is the result of the commitment made by both the FAA and JAA at the 8th FAA/JAA Harmonization Meeting to *"develop a structure and formal procedures"* for a joint harmonization program. The ultimate objective of the program is to bring about the efficient and effective *"harmonization"* of the Federal Aviation Regulations (FAR) and the Joint Aviation Requirements (JAR). It begins with the submittal of an idea and ends with the harmonization of a FAR/JAR standard or regulation.

Harmonization Ideas

The first step in integrating FAA/JAA harmonization activities is the development of a *"harmonization idea."* Harmonization ideas come from many sources. These sources are internationally diverse, and include organizations, associations, aviation authorities (such as the JAA, FAA, and Transport Canada), the international aviation industry, technical experts, Congress, other U.S. and foreign government agencies, academia, and private citizens.

Specific guidelines have been established for submitting harmonization ideas. First, a harmonization idea must be submitted *in writing* for consideration by the FAA and JAA. The text of the submittal usually contains the following:

- **The FAR and JAR to be harmonized;**
- **A statement discussing why the harmonization should be initiated;**
- **A statement discussing the benefits to be derived from the harmonization, including both quantitative and qualitative benefits, as well as an estimate of the costs associated with the harmonization; and**
- **If other regulations are affected by the harmonization but are not included in the regulation to be harmonized, a statement discussing why these other regulations should not be harmonized as well.**

All harmonization ideas are submitted to both the appropriate FAA and JAA Focal Points (*see listing at end of article*). The Focal Points are available to assist individuals in understanding the guidelines established for submission of a harmonization idea.

Joint Harmonization Review: JAA/FAA Focal Points and Users

A *"Joint Harmonization Review"* is the next step in the process. The Review consists of coordinated staff work between the FAA and JAA Focal Points. For the FAA, the Focal Point is a technical position established in each FAA office having rulemaking responsibility for a specific FAR (i.e., the Transport Airplane Directorate has rulemaking responsibility for FAR 25). For the JAA, the Focal Point is a position established as part of the duties and responsibilities of the relevant JAA Director. The Director consults relevant Study Group(s), as well as the JAA Regulations Committee during the JAA review.

After a harmonization idea is received in writing, a preliminary assessment is made on the technical merit of the harmonization idea. This is accomplished by the FAA and JAA technical staffs, in consultation with the designated U.S. and European industry users. If both the FAA and JAA technical staffs determine that the idea has merit, a draft *"Terms of Reference"* sheet is completed by the Focal Points within 2 months.

The Terms of Reference includes information such as:

- **the description of the harmonization task;**
- **the benefits to be derived from it;**
- **the proposed composition of the harmonization work group as agreed to by the FAA and JAA Focal Points;**
- **contacts for the FAA, JAA, and U.S./European industry; and**
- **an estimate of resources required for the task (for FAA, JAA, and users).**

The Focal Points may obtain input from U.S. and European industry users to assist in the completion of the draft Terms of Reference.

From this coordinated staff work, a draft Terms of Reference is produced and is submitted as a recommendation for executive review by the FAA and JAA.

FAA and JAA Executive Reviews

The FAA and JAA Executive Reviews are separate internal reviews. The results of each review are discussed between these two bodies. The high level management personnel involved in these internal reviews may differ depending on the type of harmonization task recommended for review. For rulemaking initiatives, FAA management includes the Director of the Aircraft Certification Service (AIR-1), Director of the Flight Standards Service (AFS-1), Director of the Office of Rulemaking (ARM-1), and the Associated Administrator for Regulation and Certification (AVR-1). JAA management includes members of the Executive Board.

Both the FAA and JAA Executive Reviews focus on the availability of resources, rather than the technical aspects, when making the decision to either reject or accept the draft Terms of Reference submitted by the Focal Points.

The decision to approve and finalize a specific Terms of Reference must be a joint decision, agreed to by both the FAA and JAA Executive Reviews. If the Terms of Reference is approved, FAA and JAA rulemaking begins with the proper notification and documentation to the U.S. and European rulemaking systems.

The FAA and JAA Executive Review is an on-going process, rather than a limited-time schedule during the year. This allows the submission of any draft Term of Reference to both the FAA and JAA Executive Review whenever it has been completed by the Focal Points.

U.S. System (ARAC Subcommittee)

For rulemaking harmonization initiatives, the FAA assigns the task to the FAR/JAR Harmonization Working Group through the appropriate Subcommittee of the Aviation Rulemaking Advisory Committee (ARAC). ARAC was established specifically to provide advice and recommendations to the FAA on all rulemaking activity. For any new harmonization initiative, a mission statement based on the Terms of Reference is forwarded from the FAA to the appropriate ARAC subcommittee. The ARAC Subcommittee then establishes a group that works on behalf of the FAA in the Harmonization Working Group.

European System

For rulemaking harmonization initiatives, the JAA assigns the task to the FAR/JAR Harmonization Working Group through the relevant JAA Study Group, since all amendments to the JAR require sponsorship by a relevant body. The applicable Director (i.e., the Regulation Director for airworthiness regulations, the Operations Director for operations issues, etc.) formally nominates the relevant JAA Study Group Chairman as the JAA Contact Point for the harmonization initiative. The Study Group Chairman, along with the study group, prepares discussion items for the FAR/JAR Harmonization Working Group. The Study Group Chairman also organizes the authorities' participation.

The Study Group members and/or additional experts nominated by the relevant European organizations may be members of the FAR/JAR Harmonization Working Group.

FAR/JAR Harmonization Working Group

The FAR/JAR Harmonization Working Group (HWG) is *one group* established under both the U.S. and European Systems, and its membership includes individuals from the FAA, JAA, and U.S. and European aviation industry groups. All individual members of the HWG are full participants of the group. The group elects a chairman, co-chairman, and/or vice-chairman, who facilitate meetings and facilitate reporting to the FAA and JAA. The responsibilities of the HWG chair/co-chair/vice-chairman include: presiding over each group meeting, assuring progress within the group towards the completion of all tasks, and providing status reports on the HWG to the ARAC Subcommittee and the JAA when requested.

Finally, the HWG chair/co-chair/vice-chairman does not have *"veto power"* over group decisions. Both authorities may have direct contact with their group members to help ease any difficulties that may occur during the harmonization tasks.

The actual task of harmonization is completed by the HWG. This task consists of first reaching technical agreement and then preparing the proposed rulemaking packages for both the FAA and JAA.

For the FAA, this package consists of a *"Notice of Proposed Rulemaking (NPRM);"* for the JAA, it is a *"Notice of Proposed Amendment (NPA)."* Technical agreement denotes that the draft text of the new rule and/or advisory material has been agreed upon by the HWG.

The full NPRM/NPA packages include all economic analyses and supporting documentation. In order to achieve these tasks, both authorities provide assistance to the HWG when requested, such as legal and economic support. Throughout the harmonization task, the objective of the HWG is to satisfy the needs or rulemaking requirements of all participating authorities.

A two-step approval process is then used for all products of the HWG:

First, the ARAC Subcommittee and the relevant JAA Director approve the technical agreement of the HWG, before economic justification is completed.

Second, the complete package, including economic justification, is approved by the ARAC Subcommittees and the relevant JAA Director.

The purpose of this process is to avoid a major commitment of resources to the supporting economic analysis before the ARAC Subcommittees and JAA Director have given approval to the draft text.

The Next Steps: More Reviews

After the FAR/JAR HWG has finalized the rulemaking packages, the recommended NPRM is submitted to the FAA through the U.S. system (ARAC Subcommittee), and the recommended NPA is submitted to the JAA through the European system.

For the JAA, the output of the working group is first reviewed by the Regulation Director and Regulation Committee. Their advice is then sent to the JAA Executive Review, with a copy to the JAA Committee.

For the FAA, the recommendation from the ARAC Subcommittee will go directly to the appropriate members of the FAA Executive Review.

Once again, the FAA and JAA Executive Reviews complete separate reviews, with the results discussed between these two bodies. The high level management personnel involved in these internal reviews at this stage are the same personnel who finalized and approved the Terms of Reference for the FAR/JAR HWG. The main purpose of this coordinated Executive Review is either to accept or to reject the draft NPRM/NPA based on the original harmonization objectives stated in the Terms of Reference. The decision to approve both the NPRM and the NPA is a joint decision, agreed to by both the FAA and JAA Executive Reviews.

If the Executive Reviews determine that the harmonization objectives have not been met, and the task needs to be re-worked, both the FAA and JAA Executive Reviews send the rulemaking package back to the HWG through the U.S. and European systems.

After the HWG has re-worked the NPRM/NPA, the recommendations are again forwarded to the FAA and JAA Executive Reviews through their respective systems.

FAA / JAA Rulemaking Procedures

If the coordinated review determines that all harmonization objectives are met, the FAA Executive Review sends the NPRM through the standard FAA rulemaking procedures, and the JAA Executive Review sends the NPA through the standard JAA rulemaking procedures.

After the NPRM/NPA has been published for public comment, the FAA and JAA coordinate a joint government-to-government review of all comments received, in order to assure that the FAR and JAR will remain harmonized throughout the disposition of comments.

An important goal of the FAA/JAA Harmonization Work Program is to issue harmonized FAR's and JAR's on the same day. Therefore, the FAA and JAA work together to coordinate the NPRM/NPA issuance dates. (In some cases, this may mean that either the FAA or JAA will temporarily delay the publication of its document to allow for the other authority to complete its rulemaking procedures.)

Harmonized FAR/JAR

After the FAA and JAA rulemaking procedures have been completed, the harmonized FAR is published in the Federal Register, and the harmonized JAR is distributed to interested parties.

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Although the foregoing addresses the process for harmonizing rulemaking projects, the process for harmonizing policies, guidance material, practices, and non-rulemaking projects is almost identical.

One major exception is that the U.S. and European rulemaking systems are omitted from the process, as those procedures are not required for non-rulemaking activities. For the FAA, this means that non-rulemaking harmonization activities do not pass through the ARAC, unless the materials are being developed in conjunction with a new rule. Also, the FAA and JAA rulemaking procedures are replaced by the appropriate FAA and JAA standard processes for policies, guidance material, practices, and procedures.

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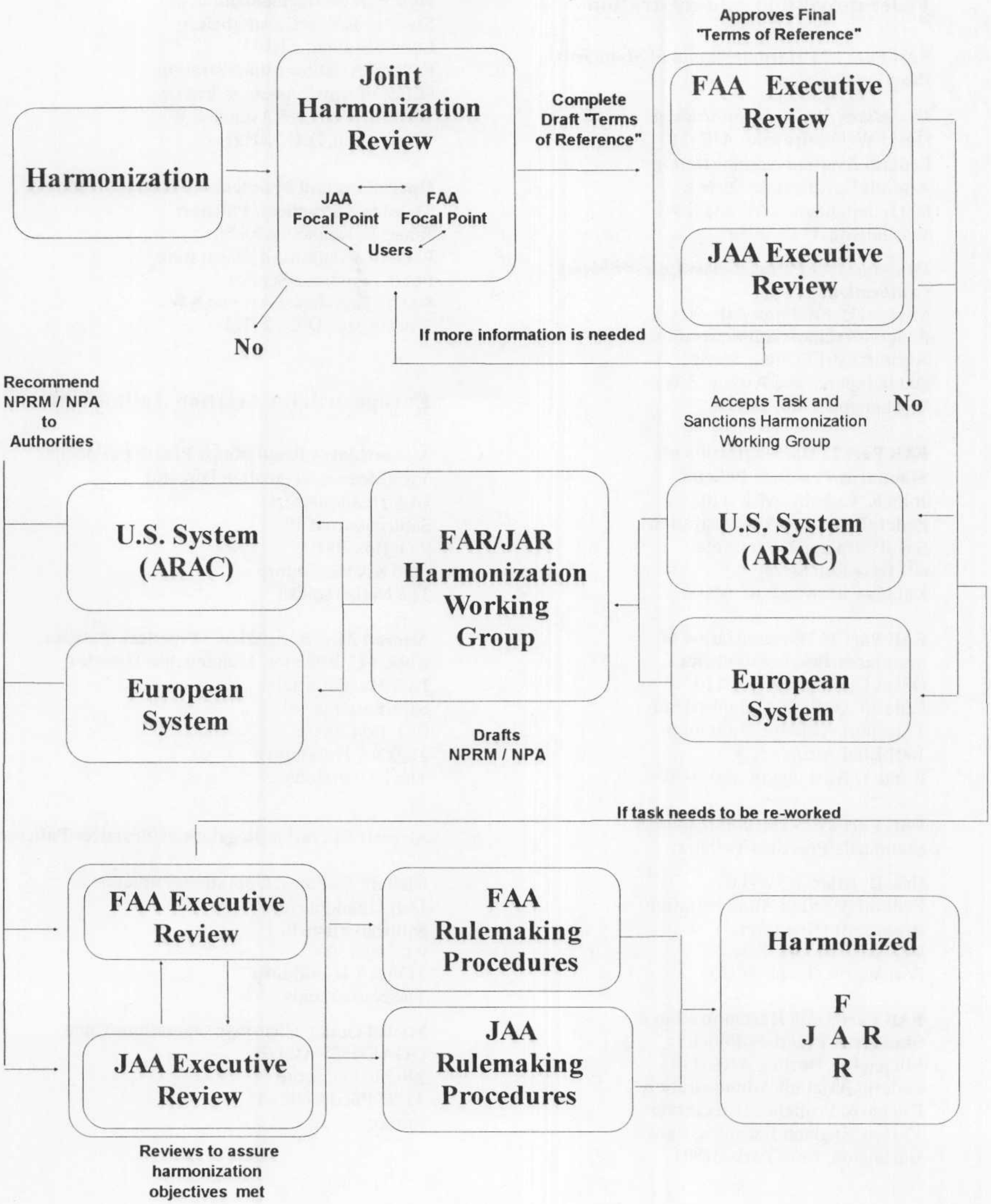
Integration of FAA/JAA Harmonization Activities with FAA Rulemaking



List of FAA and JAA Focal Points

Federal Aviation Administration

FAR Part 1/21 Harmonization of Standards/ Practices/Policies:

Procedures for Type Certification:
David W. Owstrowski, AIR-110
Federal Aviation Administration
Aircraft Certification Service
800 Independence Avenue S.W.
Washington, D.C. 20591

Procedures for Production and Airworthiness Certification:
Michael B. Fradette, AIR-209
Federal Aviation Administration
Aircraft Certification Service
800 Independence Avenue S.W.
Washington, D.C. 20591

FAR Part 23 Harmonization of Standards/Practices/Policies:
John R. Colomy, ACE-110
Federal Aviation Administration
Small Airplane Directorate
601 East 12th Street
Kansas City, Missouri 64106

FAR Part 25 Harmonization of Standards/Practices/Policies:
David G. Hmiel, ANM-110
Federal Aviation Administration
Transport Airplane Directorate
1601 Lind Avenue S.W.
Renton, Washington 98055-4056

FAR Part 27/29 Harmonization of Standards/Practices/Policies:

Eric D. Bries, ASW-110
Federal Aviation Administration
Rotorcraft Directorate
4400 Blue Mound Road
Fort Worth, Texas 76193

FAR Part 33/35 Harmonization of Standards/Practices/Policies:
Michael H. Borfitz, ANE-110
Federal Aviation Administration
Engine & Propeller Directorate
12 New England Executive Park
Burlington, New York 01803

FAR Part 36 Harmonization of Standards/Practices/Policies:
Louise Maillet, AEE-1
Federal Aviation Administration
Office of Environment & Energy
800 Independence Avenue S.W.
Washington, D.C. 20591

Operations and Maintenance Harmonization of Standards/Practices/ Policies:
James B. Kenney, AFS-50
Federal Aviation Administration
Flight Standards Service
800 Independence Avenue S.W.
Washington, D.C. 20591

European Joint Aviation Authorities

Airworthiness Regulations/ Practices/Policies:
Yves Morier, Regulation Director
JAA Headquarters
Saturnusstraat 10
P.O. Box 3000
2130 KA Hoofddorp
The Netherlands

Aircraft Mtc. Regulations/ Practices /Policies:
Robert C. Williams, Maintenance Director
JAA Headquarters
Saturnusstraat 10
P.O. Box 3000
2130 KA Hoofddorp
The Netherlands

Aircraft Operation Regulations/Practices/Policies:

Richard C. Yates, Operations Director
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P.O. Box 3000
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Michel Gouet, Chairman Operations Cmte.
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246 rue Lecourbe
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France

SPECIAL TOPIC:

Status of the Aging Aircraft Program

The following was taken from a speech delivered by Anthony J. Broderick, the FAA's Associate Administrator for Regulation and Certification, at the 5th International Conference of Structural Airworthiness of New and Aging Aircraft, in Hamburg, Federal Republic of Germany, on June 16, 1993.

It has been just over five years since the Federal Aviation Administration (FAA) sponsored the first conference in this series, amid intense public, political, and technical interest, and with very close media scrutiny.

It is time to assess our accomplishments and fix our sights firmly on the work yet to be done:

Have we done what we set out to do?

Have we done what we promised the United States Congress and travelers would be done, to assure the continued operational safety of our aging fleets?

Will our actions assure that needed changes actually take place?

When will those needed changes finally be made?

How will we treat newer designs, or future designs?

I hope that a primary outcome of this conference will be a re-dedication on the part of all concerned to complete this work. We should all return to our respective organizations or working groups with a commitment:

- **to agree on what remains to be done;**
- **to take all necessary steps to complete that work; and**
- **to vigorously support those decisions with appropriate action on the fleet.**

Background

This conference series was set in motion by an accident in Hawaii on April 28, 1988, which drew international attention to the problems of an aging fleet of large jet transports. The graphic images of that accident airplane testified to the reality of the problem of aging airplanes. In the United States, the Congress, the National Transportation Safety Board (NTSB), the news media, and many others questioned how the FAA and the air transportation industry were acting to maintain the structural integrity of our older airplanes.

In response, a massive international effort was developed, thanks to many of you in this room, to address each element of the structural integrity issue. The resulting *"Aging Aircraft Program"* includes Large Jet Transports (60 passengers and over), Smaller Transports and Commuters (under 60 passengers), Engines, Maintenance Issues, and a National Aging Aircraft Research Program.

Aging Aircraft Program

To maintain the structural integrity of our fleet of large jet transport airplanes, a government/industry task force decided very shortly after the first conference in this series, that certain additional, or improved, actions were needed. These were:

- **Reduction of reliance on structural inspections.**
- **Agreement on objective standards for corrosion prevention and control.**
- **Assessment of existing repairs for damage tolerance.**
- **Development of corrected Supplemental Structural Inspection Programs.**
- **Development of maintenance guidelines tailored to older airplanes.**
- **Use of techniques for the prediction of widespread fatigue damage.**

This last item was added later, as a result of an NTSB Recommendation, and a resulting FAA proposal for full-scale fatigue testing of older models.

It is important to note that, as originally proposed, five of these six items were to be implemented by rulemaking. The first four items were to be the subject of Airworthiness Directives (AD), and the last, as Special Federal Aviation Regulation (SFAR). This was how the actions were proposed, and promised, to Congress, NTSB, and the others.

Accomplishments

Most of you are well aware of the great strides the aviation community has made in addressing every aspect of the aging airplane program over the last five years. Each person here today, and the companies of organizations that they represent, can take pride in the roles that they have played in creating workable solutions to the challenge that each task presented. This program is really your program, and is a tribute to what has been an unprecedented cooperative effort between government, manufacturers, and operators.

We hope that this program will form the basis for a new approach to airplane maintenance -- an approach that not only provides increased safety to the flying public, but also makes good economic sense over the long term.

As a result of all of this good work, I have heard from some quarters that the aging airplane program is essentially complete. We have addressed the major problems that existed before the Hawaii accident. Therefore, we should now disband the advisory groups and close out our aging aircraft activities. Is this true? Have we finally realized our objective? If it were true it would certainly be good news, because the average age of the world fleet continues to increase, and the many cancellations of orders for new airplanes we have been hearing about will only accelerate that process.

Work Remaining

Unfortunately, what I see as I look at the status of the program today is some very good work, but an incomplete picture. Let me give you some examples:

Structural modifications are now being carried out on the 11 oldest models, yet no mechanisms are in place to assure that the same criteria used here will be applied in the future. We must make sure that we do not slip back into reliance on inspections of critical structure that has a known tendency for fatigue cracking.

Those criteria need to be continuously and uniformly applied to these older models as service history continues to accumulate, and they must also be applied to newer models and to future designs on a mandatory basis.

A new standard for the control and prevention of corrosion is being applied to the 11 oldest models by airworthiness directives, yet mechanisms are not in place to assure that this same coverage will be applied uniformly to the rest of the fleet. When the corrosion programs were first developed, they were widely hailed as the most significant improvement in airplane maintenance to come out of the aging airplane program. We must not go back to treating corrosion as simply and economic matter, with control left up to the discretion of individual maintenance programs. A mandate is needed to make corrosion control a positive part of each operator's maintenance activity.

A method for assessing existing repairs for damage tolerance has been created, yet no mechanism is in place to assure that such assessment will actually take place, even on the oldest transport airplanes. In the early 1980's, when we first attempted to apply damage tolerance concepts to the existing fleet, we did it by Advisory Circular, with voluntary compliance. Compliance was not achieved, and so AD action was instituted.

While we do not see the AD as the appropriate regulatory vehicle today, we do believe that some rulemaking action will be needed for repair assessment, just as it was for the basic structure.

A systematic method of predicting widespread fatigue damage has been developed, yet there is currently no mechanism in place to implement it on the 11 oldest models, much less on the remaining fleet of transport airplanes when they reach old age. In the absence of regulatory pressure, it appears that one or more manufacturers of some of the oldest airplanes will not comply with this method.

It has already been demonstrated that airplanes cannot be operated safely with widespread fatigue damage. What we need now is the resolve to apply the methods our working groups have so painstakingly developed. This work is essential to safety.

Other Considerations

I realize that many people have worked long and hard to get where we are now. A great deal of time and money has been spent, and after 5 years many of us are weary of the task. The financial position of the aviation industry is not as good as it was in 1988 when we set our goals for these tasks. The costs incurred in complying with safety directives are more burdensome now, and sometimes seem to be driven more by paperwork than by the actual safety related work on the fleet. The FAA recognizes that we have not had a recent accident attributed to aging airplane structure.

We also appreciate the industry's excellent work in facing the maintenance issues involved, and in continuing to provide a high safety standard despite the increasing age of the fleet.

Still, from a safety regulatory point of view, there are strong reasons in favor of continuing the mandatory approach to this program as originally planned.

Mandated programs are the principal way FAA has of assuring that needed actions actually take place. This is particularly true in a time of economic distress, when some organizations are faced with possible closure. Although we have been asked to mandate actions only applicable to those airlines posing the greatest threat, there is no way that the FAA can do this without a regulation that establishes enforceable safety standards.

Mandated programs establish evidence-of-progress which show the public, the NTSB, the Congress, and other concerned parties that something is happening. Even if airlines do comply voluntarily, verification of this is hard to establish to the satisfaction of Congress and the flying public.

Mandated programs can be picked up directly by all airworthiness authorities to assure a more or less uniform application of those standards worldwide. By itself, this might not be sufficient justification for rulemaking. But as an additional consideration, it also supports regulatory action, especially n view of our international airworthiness obligations.

Consequences

While recognizing all of the improvements that have been made in maintaining the airworthiness of aging airplanes since this program began, it must also be realized that there are unquestionably severe consequences of failing to complete the tasks as originally planned.

Both the FAA and industry quite clearly publicized our plans for addressing each aging aircraft issue. We did so to Congress, the NTSB, the media, and anyone who attended our many conferences and workshops on the subject. The FAA continues to report on its progress on these tasks to both the Congress and the NTSB.

It is true that, at the moment, we can also report on an outstanding safety record since the Hawaii accident.

Even so, it seems almost inevitable that someone will try to blame a future accident, wholly or partially, on the age of the airplane involved. When that occurs, all parties will look back at what the FAA and industry promised to do. If the tasks remain incomplete, or compliance cannot be shown, there will be serious repercussions for the entire industry. Certainly our credibility will be impugned, and the air transportation industry could suffer another loss in revenue.

If an accident is found to be directly related to an unfulfilled objective, the consequences could be much more severe. Large transports could be subjected to fixed life limits, and operator maintenance documentation burdens could become overwhelming.

Regulatory Action

Having made it clear that the FAA still favors regulatory action in support of continued structural integrity, I would now like to balance that by pointing out that we are also opposed to unnecessary, excessive or poorly written regulations. We are not asking for regulation for its own sake. Our objective is the minimum regulation which meets the criteria previously stated, and which imposes the minimum burden.

Those criteria, again, are as follows:

- **There must be assurance that the work is actually being done on all affected airplanes, and done on schedule.**

- **Evidence of that work must be available to and understandable by the public, as well as ourselves.**
- **The format of the documentation should be easily adopted by other airworthiness authorities.**

In creating the documents, methods, and other solutions to the aging aircraft problems, the men and women of the various task groups exhibited great skill, understanding, and cooperation. I expect the same in recommending a final course of action for each task.

The private sector should bring their point of view to the discussion and argue persuasively for it. The regulators will do the same. I only ask that you do not reject rulemaking out-of-hand, and withdraw support for necessary regulation.

At the same time, the regulators will not reject alternative methods of achieving our purpose simply because they do not involve regulation. The purpose, again, is to get the job done in a clear, timely, institutionalized, and demonstrable way.

Future Plans

As I said before, we have seen some excellent work on the individual pieces of the aging airplane task. We have nearly all of these pieces in hand, but we haven't assembled them into an overall coherent picture.

Ultimately, that picture must include all airplanes, not just older ones that are old today. We must also include older designs that are still in production, newer designs, and those that will be certificated in the future.

It is well to keep in mind that most of the airplane models that we call "aging" today, were not even type certificated in 1968 when the FAA first established the *"Industry Advisory Committee on the Airworthiness of Pressurized, Older Aircraft."* We have accomplished much to date. We must now apply that same skill and expertise to completing the picture.

I want to assure you that the FAA is committed to a final, comprehensive, institutionalized solution to the problem of continued structural integrity.

Our flying public expects and deserves no less.

Conclusion

We still face the danger of not following through on what we started. We need to produce the best possible combination of regulation and advisory material that achieves our purpose and that minimizes regulatory impact. If this necessitates completely re-inventing the way we regulate airplane maintenance, then we need to seriously consider that.

With the maturing of the Aging Airplane Program, we are putting the final touches on a system for maintaining aircraft structural integrity for a long, safe operational life. It seems quite natural now to begin to address the full spectrum of airplane structural, corrosion, and maintenance issues. Your challenge will be to help us create such a comprehensive system.

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FAA Type Certification of the Airbus Model A340

Airbus Model A340 during water ingestion tests at Bretigny (France)

On May 27, 1993, the Transport Airplane Directorate presented the U.S. Type Certificate of the Airbus Model A340 to Airbus Industrie.

The long-range, four-engine airplane is designed to carry 295 passengers and has a range of 6,750 miles. The powerplants are CFMI CFM56-5C2 engines and the airplane has fly-by-wire flight controls. This is Airbus Industrie's first four-engine airplane and is also its largest aircraft.

Airbus made application for FAA type certification of the Model A340 on April 16, 1986. The first flight of the Model A340 took place in late October 1991, and the airplane was type certificated in Europe by the Joint Airworthiness Authority (JAA) member nations in December 1992. It has been in service in Europe for several months.

FAA and JAA certification of a virtually identical medium range, twin-engine airplane, the Model A330, is expected to follow closely on the heels of the Model A340 in October of this year.

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Hinson Selected for Top FAA Post

David Hinson has been confirmed by the U.S. Senate as the 13th Administrator of the Federal Aviation Administration. Hinson brings to the agency extensive airline, general aviation, and aircraft manufacturing experience.

"David has made promoting aviation safety a priority," said Department of Transportation Secretary **Frederico Pena**, "which is the foundation of the FAA's mission."

Hinson has been Douglas Aircraft Company's Executive Vice President for Marketing and Business Development since January 1992, responsible for leading sales of McDonnell Douglas commercial jet transports.

Hinson's experience in both the manufacturing and airline sectors of the industry make him uniquely qualified to serve as Administrator.

Hinson holds a B.A. in general studies and business from the University of Washington. He is a member of the advisory board of the Graduate School of Business at both the University of Chicago and the University of Washington, and a trustee of the Naval Aviation Museum Foundation.

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Aircraft Certification Service Leadership Changes

In January 1993, the leadership of the Aircraft Certification Service underwent major changes. **Craig Beard**, the former Director of the Aircraft Certification Service, was appointed Deputy Associate Administrator for Regulation and Certification (AVR). Subsequently, Mr. Beard was selected as the FAA's first Director of the International Area Office in Singapore.

Thomas McSweeny was appointed as Director of the Aircraft Certification Service, replacing Mr. Beard. Mr. McSweeny was formerly Deputy Director of the Service.

Elizabeth Yoest was appointed as new Deputy Director of the Aircraft Certification Service. Ms. Yoest was previously the Manager of the Planning and Program Management Division of the Aircraft Certification Service.

Both Mr. McSweeny and Ms. Yoest bring strong leadership skills to their new positions. They have been heavily involved in the strategic planning for the Service over the past several years and have played primary roles in the development and implementation of many of the Service's new initiatives. They are strong supporters of the designee program. We know that you will enjoy working with them.

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Systems Review Task Force Final Report

In 1989, a Systems Review Task Force (SRTF) was formed and tasked with reviewing the adequacy of currently used flight systems on transport airplanes, with an eye towards alternative means to ensure controllability of aircraft that have lost all normal flight control functions. The SRTF's report of findings was initially published in September 1991. (Additional material has been added since that time.) The following information was taken from Volume 1 of the SRTF report.

Background and Charter

On July 19, 1989, a McDonnell Douglas Model DC-10 series airplane, operated by United Airlines, experienced a catastrophic failure of the Number 2 tail-mounted engine during cruise flight. The separation, fragmentation, and forceful discharge of the first stage fan rotor assembly parts led to the loss of all three hydraulic systems that provide power for the airplane's flight control system. The airplane was still capable of flight, but was not controllable using conventional flight controls. The flight crew was able to exercise a degree of control over the flight path by manually varying the engines' thrust, separately and collectively. The airplane eventually crashed during an attempted landing at Sioux City, Iowa. Of the 296 people aboard the airplane, 111 were fatally injured. The actions by the flight crew in manipulating the throttles significantly reduced the number of fatalities and the extent of injuries to the survivors.

A review of accidents involving aircraft with fully powered flight controls (most notably, accidents involving an Eastern Airlines Lockheed L-1011 in 1981, a Japan Airlines Boeing 747 in 1985, and the United Airlines McDonnell Douglas DC-10 in 1989) had led to an awareness that occurrences believed to be extremely improbable during the design and certification of these aircraft could indeed occur and result in loss of hydraulic power to the flight control systems. Following this review, the FAA asked the industry to form a task force to assist them in determining what measures could be taken to prevent the reoccurrence of this type of event.

The Systems Review Task Force (SRTF) was organized in response to this request and first met on September 21, 1989. The SRTF was to report to the newly-formed Transport Airplane Safety Subcommittee (TASS), which in turn was formed as part of the FAA's Research, Engineering, and Development Advisory Committee. TASS, which also has a working group addressing aging aircraft issues (Airworthiness Assurance Task Force), has as its charter 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 working groups are comprised of representatives of operators, manufacturers, the Air Transport Association (ATA) of America, regulatory agencies, and others such as the Air Line Pilots Association (ALPA) of America.

In this same time period, then Department of Transportation Secretary Skinner and FAA Administrator Busey formed a separate task force to recommend ways to improve the Administrator's ability to manage the FAA during the period of rapid change in the aviation industry. One of the task force recommendations resulted in the formation in February 1991, of the Aviation Rulemaking Advisory Committee (ARAC), which is tasked to provide advice and recommendations to the FAA concerning the full range of the FAA's rulemaking activity with respect to safety-related issues, such as air carrier operations, aircraft certification, airports, and noise.

One of the subcommittees established under the ARAC is the Transport Airplane and Engine Subcommittee. Effective in mid-1991, one of the tasks assigned to this subcommittee was to assume jurisdiction of the AATF and the SRTF.

The charter of the SRTF is as follows:

> *"Determine possible design concepts that will provide alternative means of control of flight-critical functions in the event of total loss of all (normal) redundant systems which provide that control -- regardless of the probability of such loss."*

The charter was specifically oriented to alternative means to ensure controllability for aircraft that have lost all normal flight control functions while maintaining basic aircraft structural integrity. In addition, the SRTF was asked to consider the need for improved engine particle containment. Where appropriate, the concepts developed by the task force should be considered for retrofit of current flight aircraft.

In the first meeting of the SRTF, a core group representing the air transport industry proposed a working group organization similar to that utilized by the Airworthiness Assurance Task Force. This organization consists of a steering committee, comprising representatives for organizations involved in working group activities, and includes members from airlines, aircraft manufacturers, regulatory agencies, major aircraft turbine engine manufacturers, and ALPA.

Four *"airframe"* working groups were organized: one from each of the transport category airplane manufacturers producing airplanes with fully-powered flight controls (Airbus Industrie, Boeing, Lockheed, and McDonnell Douglas). Also formed were an Engine Hazards working group and an *"Other Hazards"* working group. The airframe working groups were to orient their activities toward flight critical system functions; the Engine Hazards working group was to address engine containment concerns; and the Other Hazards working group was to concentrate on newer technology problems for which no industry experience exists (such as fly-by-wire, ultra-high-bypass engines, etc.) and other concerns that might surface.

During the initial meetings of the SRTF Steering Committee, a number of objectives were identified for the working groups. The engine Hazards working group was to address the following objectives for engines currently in service:

- **engine hardware inspection practices;**
- **incorporation of design changes where non-containment has occurred;**
- **repair practices and their effect on containment; and**
- **fan blade non-containment.**

For future engine designs, a different set of issues was identified:

- **shaft separations;**
- **high pressure vessel integrity;**
- **disk containment;**
- **fan blade loss certification testing;**
- **non-containment of blade fragments out of the plane of the rotor;**
- **debris models;**
- **turbine blade failures;**
- **disk lug failures;**
- **wear-out modes;**
- **cooling system failures; and**
- **titanium fires.**

The charter for the airframe working groups was further defined by listing the following objectives (common checklist):

- **Define flight critical functions.**
- **Reassess past failure modes.**
- **Review systems service bulletins for flight critical systems.**
- **Assess system geometries for convergence points (common failures).**
- **Reassess systems design decisions that were based on probability.**
- **Assess multiple failure consequences for hardware/software.**
- **Investigate alternative design potentials for backup systems and control systems/configurations.**
- **Investigate maintenance damage tolerance considerations.**
- **Evaluate maintenance practices with multiple failure potential.**
- **Define minimum control surface requirements for controllability.**
- **Assess asymmetry protection systems.**
- **Assess total loss of flight control function.**
- **Assess total loss of electrical power consequences.**
- **Assess total loss of engine power consequences.**
- **Assess total loss of anti/de-icing function.**

More than 150 industry experts were involved in the various working groups, with over 50 total working group meetings held.

Each of the working groups, except the Other Hazards working group, has produced or will produce a final report summarizing their findings and recommendations. (The output of the Other Hazards working group was considered by each of the primary working groups and is incorporated in the resulting recommendations.)

Conclusions and Recommendations

Flight Controls Systems Review: The SRTF charter was specifically oriented toward alternative means of controllability for aircraft that have lost all normal flight control functions while maintaining basic aircraft structural integrity. This can be simply stated as:

"If an aircraft is flyable, it should also be controllable."

The SRTF conducted a rigorous review of system parameters that affect the survivability of flight control systems. Evaluation included regulations affecting flight controls systems, incidents associated with the loss of flight control function, the design process, and specific existing aircraft designs of flight controls and associated systems.

Principal conclusions are:

1. Pertinent Federal Aviation Administration (FAA)/FAR 25 and Joint Airworthiness Authorities (JAA)/JAR 25 regulations and associated advisory guidance material are considered appropriate and adequately address design requirements. Some standardization of requirements between these two principal regulatory agencies is desirable.

2. A review of the in-service flight accidents involving multiple flight control systems losses determined that they resulted from unrelated root causes.

3. The current design process and certification procedures are sound and provide safe and reliable aircraft.

4. More redundancy in flight control systems does not provide benefits proportional to the incorporation effort involved.

This review was directed toward those large transport category airplanes with flight control systems that are entirely hydraulically powered. The size of the flight control surfaces of these large airplanes and the power required to move these surfaces under aerodynamic loading preclude the use of the purely manual backup (manual reversion)systems that are used in smaller aircraft. All current large transport airplanes were designed with multiple independent hydraulic systems powering the flight controls, with redundant actuation in each of the three control axes and physical separation to minimize exposure of multiple systems to projectiles.

The SRTF's review has determined that, on these airplanes, any one hydraulic system can effectively control the airplane, and that incorporation of improvements to the inherent reliability of these systems results in a greater level of safety than further redundancy.

Following this premise, the review of systems under the guidelines set forth by the Charter and reviewed under the guidelines of the common checklist, led to a recommendation that a number of Service Bulletins be further reviewed by the appropriate regulatory agencies with consideration given to making them mandatory.

The Service Bulletins selected address procedures and modifications which, if not incorporated, could result, under certain combinations of failures and events, in a condition that would endanger the safety of the airplane, crew or passengers; would require exceptional piloting skills to maintain control; or would require immediate in-flight corrective action, emergency procedures, or landing a the nearest airport. (A listing and detailed discussion of these Service Bulletins can be found in the SRTF's complete report.)

Engine Burst Protection: The SRTF was also asked to consider the need for improved engine burst protection, and to consider the concepts developed by the SRTF, where applicable, for retrofit of the current fleet of aircraft.

The Engine Hazards Working Group was formed to address the question of transport engine non-containment as it relates to aircraft survivability. Although the probability of a major aircraft accident caused by an engine rotor burst is extremely low, it must be considered an important element of overall aircraft safety and continue effort to reduce the hazards from engine rotor burst is warranted.

Manufacturers of composite materials have expressed an interest in investigating the applicability of fiber composite materials as a means of shielding aircraft from uncontained engine fragments. Preliminary materials data from these manufacturers indicate that containment may be possible with much lower weight penalties than those associated with metallic systems. None of these data were generated using full-size engine hardware; thus, considerably more engineering research and development would be required before feasibility can be established.

Because of the multiple application of the technology of advance material containment systems, it would be appropriate for the government agencies (FAA, DOD, and/or NASA) to sponsor the required research to pursue disk containment technology and shielding technology as a means of improving the protection against engine non-containments in future designs.

Principal conclusions of the Engine Hazards Working Group are:

1. The current state-of-the-art does not offer the possibility to incorporate disk containment in the existing fleet or in those engines currently being designed.

2. Current engine blade containment designs and their certification procedures are consistent with state-of-the-art at the time of their certification. Each new generation engine has benefitted from the prior experience and subsequent improved state-of-the-art for containment structures.

3. There are some engine containment structure designs in current use that could be improved. This does not represent a threat to flight safety, as currently known blade non-containment problems are being controlled by correcting the initiating causes. For future blade non-containment problems that are a potential threat to flight safety, the practice of correcting the initiating cause of failure should be augmented with mandatory incorporation of improved containment.

The SRTF concluded that the engine containment structure designs currently in use were the most efficient (best) that could be accomplished at the time the engines were certified. Service experience has shown, however, that non-contained failures do occur. The rate of non-contained failure is very low, at less than one event for every 10 million engine hours. While this rate has decreased over time, it is still desirable to strive for improvement.

An extensive review of over 10,000 engine manufacturer's Service Bulletins did no reveal any additional bulletins that the group considered appropriate for recommendation for further regulatory agency review.

The recommendations of the SRTF are as follows:

1. A category of parts, the primary failure of which is considered to have non-containment potential (NCP parts), should be created. Engine manufacturers should identify the parts that fall into this category by engine model.

2. NCP parts should get *"special"* attention -- not only during design and manufacture, but also subsequently in the areas of inspection and repair practices.

3. Engine manufacturers should improve their fan blade maintenance recommendations and repair practices where necessary to improve structural integrity.

4. There is a need to determine reliability statistics for the inspection techniques (for cracks and defects) currently employed by the industry. A joint industry/regulatory agency program should be initiated to develop an approach that will generate the statistics for determining Probability of Detection (POD) levels for current inspection techniques.

5. The design issues for future engines and certification programs are recommended for further study.

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More detailed results from the SRTF airframe working groups for Airbus, Boeing, Lockheed, and McDonnell Douglas, plus those from the Engine Hazards Working Group, are included in Volumes 2 through 6 of the SRTF report. Since those volumes pertaining to the specific manufacturers all contain proprietary information and are so marked, the FAA is not at liberty to release them. If you are interested in more of this information and data, we suggest that you contact the airframe manufacturers directly and request copies of the specific volumes.

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Design Process for Categorizing Failure Conditions and Assessing Safety Systems

The following article is included as an appendix in Volume 1 of the Systems Review Task Force report. It summarizes the evolution in certification requirements for substantiating that the design of airplane systems and equipment has been accomplished in a manner that will minimize hazards to the safe operation of the airplane.

Evolution of the Regulations

Prior to Amendment 23 to Part 25 of Title 14 of the Code of Federal Regulations issued April 8, 1970, the regulations did not specify a specific process for substantiating that systems and equipment were designed and installed on airplanes in a manner that would minimize hazardous events and maximize safe operation. Industry procedures and standards for substantiating systems and equipment design evolved over many years.

There were no formal, written functional hazard analyses (FHA) prepared to identify various hazard levels and certification criteria, because the hazards were generally known from experience, and the design approaches needed to cope with them were well established. Potential hazards and various design approaches were discussed in design meetings, and a consensus was reached on the best design approach that took these potential hazards into consideration.

Failure mode and effects analyses (FMEA) were then used to verify that no serious failure condition would result from any single failure or malfunction of any element of the system. The qualitative FMEA was usually the only formally written safety analysis provided for a system, although safety analyses were certainly conducted as part of the many discussions in design meetings.

In addition, development and qualification tests were conducted, and the usual load and stress analyses were prepared, but the acceptability of the system's architecture and installation was normally based on the design review process mentioned above.

In the 1970's, as manufacturers began developing new systems with more complex functions and updating existing systems by adding more complex functions, potential failure modes were not always as easily analyzed using the design review approach, and more formally documented safety assessment procedures began to be developed.

Early efforts to develop modern safety assessment requirements for transport category civil aircraft actually began in the late 1950's with the early British research on automatic landing systems. Aircraft and equipment designers approached the regulatory authorities of the United Kingdom and asked what requirements or special conditions would be applied to such systems. This issue was discussed initially in terms of failure and analysis combined with performance evaluation, but this was soon reconsidered in light of the following questions:

— *How many failures should be considered in a single flight?*

— *How does one relate variability of performance with variability of environmental conditions?*

— *How does one combine failures with environmental conditions?*

These and other questions could not be resolved using the traditional methods of certifying and evaluating system designs.

The U.K. regulatory authorities did not believe that they had the background and experience at that time to write detailed *"how to"* requirements covering all the relevant aspects of safety assessments. They believed that drafting detailed requirements too early in a development effort -- particularly one with the potential for substantially improving safety -- could result in incomplete or unnecessarily constraining requirements, thus restricting development.

To overcome the problem, a target safety level was established as a basis for certification. This was expressed as the likelihood of the occurrence of selected undesired or unsafe events.

For example, the probability of an undershoot or overrun on landing was essentially based on the historical record of such events. Applicants were required to make a case for their individual systems by assessing them against the declared objective. Detailed methods of establishing compliance were subsequently derived and incorporated into the requirements and recommended practices.

In the mid-1960's, the with arrival of the Concorde airplane and its complex systems and new technologies, France and Britain developed requirements for certifying the aircraft, and these were applied by the manufacturers to its systems. In the U.S., the FAA established special conditions requiring similar safety assessments for certifying selected systems, such as automatic landings systems on the wide-bodied transports then under development.

The European authorities and the FAA next produced regulations and advisory material adopting the general principle that an inverse relationship should exist between the probability of a failure condition and the degree of hazard inherent in its effect; that is, the more serious the hazard, the lower the risk must be that it will ever occur.

In 1970, this philosophy was expressed in the Federal Aviation Regulations (FAR) by Amendment 23 to Part 25, particularly (but not exclusively) in Section 25.1309. The pertinent portion of this regulation now reads as follows:

(a) The equipment, systems and installations whose functioning is required by this subchapter must be designed to ensure that they perform their intended function under any foreseeable operating condition.

(b) The airplane systems and associated components, considered separately and in relation to other systems, must be designed so that --

(1) The occurrence of any failure condition which would prevent the continued safe flight and landing of the airplane is extremely improbable; and

(2) The occurrence of any other failure condition which would reduce the capability of the airplane or the ability of the crew to cope with adverse operating conditions is improbable.

(c) Warning information must be provided to alert the crew to unsafe system operating conditions and to enable them to take appropriate corrective action. Systems, controls, and associated monitoring and warning means must be designed to minimize crew errors which would create additional hazards.

(d) Compliance with the requirements of paragraph (b) of this section must be shown by analysis, and where necessary, by appropriate ground, flight, or simulator tests. The analysis must consider --

(1) Possible modes of failure, including malfunctions and damage from external sources;

(2) The probability of multiple failures and undetected failures;

(3) The resulting effects on the airplane and occupants, considering the stage of flight and operating conditions; and

(4) The crew warning cues, corrective action required, and the capability of detecting faults.

Probability

It is important to recognize that the term *"failure condition"* does not refer to any specific part or equipment failure. It is the consequential airplane state resulting from one or more failures, including consideration for adverse operational or environmental conditions.

This regulation specifies a level of safety in **qualitative** terms, and specifically requires a safety analysis. However, it soon became evident that **quantitative** requirements were sometimes necessary, since some aircraft systems were becoming so complex that subjective qualitative evaluations of critical failure conditions could no longer always be made with confidence. Probability values were assigned to the qualitative terms for standardization throughout the industry.

The approach taken by the world's regulatory agencies in establishing rational probability values for use in assessing the acceptability of a system design was based on the industry's safety record. Using the historical record of accident causes and frequencies as a baseline, quantitative ranges of probability values were derived for the FAR 25.1309 regulatory terms *"improbable"* and *"extremely improbable,"* and for some others used in other regulations having a similar intent. This allowed designers to evaluate and compare design approaches using standardized criteria.

Over the two decades that have passed since Amendment 23 was issued, the FAA and industry have both developed safety and analysis procedures and standards based on the requirements of FAR 25.1309 and other regulations with a similar intent.

In 1975, a system safety analysis training program for FAA engineers was developed and taught several time each year through 1989. Manufacturers' design engineers typically received this same type of training. It provided basic familiarization with several types of qualitative and quantitative analyses that are used to assess systems and equipment against the requirements of FAR 25.1309.

Advisory material based on the evolving techniques was developed by the FAA and the European authorities, the latest of which, Advisory Circular 25.1309-1A, was published by the FAA in 1988; the European version of the same guidance material, AMJ 25.1309, was published in November 1990.

Formal written functional hazard analyses have been prepared for every significant system function on recently developed airplanes. These were used to categorize postulated failure conditions as to the severity of their effect on the airplane. Systems FMEA's and fault trees were prepared and submitted to the FAA for all significant cases. Zonal analyses were conducted to assess the installations for vulnerability to cascade or common-cause failure conditions.

Further, the service histories of the unchanged systems carried over from previous aircraft were evaluated to verify that they have established a safety record acceptable to today's regulatory and industry standards.

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Differential Global Navigation Satellite System Operational Approval Requirements for Private Systems

Industry's rapid development of Global Positioning System (GPS) technology has created the need to establish procedures for approving Differential Global Navigation Satellite System (DGNSS) operations using commercial and private navigation facilities. Special DGNSS procedures currently are being developed at Dallas, Texas (DFW), as part of an FAA/Industry GPS implementation effort. Requests for approval of similar installations at other locations are anticipated to follow quickly.

Any DGNSS instrument approach operation by U.S. operators or any such operation in the U.S. by foreign flag operators must be approved in accordance with the following direction and guidance. This also includes all privately owned DGNSS ground installations and all commissioning, inspection, and maintenance requirements for these facilities.

Foreign flag operators shall not be approved to conduct DGNSS instrument approach operations unless the State of the Operator expressly, in writing, approves that operator to conduct DGNSS instrument approaches at U.S. runways. The foreign flag operator must also provide written evidence that its State of the Operator has determined that the DGNSS equipment, training, and procedures used are equivalent to U.S. requirements.

The FAA has established the following interim procedures for approving Special Instrument Approach Procedures that are used on privately owned DGNSS installations at U.S. airports/runways. These procedures must also be used to approve operators to conduct any DGNSS Instrument Approach Procedures (IAP) to any runway.

All DGNSS instrument procedures must be developed as Special Instrument Approach Procedures until under Federal Aviation Regulation (FAR) 97 (**'Standard Instrument Approach Procedures"**) criteria are established for DGNSS precision approaches.

Until national criteria for routine approval of DGNSS instrument approach operations have been established, all requests to establish a DGNSS instrument approach operation of approve an operator to conduct DGNSS instrument approach must be forwarded to the FAA's Flight Standards Service, Technical Programs Division, AFS-400, through the regional Flight Standards Division Manager. During this initial implementation phase, each request for approval must be evaluated on a case-by-case basis in accordance with this national guidance.

All DGNSS ground and airborne installations must be evaluated and approved in accordance with these national interim criteria and concurrence must be obtained prior to issuing DGNSS instrument approach approvals to any operator. A national list will be established of the runways, aircraft/avionics configurations, and operators approved for DGNSS instrument approach operations.

DGNSS instrument approach operations are limited to those airports and runways on the nationally approved list. Operations for a particular operator are limited to those airplanes and runways and to the aircraft/avionics types on the approved list that are specified in its certificate of authorization or operations specifications, as appropriate.

Each DGNSS ground installation used by U.S. operators and each installation used by foreign flag operations in the U.S. must be specified in the nationally approved list. These ground installations may be privately owned. The ground installation includes the DGNSS reference station, ground-based monitor, data link, and transmitting equipment. Approval of the DGNSS ground installation includes the physical installation and its performance, commissioning, inspection, and maintenance requirements. Approval criteria for DGNSS ground installations are contained in FAA Order 8400-DGNSS CAT I.

FAR Part 91 (**"General Operating and Flight Rules"**) operators desiring to conduct DGNSS Special Instrument Approach Procedures must obtain a certificate of authorization (FAA form 7711-2) prior to conducting any DGNSS instrument approach operation. This certificate must list the specific Special Instrument Approach Procedures authorized. The DGNSS authorization for all FAR Part 91 operators must be renewed on an annual basis.

FAR Parts 121 (**"Certification and Operations: Domestic, Flag, and Supplemental Air Carriers and Commercial Operators of Large Aircraft"**) and 135 (**"Air Taxi Operators and Commercial Operators"**) operators must obtain operations specifications approval for DGNSS instrument approaches. Operations specifications paragraphs C52a and C52b must be amended to include *"DGNSS"* approaches. Paragraph C64e must also be amended to include the specific Special Instrument Approach Procedures that the certificate holder is authorized to conduct using DGNSS. For rotorcraft, the applicable paragraphs are H102a, H102b, and C114e, respectively.

The suitability of a privately owned DGNSS ground station within the U.S. must be demonstrated, in accordance with FAR 171 (**"Non-Federal Navigation Facilities"**) and FAA Order 8400-DGNSS CAT I, to the regional FAA Airways Facilities Division. DGNSS ground facilities that are used to support instrument approaches outside the U.S. must be evaluated and approved, in accordance with this order, by the FAA's Flight Standards Service.

The airworthiness of the DGNSS airborne equipment must be demonstrated in accordance with the criteria in FAA Order 8400-DGNSS CAT I. Until further experience is gained with these operations, all DGNSS airworthiness approvals must be granted through the Type Certificate (TC) or Supplemental Type Certificate (STC) process.

Each certificate holder must demonstrate its ability to conduct the type of DGNSS operations requested for each aircraft type and DGNSS equipment type used. This demonstration is required to assess the operator's training program and validate the performance of the DGNSS equipment used. All evaluations and approvals must be accomplished in accordance with FAA Order 8400-DGNSS CAT I.

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Availability of Flightcrew Oxygen

This article provides guidance regarding annunciation that oxygen is available for use by the flight crew when in actuality there is no oxygen available. This guidance, like other advisory material, does not constitute regulatory requirements, but is provided for your information in the interest of standardization.

On a recent twin-engine transport airplane flight, the crew elected to divert after the first officer donned his oxygen mask and discovered he had no oxygen available. After landing, the crew oxygen bottle valve was found turned to the closed position.

Prior to the flight, maintenance had started to replace the bottle due to low pressure, and the valve located at the bottle was turned off. When the bottle pressure was found to be acceptable, the bottle was reinstalled but the valve was left turned off and safety wired in that position. The maintenance crew checked the bottle pressure on the airplane Engine Indication and Crew Alerting System (EICAS) status page and, because the EICAS displays the pressure in the line downstream of the valve, the residual pressure in the line resulted in a displayed pressure that was within limits.

The existing system on the airplane measures the oxygen pressure in the line to the flightcrew regulator. If the shutoff valve at the pressure bottle is shut off, there is sufficient pressure remaining in the line to indicate a pressure high enough for dispatch. Even when the crew checks the masks, only a small amount of oxygen is allowed to escape, and there is currently no means to determine that the valve is off. Further, the oxygen pressure, and therefore the quantity, is observable on EICAS only when the crew selects the status page.

The FAA does not consider this to be acceptable for the following reasons:

Section 25.1441(c) (**'Oxygen equipment and supply'**) requires that the crew be able to determine the quantity of oxygen available. When the valve is in the *"OFF"* position, the oxygen is not available, but the indication on EICAS (the residual pressure in the line) shows that oxygen is available if needed. Further, the indication on EICAS is an indication of pressure rather than an indication of quantity. The pressure measurement gives information about quantity only when the valve is open. If the valve is inadvertently left closed, the information provided is misleading.

Section 25.1309(c) (**'Equipment, systems, and installations'**) states:

> *"Warning information must be provided to alert the crew to unsafe system operating conditions, and to enable them to take appropriate corrective action. Systems, controls, and associated monitoring and warning means must be designed to minimize crew errors which could create additional hazards."*

It is clear that the existing design gives misleading information to the flightcrew, which could lead them into an unsafe operation. If depressurization takes place at a significant altitude, and oxygen is not available to the crew, an unsafe condition exists.

Further, Section 121.333(c)(4) (**'Supplemental oxygen for emergency descent and for first aid. . .'**) states:

> *"Before the takeoff of a flight, each flight crewmember shall personally preflight his oxygen equipment to insure that the oxygen mask is functioning, fitted properly, and connected to appropriate supply terminals, and that the oxygen supply and pressure are adequate for use."*

In theory, adherence to this rule should ensure that the oxygen supply is available.

In order for the scenario discussed above to be a hazard, four separate events would have to occur:

 # 1: There would have to be maintenance performed on the airplane oxygen system that required the valve, located on the oxygen bottle, to be turned off for any reason. Some maintenance manuals contains both visual and operational checks to ensure that the oxygen valve is open and the pressure is adequate. These procedures were not followed in the case of interest because the bottle was never removed.

 # 2: The flightcrew check of the oxygen equipment would have to fail to indicate that oxygen is not available. This is possible with the present preflight procedure, but the procedures for these airplanes have been changed.

 # 3: A decompression would have to occur that required the use of oxygen by the flightcrew.

 # 4: Event # 3 would have to occur before the flightcrew had attempted to use supplemental oxygen (which would demonstrate no oxygen available) or had checked the EICAS Status Page, which would indicate low oxygen pressure. In either case, airline procedures and the Federal Aviation Regulations require that the crew divert to fix the problem.

The manufacturer of the airplane involved in the incident described above has changed its operational procedures, which are used by its customer airlines for their Operations Manuals, to describe an acceptable procedure to verify that adequate oxygen is available at the pilots mask. This procedure involves two separate flow tests (Normal and 100 percent), followed by a pressure check on EICAS. As all flightcrew masks must be tested (at least two on any transport category airplane), there will be ample tests and pressure checks to identify a problem prior to dispatch.

Based on the above considerations, the FAA considers that an adequate level of safety is achieved through the existing and proposed procedures with the certificated design. However, this mechanization is not considered to meet the requirements of Section 25.1309(c).

The FAA's Aircraft Certification engineering staffs will review the design of the flightcrew oxygen systems on airplanes for which each office is responsible to determine whether the existing configurations provide appropriate information as to system status. If necessary, those staffs will work with the manufacturer and the appropriate FAA Aircraft Evaluation Group to ensure that the operations manuals contain preflight tests that adequately inform the crew regarding availability of supplemental oxygen. On future certification programs, a system design which can lead to misinformation will not be allowed.

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Policy Information Regarding Inflight Thrust Reverser Deployment

The following article is provided in response to requests for policy regarding the FAR Section 25.933 ("Reversing systems") requirement to demonstrate controllability following inflight thrust reverser deployment.

Based on information from the Lauda Airlines Model 767 accident that occurred in Thailand in 1991, the FAA has been working with the Aerospace Industries Association (AIA) to develop a standard for evaluating the safety of the existing transport category fleet following inadvertent thrust reverser deployment. This standard is contained in an FAA document, **"Criteria for Assessing Turbojet Thrust Reverser Safety,"** that was released April 15, 1992.

The Transport Directorate has also been evaluating the adequacy of the existing regulation and the certification test methods (applicable to new Type Certificates (TC), amended TC's, and Supplemental TC's) used to show compliance to the existing regulation.

Based upon our recent understanding of the effects of thrust reverser deployment on airplane controllability, direct compliance with Section 25.933 would require extensive testing and/or analysis to show that the airplane is controllable within the normal flight envelope.

Several applicants for new TC's have informed the FAA that their high bypass ratio wing-mounted two-engine airplane designs are not controllable within the normal flight envelope. These applicants have proposed, increasing system reliability to that of other critical systems (10^{-9}) and then adding an additional level of redundancy to compensate for maintenance errors, as a means to provide an equivalent level of safety.

The FAA will now consider increased levels of reliability as a means of providing a level of safety equivalent to the controllability requirement of Section 25.933. The discussion presented below provides insight into factors that should be considered to achieve an equivalent level of safety.

Based on industry-wide thrust reverser service experience, any proposal for a finding of equivalent safety must consider many factors that are not currently required by that of a traditional Section 25.1309 (**"Equipment, systems, and installations"**) analysis.

Appendix C of the **"Criteria for Assessing Turbojet Thrust Reverser Safety"** dated April 15, 1992, was developed for assessing the fleet and should be used as a starting point for assessing any proposals for an equivalent safety finding.

The following items should be addressed in the analysis:

- **maintenance related errors,**
- **existence of intermittent and latent faults (particularly wiring),**
- **improper lock out of the reverser due to complex maintenance procedures, and**

- **improper dispatch of airplanes with known system faults.**

An independent locking device and improved maintainability would likely be required to account for these factors.

The Transport Airplane Directorate recommends that its Reliability Assessment Team, headed by **Michael McRae** [telephone (206) 227-2133], of the Transport Standards Staff, Airframe and Propulsion Branch (ANM-112), be used to assist in evaluating any proposals for utilizing increased levels of reliability as providing an equivalent level of safety.

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Smoke Detection System Certification Testing

The following guidance was developed in response to an inquiry regarding certification of smoke detection systems in the cargo compartments of transport category airplanes, and provides policy for determining detection times for these systems.

Advisory Circular (AC) 25-9, **'Smoke Detection, Penetration, and Evacuation Tests, and Related Flight Manual Emergency Procedures,"** and AC 25-17, **"Transport Airplane Cabin Interiors Crashworthiness Handbook,"** differ in the guidance provided for time-to-detection for certification testing.

AC 25-17 states in paragraph 671.b.(6):

> *"An acceptable detection time for smoke detectors is 5 minutes. Use the smoke quantity and location criteria of AC 25-9. . . for showing that the smoke detection system detects a fire in satisfactory time. The time for fire detection systems was changed to one minute by Amendment 25-54 in Section 25.858."*

The guidance contained in AC 25-9 reflects the detection times required by Amendment 25-54, which added FAR Section 25.858 **("Cargo compartment fire detection systems')**. Section 25.858 established a higher standard of safety than what previously had existed for transport category airplanes, and it applies to airplanes that have Amendment 5-54 in their certification basis.

When an applicant applies for an amended or supplemental type certificate to convert a passenger configuration to a cargo configuration on an older airplane whose certification basis predates Amendment 25-54, the allowable maximum detection time is not stated specifically in the FAR. The five-minute detection time, which is not mentioned in AC 25-9, was established in a letter to the Boeing Company from the FAA Western Region in 1965, and has been the accepted maximum detection time requirement until Section 25.858 was added, effective September 11, 1980.

If an applicant applies for an amended or supplemental type certificate and the certification basis for the airplane predates Amendment 25-54, there is no regulatory basis for requiring a detection time of one minute. The applicant should be encouraged to meet the later amendment, or to make detection within one minute a design goal. However, it would be inappropriate to require that the applicant comply with Section 25.858.

Two additional points also should be made regarding wording in regulations addressing fire detection systems:

- The terms *"fire detector"* or *"fire detection system"* also encompass *"smoke detectors and systems."* A review of the preamble to Amendment 25-54 reveals that the rule is intended to address systems that detect fires, and smoke detection systems are included.

- Questions are frequently asked regarding the expression that detection must occur *"within one minute after the start of a fire."* As noted in AC 25-9, time to detection is measured *"after the start of smoke generation."* Therefore, detection time is defined as the elapsed time from when the smoke generator is activated (switched to the mode which actively generates smoke) to when detection occurs (annunciation of smoke detection to the flight crew).

The FAA currently is reviewing Advisory Circular 25-9. When a revision is released, the guidance contained in this article will be incorporated in it.

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How to Obtain Copies of FAA Publications

Throughout this edition of the Designee Newsletter, we've referred to FAA Orders, Advisory Circulars, Federal Aviation Regulations, etc. All of these publications can be obtained by requesting them through:

U.S. Government Printing Office (GPO)
Superintendent of Documents,
Mail Stop: SSOP
Washington, D.c. 20402-9328

Branch offices of the GPO are located in many larger cities, so check your local telephone book. Also, the Regional Offices of the FAA keep a limited number of various publications in stock, and may be able to provide you with a copy upon request.

Compliance with FAR 25.571(e), Discrete Source Damage (Uncontained Engine Failure)

The purpose of the following guidance is to establish a common interpretation of Section 25.571(e) of the Federal Aviation Regulations as it applies to continued safe flight and landing, during which likely structural damage occurs as a result of uncontained engine failure.

Federal Aviation Regulations Section 25.571(e), **"Damage-tolerance (discrete source) evaluation,"** requires that the airplane must be capable of continued safe flight with "likely" structural damage resulting from an uncontained engine failure. This need not be interpreted to mean the worst case scenario that could possibly occur. There apparently is some confusion in this regard.

In responding to a member of the public who thought the word *"likely"* in the lead-in of Section 25.571(e) was not necessary, the FAA disagreed by saying that the word *"likely"* has a *"substantive probability connotation in this context."* The assumption is that the engine failure event will occur, but there is some latitude in defining the location and extent of damage inflicted by the engine debris.

For most airplane designs, there are rotor segment trajectories for which continued safe flight and landing cannot be guaranteed for every failure scenario. For example, the fuselage on some airplanes cannot withstand penetration by one-third rotor disc through the crown skins or belly skins without failure occurring.

Generally, compliance with this requirement has been determined by a qualitative assessment based on known failure cases. More recently, manufacturers have conducted a quantitative risk assessment using the Joint Aviation Representatives' (JAR) interpretative material in ACJ 25.903(d)(1) to show compliance with FAR Section 25.571(e).

The intent of Section 25.571(e) is to ensure survival of the airplane with any likely damage resulting from an engine failure. It was not intended, for this evaluation, that the crown skins and belly skins would be exempt from rotor strikes. However, if the combined probability of all structural damage, including crown and belly skin damage, resulting from failure of any engine rotor has no greater chance than 1 in 20 of producing catastrophic results, the design meets the airworthiness requirements of this regulation.

The strength levels to be used in evaluating the structural strength after discrete source damage are defined in Advisory Circular (AC) 25.571-1A, **" Damage Tolerance and Fatigue Evaluation of Structure."** Freedom from flutter should be substantiated up to V_D/M_D.

In addition to the structural strength requirements following a rotor burst, vital controls and systems within the strike zone of engine rotor segments must be protected to the extent that the airplane has every reasonable chance of continued safe flight and landing. Protection is usually achieved by physical separation and functional isolation of the systems.

AC 20-128, "**Design considerations for Minimizing Hazards Caused by Uncontained Turbine Engine and Auxiliary Power Unit Rotor and Fan Blade Failures,"** provides the engine burst criteria to use in showing compliance with the Section 25.903(d)(1) ("**Engines"**) requirement to minimize the hazard to the airplane in the event of an engine rotor failure. The degree of risk should be determined and the total level of risk from all damage cases should not exceed the risk levels specified in ACJ 25.903(d)(1).

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Yaw Angle for the Downward Test in Dynamic Seat Test

FAR Part 25 Amendment 25-64, Section 25.562, "**Emergency landing dynamic conditions,"** was issued on May 12, 1989, and contains the regulations concerning improved seat restraint criteria. Section 25.562 requires a minimum of two dynamic tests of passenger and crew seats that are approved for occupancy during takeoff and landing. These two tests are a *"forward test"* and a *"downward test."*

The *forward test* determines the protection provided in crashes where the predominant impact is in the longitudinal direction in combination with a lateral component. The *downward test* determines the protection provided when the crash environment is such that a predominant impact load component is directed along the spinal column of the occupant in combination with a forward component.

Since the issuance of Amendment 25-64 and Advisory Circular 25.562-1, "**Dynamic Evaluation of Seat Restraint Systems and Occupant Protection on Transport Airplanes,"** issued on March 6, 1990, questions have been raised regarding conducting the *downward test*. In response to those questions, the Transport Airplane Directorate offers the following information:

The *downward test* does not require yawing of the seat left or right with respect to the airplane longitudinal axis. The *forward test* does require yawing of the seat left or right with respect to the airplane longitudinal axis.

However, if the actual installation of the seat in the airplane is yawed with respect to the fuselage reference axis (*i.e.*, seat track in the nonconstant section of the airplane is yawed or curved inboard), then this yaw angle must be considered in the *downward test* and this installation yaw angle is in addition to the required yaw angle for the forward test.

Section 25.562(b) states each seat approved for passenger or crew occupancy during takeoff and landing must successfully complete dynamic tests or be demonstrated by rational analysis based on dynamic tests of a similar type seat. To reduce the number of tests required to certify a family of seats, the applicant may prepare a rational analysis to determine the most critical configuration. As part of the analysis the applicant must include the yaw angle. In some cases, where the yaw angle is small and the rational analysis shows that the loads are very similar, the test may be conducted without the yaw angle in the downward test. This determination should be made by the ACO responsible for approving the test plan.

For both the *downward* and the *forward tests,* it is the responsibility of the applicant to provide a rational analysis to determine the most critical configuration that should be tested. The reviewing office must determine which configurations should be tested and what limitation should be placed on the seat installation.

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Compliance with FAR 25.1093(b)(ii), Induction System Icing Protection

This guidance was originally prepared in response to questions raised by a DER concerning three specific areas relative to engine operation in falling and blowing snow.

Airplane flight manual (AFM) limitations for operation of turbine engines in snow conditions:

Section 25.1093(b)(ii) of the Federal Aviation Regulations (FAR) states that turbine engines must be capable of operating throughout the flight power range of the engine, without the accumulation of ice on the engine, inlet system components, or airframe components that would adversely affect engine operation or cause a serious loss of power or thrust *"in falling and blowing snow within the limitations established for the airplane for such operation."*

Historically, Part 25 airplanes have not been certified with AFM limitations restricting the airplane from operation in snow. This is consistent with other FAA policy concerning airplane operation in unavoidable meteorological hazards such as rain, ice, hail, and lightning.

With respect to the wording of the rule, the only plausible AFM limitation that the FAA may consider for a Part 25 airplane would be a restriction against taxi and takeoff in falling or blowing snow.

However, once the airplane is in flight, it is the FAA's position that snow is unavoidable, and all Part 25 airplanes shall have full flight clearance to operate in snow. Additionally, visibility or time restrictions which may allow limited airplane dispatch in certain snow conditions are not acceptable.

Definition of falling and blowing snow for Part 25 airplanes:

Later editions of the FAA's **"Airman's Information Manual"** define heavy snow intensity as *"visibility less than 5/16 statute mile."* Consistent with this definition, the following airplane test criteria have been derived from past rotorcraft and airplane certification experience, combined with data from multiple research publications.

- **Visibility: A maximum of 1/4 mile test visibility (or less) as limited by snow (not snow and fog).**
- **Temperature: The applicant is responsible for defining the critical ambient temperatures that will vary for each airframe and engine inlet configuration. Typically, a temperature range between 25 and 34 degrees Fahrenheit has been found conducive to the heavy snow environment and to providing the "wet sticky snow" that may accumulate on unheated surfaces (airframe and engine) subject to impingement.**

It should be noted that colder temperatures may be critical to some configurations. In these cases, colder exterior surfaces may be bypassed, and the snow crystals may stick to partially heated interior inlet surfaces where melting and refreezing may occur. In all cases, the applicant must identify and evaluate the critical temperature for the configuration proposed.

Acceptable test methods for showing compliance with the Part 25 requirement:

Historically, the FAA has only required compliance by actual test on those inlets/airframes where, by evaluation, potentially hazardous snow accumulation sites could be identified. Therefore, airplanes with turbine engine inlets that have plenum chambers, screens, particle separators, variable geometry, or any other feature (such as an oil cooler) that may provide a hazardous accumulation site for snow, should be tested. This group includes most turboprop inlets, as well as inlets on essential auxiliary power units (APU).

For most turbojet and turbofan engines with traditional pitot (straight duct) type inlets, icing tests have been found to be a more critical case than snow. Thus, actual testing for falling and blowing snow has been relaxed in lieu of stringent icing testing and analysis, which also substantiated why ice is more critical than snow.

Additionally, in 1990, Amendment 25-72 provided clarification of Section 25.1093(b) so that the evaluation would include any portion of the airframe from which ice or snow could be shed and then be ingested into the engine. This rule clarification was precipitated by several incidents of engine flameout and/or damage following ice shedding from airframe surfaces (*i.e.*, radome, wing, fuselage, etc.)

Once it has been determined that actual testing for falling and blowing snow is necessary, compliance must be shown for both ground and flight conditions within the critical snow criteria listed above.

Ground conditions should include static operation at variable engine power settings, taxi at constant speed (15 to 30 miles per hour) to simulate blowing snow, and taxi/hold conditions to simulate typical ground holding conditions prior to takeoff.

The flight conditions should include takeoff, cruise, holding, descent, and landing.

These conditions should be evaluated at variable airspeeds and in all critical airplane configurations (*i.e.*, flap angles, gear position, etc.) for which the applicant requests certification.

The applicant should maximize the number of actual airplane tests conducted within the critical snow and temperature environment. Recognizing, however, that these snow and temperature conditions are sometimes difficult to find for test purposes, some of the conditions may be substantiated by analysis.

This methodology assumes that the analysis is substantiated by actual temperature survey data from the engine inlet and any other potentially hazardous airframe accretion sites on the aircraft.

Finally, it is worth noting that the test article must be in production configuration with respect to surface finish, texture, and material type to assure that the test conditions adequately represent those expected in service. Prototype or modified hardware (including painting) should not be used for compliance testing.

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Approval of Windshear Detection Systems

The Transport Airplane Directorate has gathered the following information together and is providing it as guidance for engine "hush kit" inlet compatibility testing and for issuance of Windshear Detection System Supplemental Type Certificates (STC).

Multiwake windshear detection system manufacturers have raised concerns as to the apparent lack of certification policy applicable to airplanes with engine "hush kit" nacelles that ensure adequate engine operating characteristics when the airplane is equipped with a windshear detection system. Under a windshear condition, the airplane may be at a high power and Angle-Of-Attack (AOA), which can cause distorted engine inlet airflow and possible engine surges or stalls.

Advisory Circular (AC) 25.939-1, **"Evaluating Turbine Engine Operating Characteristics,"** provides guidance for a high angle-of-attack inlet compatibility testing for transport category airplanes which is either equivalent to, or more severe than, the windshear test requirements listed in paragraph 6.h.3 of AC 25-12, **"Airworthiness Criteria for the Approval of Airborne Windshear Warning Systems in Transport Category Airplanes."**

Paragraph b(2)(ii) of AC 25.939-1 recommends that the high AOA condition be accomplished as part of the engine inlet compatibility tests.

Inlet compatibility tests would be required for airplanes undergoing engine modifications that could adversely impact engine operating characteristics.

Note that some hush kit modifications to inlets consist only of additional acoustic treatment (sound absorbing material) which does not affect the inlet airflow, and thus may not have required retesting at the critical conditions in AC 25.939-1 or AC 25-12.

If the original airplane (the engine without the hush kit) was certified prior to the publication of AC 25.939-1 (March 19, 1986), the engine operating characteristics may not have been assessed at high AOA conditions specified in AC 25.939-1 or in AC 25-12.

For windshear detection systems installed on those airplanes, the STC applicant should evaluate the engine operating characteristics and, if necessary, provide an AOA limit that is compatible with satisfactory engine operation and the criteria listed in paragraph 6.h.3 of AC 25-12. Compliance options for the applicant include biasing the low altitude stall warning (stick shaker) activation point and/or changing the reference AOA indicator in the airplane's flight director system.

Another concern raised regards the lack of control of the applicability of the installed windshear detection system on an airplane with a nacelle modified as a *"hush kit."*

Currently, as recommended in FAA Order 8110.4, **" Type Certification,"** most STC's state:

"This approval should not be extended to other aircraft of this model on which other previously approved modifications are incorporated unless it is determined by the installer that the interrelationship between this change and any of those other previously approved modifications will introduce no adverse effect upon the airworthiness of that aircraft".

Additionally, the approved engines and their applicable modifications should always be referenced in the Top Drawing and the Airplane Flight Manual Supplement (AFMS) for the approved installation.

In summary, current engine certification guidance (AC 25.939-1) is consistent with the windshear high AOA maneuver, as defined in AC 25-12. This guidance is adequate to show compliance with FAR 121.358, **"Low altitude windshear system equipment requirements."**

Further, Section 21.101(b)(1), **"Designation of applicable regulations,"** requires that the latest FAA requirements be applied to any type design affected by a modification.

Thus, it is the responsibility of the STC applicant (in some cases, this is the windshear detection system manufacturer) to substantiate that their system is compatible with specific engine/airframe configuration that is being approved, as described in paragraph 6.h.(3)(ii) of AC 25-12.

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Engine Fire Zone Definition

The Transport Airplane Directorate has been involved in reviewing proposals for an equivalent safety finding regarding the engine fire zone protection provisions of Federal Aviation Regulations Section 25.1181(a)(6). Section 25.1181(a)(6) (**"Designated fire zones; regions included"**) defines the "compressor and accessory sections of turbine engines" as fire zones and, as such, these zones require dedicated fire extinguishing and fire detection systems.

The evolution of turbofan engines from turbojet engines has resulted in apparently inconsistent interpretations of what constitutes a *"fire zone."* Earlier turbojet engines had a single compressor case which, by itself, was considered an ignition source. The regulation at that time specifically defined the compressor, accessory, and turbine sections of turbine engines as *"fire zones."*

Later technology engines with increased bypass ratio separated the first stage of the compressor (the fan section) from the remainder of the compressor case. The fan case is cool and, by itself, is not an ignition source.

Section 25.1181 specifically defines those regions of the engine that contain ignition sources and potential flammable fluid leakage as fire zones. These zones include:

- **the engine power section,**
- **the engine accessory section,**
- **the APU compartment,**
- **any fuel burning heater (or combustion equipment described in Section 25.859),**
- **the compressor and accessory sections of turbine engines, and**
- **the combustor, turbine, and tailpipe sections of turbine engines that contain lines or components carrying flammable fluids.**

Review of certification program records indicates that the FAA has been inconsistent in interpretation of Section 25.1181.

A case in point is the Pratt & Whitney PW4000 and the General Electric CF6-80 series engines installed on the new Boeing Model 777. These engines are configured with the engine oil tank installed in the fan compartment, with the remainder of the engine accessories mounted in the core compartment.

The FAA has been asked whether the fan compartment should be treated as a flammable fluid leakage zone, which would require compliance with Section 25.863 (**"Flammable fluid fire protection"**), but would not require the dedicated systems (fire detection and extinguishing) required within a fire zone.

The fan compartments of the engines installed on the Model 777 airplane are technically part of the compressor and, therefore, the rule could be interpreted to require classification as fire zones. These zones, however, do not contain continuous ignition sources (as do the other zones classified as fire zones) and, therefore, the fan compartment should not be considered a fire zone.

The matrix following this article summarizes the practices of the more recent certification projects. The matrix shows several engine designs that have been certified with flammable fluid sources in the fan compartment.

In 1982, Boeing proposed an equivalent method of compliance for the JT9D-7R4 engine installation on the Model 767. The FAA did not require an equivalent safety finding on the Boeing 747, McDonnell Douglas MD-11, or Airbus A300 airplanes, although engine installations on these airplanes have flammable fluids located in the fan compartment.

After reviewing the regulatory history, the certification practices, and the intent of the regulation regarding classification of fire zones per Section 25.1181(a)(6), the Transport Airplane Directorate recommends the following policy:

- **Fan compartments of turbofan engines may be considered as flammable fluid leakage zones, instead of a fire zone, provided the accessory gearbox is not located in the zone and the applicant demonstrates that no ignition sources are present within the zone during normal operation and foreseeable failure conditions.**

- **The justification for treating the fan compartment as a flammable fluid leakage zone rather than a fire zone must be included by the applicant in the certification documentation.**

This policy will allow a compliance finding for these configurations without the need for processing a finding of equivalent safety.

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Airplane Model	Engine Model	Fan Cowl Configuration	Fan Zone Definition	Equivalent Safey
Boeing 737-300	CFM-56	Gearbox in fan; Fuel/oil sources; Ignition sources.	Fire zone	No
Boeing 757	RB211	"	Fire zone	No
Boeing 757	PW2037	"	Fire zone	No
Boeing 767	CF6-80	Gearbox in core; Fuel cooled sensor; Strut drain valves.	Flammable fluid leakage	Yes
Boeing 767	JT9D	Gearbox in core; Tt_2 Sensor (fuel); Thrust reverser (HYD).	Flammable fluid leakage	Yes

Airplane Model	Engine Model	Fan Cowl Configuration	Fan Zone Definition	Equivalent Safey
Boeing 767	PW4000	Gearbox in corel	Similarity to JT9D	Yes (Similarity)
Boeing 767	RB211-524	Gearbox in fan	Fire zone	No
Boeing 747	JT9D-3, 7	Gearbox in core	No flammable fluids or ignition sources	No
Boeing 747	JT9D-70	Gearbox in fan	Fire zone	No
Boeing 747	JT9D-7R4G2	Gearbox in core; Tt_2 sensor (fuel)	Flammable fluid leakage zone	No
Boeing 747	PW4000	Gearbox in core	Same as B-767	(See B-767)
Boeing 747	RB211-524	Gearbox in fan	Fire zone	No
Boeing 747	CF6-50	Gearbox in fan	Fire zone	No
Boeing 747	CF6-80	Gearbox in core	Flammable fluid	No
Boeing 777	PW4000	Gearbox in core; Oil tank	Leakage zone	**
Boeing 777	CF6-80	Gearbox in core; Oil tank	Leakage zone	**
Douglas DC-10	CF6-50	Gearbox in fan	Fire zone	No
Douglas DC-10	JT9D-7R4	Gearbox in fan	Fire zone	No
Douglas MD-11	CF6-80C	Gearbox in core; Oil tank in fan	Flammable fluid	No
Douglas MD-11	PW4460	Gearbox in core; Oil tank in fan	Flammable fluid	No
Airbus A300	JT9D	Gearbox in core; Tt_2 sensor (fuel); EEC, PMUX, and cowl anti-ice	Flammable fluid leakage	No

FAR Part 36 Type Certification Basis

Recently, there has been some confusion concerning which FAR Part 36 amendment should be identified in establishing an applicant's type certification (TC) basis. Part 36 deals with noise standards for aircraft type and airworthiness certification.

The type certification basis for airworthiness standards, applicable under Parts 23, 25, 27, 29, 33 and 35, are specified in Section 21.17(a)(1) as:

> *"The applicable requirements of this subchapter that are effective on the date of application for that certificate unless. . ."*

However, for aircraft approved under the provisions of Part 23, 25, 27, and 29, Section 36.2 (**"Special retroactive requirements"**) states:

"(a) Notwithstanding Section 21.17 of this chapter, each person who applies for a type certificate:

(1) for an airplane covered by this part, irrespective of the date of application for the type certificate, or

(2) for a helicopter covered by this part, on or after March 6, 1986, must show compliance with the applicable provisions of this part.

(b) Notwithstanding Section 21.101(a) of this chapter, each person who applies for an acoustical change to a type design specified in Section 21.93(b) of this chapter must show compliance with the applicable provisions of this part."

Since the type certification basis for noise standards, applicable under Part 36, are considered to be continuously evolving and developing, the regulatory basis for noise certification are the latest standards effective on the date of certification.

For most certification projects, this Part 36 type certification basis should not be a problem. In some cases, however, the projects could be affected by regulatory amendments that modify either the aircraft noise measurements conditions or the aircraft noise evaluation procedures.

In the past, the FAA has not required the applicant to re-test when a Part 36 amendment, that became effective following a noise test, changed the test procedures. However, adjustments were imposed by the FAA's Office of Environment and Energy (AEE) that corrected the test data for equivalent effects of an effective Part 36 amendment.

When amendments that changed the noise test data analysis procedures (not the text procedures) are made effective after the initial data processing occurs, but prior to the TC date, additional acoustic data processing and evaluation has been required prior to compliance determination.

Applicants and their DER's should be cognizant of potential Part 36 amendments that are being processed, which could become effective prior to the date of certification, in order to plan appropriately.

Frequent communication with the ACO noise specialist should alleviate any future problems and reduce any possible project delays associated with this type certification basis.

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Aircraft Certification Indoctrination Course

The Aircraft Certification Service has recently completely revamped and updated the *"Aircraft Certification Indoctrination Course."* We believe that this course is the most important course we offer in the Service and FAA top management has committed to kicking-off each class.

The course is 8 days long and introduces the students to all products and service that the certification community provides. The new focus of the course is by subject, rather than handbooks. The students are led through each process (type certification, supplemental type certification, technical standard orders, parts manufacturer approval, etc.) and how the rules and advisory materials apply to each.

Students are taught by an instructor team about specialists' roles and responsibilities, continued operational safety, type certification, certification of export/import products, designee management, and production certification.

The course also provides a text that organizes many of the various FAA orders, advisory circulars, etc.

A prototype of the course was presented March 8-12 and the production course began in June 1993. Attendees at the first class included not only FAA personnel, but representatives from the General Aviation Manufacturers Association (GAMA) and Bell Helicopter.

This course is available to all employees in the Aircraft Certification Service (both technical and non-technical), foreign certification authorities, and designees.

For additional information concerning the cost and course availability, you may contact **Ms. Nancy Lane** [telephone (202) 267-7061] or **Mr. Roger Richardson** [telephone (202) 276-8624] at:

Federal Aviation Administration
Aircraft Certification Service
Planning and Program Management
Division, AIR-500,
800 Independence Avenue SW.,
Washington, DC 20591.

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DER Kits and Other Distribution

The FAA is conducting an on-going review of the problems associated with DER kits and other mail distribution problems. It has been brought to our attention that some DER's have asked to be put on other distribution lists such Advisory Circulars, Technical Standard Orders, Airworthiness Directives, etc. However, once you are no longer a DER, your local Aircraft Certification Office (ACO) is not aware of all the distribution lists that you have signed up for, outside of the basic DER kit distribution. Once you have retired or are no longer a DER, the Government Printing Office will continue to send mail to your address until you personally request to be removed from the list.

Another problem in this area is that, when you change location and as a DER submit an address change, that change only applies to your DER kit distribution material. Some companies are receiving large volumes of mail for DER's that no longer work there. Please remember that if you no longer want any government distribution in a particular area, or change your address, it would be a cost savings to the government if you were to assure that the appropriate changes were made.

Please use the following address, when needed, to cancel receipt of FAA/DOT documents which were not contained in your DER kit:

Department of Transportation
Distribution Requirements Section
M-484.1
Washington, D.C. 20590

□

New Airworthiness Directives Service

The FAA has contracted with Aerodata, Inc., of Boulder, Colorado, to provide airworthiness directives (AD) to the public in an electronic format. The public now will be able to obtain this data in raw format for a minimal fee in various electronic formats: on line, diskette, tape, etc. This service includes the preamble as well as the text of the AD.

Historically, the FAA has made the AD's available to the public (international as well as domestic) as paper copies or as a microfiche. Recently, however, the FAA has received numerous requests from the public for AD's in electronic format. Various publishers already have made AD's available in electronic format for sale to the public: some take the AD's as they are published from the **Federal Register**; others wait for the FAA's paper copy to arrive and scan it into their systems.

The FAA's contract with Aerodata, Inc., is intended to provide the electronic service requested by our many AD customers. Beginning with Biweekly Supplement 93-01 (January 1993), the public can now access AD's, in an electronic format:

WHERE: Aerodata, Inc.
260 Bellevue Drive
Boulder, CO 80302-7818

TELEPHONE: (800) 925-7636
FAX: (303) 444-7405
COST: Varies*
FORMAT: Several*

*Please check with Aerodata, Inc.

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Transport Airplane Directorate Regulatory and Other Projects

FAA Rulemaking Issued in FY-93

Amendment 25-78, "Use of Nitrogen or Other Inert Gas for Tire Inflation in Lieu of Air." Published February 26, 1993.

This amendment requires that an inert gas, such as nitrogen, be used in lieu of air, for inflation of tires on certain transport category airplanes. This action was prompted by at least three cases in which the oxygen in air-filled tires combined with volatile gases given off by a severely overheated tire and exploded upon reaching autoignition temperature. The use of an inert gas for tire inflation will eliminate the possibility of a tire explosion.

Amendments 25-79, 121-233, 135-46, "Improved Flammability Standards for Materials Used in the Interiors of Transport Category Airplane Cabins" (To be published soon.)

These amendments clarify standards adopted in 1986 concerning the flammability of components used in the cabins of certain transport category airplanes. These clarifications are applicable to air carriers, air taxi operators and commercial operators, as well as manufacturers of such airplanes.

Notice 93-8, "Improved Standards for Determining Rejected Takeoff and Landing Performance." Published July 8, 1993. The period for public comment closes November 5, 1993.

This notice, applicable to transport category airplanes, proposes revised standards for determining the runway length that must be available for takeoff and landing. The FAA is proposing to revise the current standards to:

(1) revise the method of accounting for pilot reaction time used in determining the runway length that must be available in the event of a rejected takeoff;

(2) account for the effect of wet runways on takeoff performance; and

(3) account for the reduced capability of worn brakes on takeoff and landing performance.

This rule would reduce the impact of the current standards on the competitiveness of new vs. derivative airplanes without adversely affecting safety, and would provide harmonization with proposed standards for the European Joint Aviation Requirements (JAR). The proposed standards would not be applied retroactively to either airplanes currently in use or airplanes of existing approved designs that will be manufactured in the future.

Notice 93-9, "Fatigue Evaluation of Structure." Published July 19, 1993. The period for public comment closes November 16, 1993.

This notice proposes to amend the fatigue requirements for damage-tolerant structure on transport category airplanes. It would require full-scale fatigue testing, and inspection thresholds based on a crack growth from likely initial manufacturing defects in the structure.

The revised standards proposed in this notice are intended to ensure that, should serious fatigue damage occur within the operational life of an airplane, the remaining structure can withstand loads that are likely to occur, without failure, until the damage is detected.

Advisory Circulars (AC) Issued in FY-93

AC 25.733-1, "Pilot Compartment View for Transport Category Airplanes." Issued January 8, 1993.

This AC includes current guidance concerning the geometric characteristics of the pilot compartment and the properties of transparent materials necessary to assure adequate visibility from the flight deck. A study of the clear vision field was made by the Aerospace Industries Association which resulted in recommendations that were subsequently adopted by the Society of Automotive Engineers and published in the Aerospace Standards AS-580B. Some of the SAE criteria have been adopted and modified as guidance in this AC for validating the pilot compartment view.

AC 25.1523-1, "Minimum Flightcrew." Issued February 2, 1993.

This AC sets forth a method of compliance with the requirements of Section 25.1523 of the FAR, which contains the certification requirements for minimum flightcrew on transport airplanes. It provides guidance in assessing flightcrew workload for new flight deck design and modification to existing flight deck configurations.

AC 20-131A, "Airworthiness Approval of Traffic Alert and Collision Avoidance Systems (TCASII) and Mode S Transponders." Issued March 29, 1993.

This AC provides guidance material for the airworthiness approval of Traffic Alert and Collision Avoidance Systems (TCASII) and Mode S transponders.

Working Groups Established under the ARAC on Transport Airplane and Engine Issues

Loads and Dynamics Harmonization Working Group

Task 1 - General Design Loads: Develop new or revised requirements and associated advisory and guidance material for the general design loads for transport category airplanes (FAR 25.331, 25.335, 25.341, 25.345, 25.351, 25.371, 25.427, 25.483, 25.511, 25.561, 25.963, and other conforming changes).

Task 2 - Engine Torque and Gyroscopic Loads: Develop new or revised requirements and associated advisory and guidance material for determining the design loads for engine seizure conditions (FAR 25.361, 25.371, and other conforming changes.

Task 3 - Flutter, Deformation, and Fail-Safe Criteria: Develop new or revised advisory and guidance material for flutter, deformation, and fail-safe criteria (FAR 25.629).

General Structures Working Group

Task 1 - Bird Strike Damage: Develop new or revised requirements for the evaluation of transport category airplane structure for in-flight collision with a bird, including the size of the bird and the location of the impact on the airplane (FAR 25.571, 25.631, 25.775).

Task 2 - Safe Life Scatter Factor: Develop recommendations for new or revised advisory and guidance material concerning the safe life scatter factors (FAR 25.571).

Purpose: Develop rule and associated advisory material concerning the design load for engine seizure.

Systems Design and Analysis Harmonization Working Group

Task: Develop guidance material concerning the evaluation and control of certification maintenance requirements created to satisfy the requirements of FAR 25.1309 for newly certificated transport category airplanes (AC 25.1309-1A; ref. FAR 25.1309).

Seat Testing Harmonization Working Group

Task: Make recommendations to the ARAC Transport Airplane & Engine Interest Group concerning the requirements and guidance material for the certification of flightcrew seats and the associated test conditions (FAR 25.562; AC 25.562A).

Direct View Harmonization Working Group

Task: Review the proposed guidance material contained in FAA draft Advisory Circular 25.785 for finding compliance with the cabin attendant's direct view requirements of FAR 25.785 and make recommendations to the ARAC Transport Airplane & Engine Interest Group for new or revised guidance (FAR 25.785; AC 25.785).

Hydraulics Test Harmonization Working Group

Task: Make recommendations concerning new or revised requirements for hydraulic systems and the associated test conditions for hydraulic systems installed in transport category airplanes (FAR 25.1435).

Electromagnetic Effects Harmonization Working Group

Task 1 - High Energy Radiated Fields: Develop new requirements for aircraft exposure to high energy radiated fields (new FAR 25.1316 or 25.1317 and related provisions of FAR Parts 23, 27, 29, 33, and 35, as appropriate).

Task 2 - Lightning Protection: Revise advisory material on lightning protection requirements in Advisory Circulars 20-53B and 20-136 (FAR 25.1316 and related provisions of FAR Parts 23, 27, 29, 33, and 35, as appropriate; AC 20-53B, and 20-136).

Installation Harmonization Working Group

Task 1 - Installations (Engines): Develop recommendations concerning new or revised requirements for the installation of engines on transport category airplanes and determine the relationship, if any, of the requirements of FAR 25.1309 to these engine installations (FAR 25.901).

Task 2 - Windmilling Without Oil: Determine the need for requirements for turbine engine windmilling without oil (FAR 25.903).

Task 3 - Non-contained Failures: Revise advisory material on non-contained engine failure requirements (FAR 25.903 and related provisions of FAR Parts 23, 27, 29, 33, and 35, as appropriate; AC 20-128). The working group should draw members for this task from the interests represented by the General Aviation and Business Airplane and Rotorcraft Interest Groups.

Task 4 - Thrust Reversing Systems: Develop recommendations concerning new or revised requirements and guidance material for turbojet engine thrust reversing systems (FAR 25.933).

Cargo Standards Harmonization Working Group

Task: Make recommendations to the ARAC Transport Airplane & Engine Interest Group concerning new or revised requirements for main deck Class B cargo compartments, a subject which has recently been coordinated between the JAA and FAA.

Flight Test Working Group

Tasks: Make a recommendation to the ARAC Transport Airplane and Engine Interest Group concerning the disposition of the joint Aerospace Industries Association of America, Inc. (AIA), and Association Europenne des Constructeurs de Material Aerospatial (AECMA) petition for rulemaking dated May 22, 1990.

More specifically, these issues relate to harmonization of the strength of pilots table of maximum control forces and associated advisory material; harmonization of FAR/JAR maneuverability requirements and associated material; and harmonization of the minimum control speed requirements of the FAR/JAR. (FAR 25.143(c), 25.143(f), 25.149, 25.201.)

Propulsion Harmonization Working Group

Task 1: Bird Ingestion. Update turbine engine bird ingestion requirements, including size and number of birds and pass/fail criteria (FAR 33.77).

Task 2: Inclement Weather. Update the inclement weather requirements for rain and hail in turbine engines (FAR 33.77).

Task 3: Vibration Surveys. Determine test requirements and pass/fail criteria for turbine engine vibration tests (FAR 33.83).

Task 4: Rotor Integrity. Determine test requirements and pass/fail criteria for turbine, compressor, fan, and turbosupercharger rotor overspeed tests (FAR 33.27).

Task 5: Turbine Rotor Overtemperature. Clarify test and pass/fail requirements for turbine engine overtemperature tests to assure consistent certification criteria (FAR 33.88).

Task 6: Windmilling. Examine current turbine engine windmilling requirements and specify appropriate test and analysis requirements (FAR 33.92).

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Note from the Editor

If you are a Designee and would like to have your name added to our mailing list to receive future copies of the Transport Airplane Directorate **Designee Newsletter**, *please submit your request to:*

Federal Aviation Administration
Transport Airplane Directorate
ATTN: Editor (J. DeMarco), ANM-103
1601 Lind Avenue, S.W.
Renton, Washington 98055-4056

Local DER Conferences

Seattle Aircraft Certification Office

The Propulsion Branch (ANM-140S) of the Seattle Aircraft Certification Office (ACO) plans to hold its Bi-annual DER Conference and three subject-specific workshops during the next year. The subject-specific workshops have been added to the regular DER conference agenda so that issues of current significance can be discussed with the interested and affected DER's at some length.

The Bi-annual DER Conference for Propulsion and Noise DER's is planned as an all-day event to be held in early November at the Renton Technical College in Renton, Washington.

The DER's supervised by the Seattle ACO's Propulsion Branch will be notified by letter at a later date of the exact time and place. Other designees who would like to attend should contact Ms. Sylvia Torres at (206) 227-2678 as soon as possible so that your name may be placed on the list of those to be notified of the time and place.

The agenda planned for this conference will include the following topics:

- **Introduction**
- **FAA Budget Impact on DER's**
- **Harmonization**
- **FAA Organization Update**
- **Results of DER Survey**
- **DER National Standardization**
- **Candidate DER's**
- **Conformity Issues**
- **Thrust Reverser Policy Update**
- **Early ETOPS and the Boeing Model 777**
- **DER Involvement in ETOPS**
- **Noise Rule Changes and FAR 34**

The subject-specific workshops currently are planned for the following subjects and will be held on the indicated dates at the FAA's Northwest Mountain Regional Office building (located at 1601 Lind Avenue S.W., Renton, Washington) at 1:00 p.m.

- **In-flight Starting: January 19, 1994**
- **Propulsion Instrumentation: March 15, 1994**
- **Engineering Approvals for PMA and Repairs: May 18, 1994**

This schedule is subject to change, however. The Propulsion DER's supervised by the Seattle ACO will be notified of any changes by letter. Other designees who are interested in attending these workshops should contact Ms. Torres at the telephone number indicated above.

Los Angeles Aircraft Certification Office

The Los Angeles ACO's Airframe Branch (ANM-120L) is interested in improving the communication between the Consultant DER's reporting to this office and disseminating the latest certification information. In an effort to accomplish this, a Consultant DER Workshop is being prepared for presentation in November 1993.

The workshop will serve as a refresher on the Consultant DER's responsibilities, address some of the questions that DER's may have with regard to various FAA policies, and provide a forum for discussion of specific topics of interest (*i.e.*, damage tolerance, flutter, service difficulties).

To facilitate a good interaction between the FAA and DER's, the Los Angeles ACO plans to construct the workshop in a round table format with a limited number of attendees.

The Los Angeles ACO encourages Consultant DER's to submit copies of presentations that they would be willing to present as part of the workshop. Input on discussion topics would also be appreciated.

The survey form on the next page is intended to help the Los Angeles ACO format the workshop in order to better serve its participants. Consultant DER's reporting to the Los Angeles ACO are asked to take the time to complete this survey and return it to:

Los Angeles Aircraft Certification Office
Attention: Airframe Branch,
ANM-120L
3229 East Spring Street
Long Beach, CA 90806-2425

Copies of replies may also be faxed to:

(310) 988-5210.

Once the surveys have been received, they will be reviewed and compiled. From the information garnered, the ACO will design the workshop and then disseminate specific details concerning it to the DER's.

If you have questions or would like additional information concerning the planned workshop, contact **Ms. Dorenda Baker,** of the Los Angeles ACO's Airframe Branch, at **(310) 988-5231.**

Consultant DER Workshop Survey

A survey for Los Angeles ACO-appointed Consultant DER's only

Name and DER Number: ______________________________

Address: ______________________________

____

Telephone: *Home* ______________ *Work* ______________

Please list specific topics that you would like to have presented at the next workshop:

1.

2.

3.

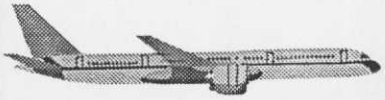
Please circle your preference for the workshop location:

Sacremento, CA *Long Beach, CA* *Other* ______________

Please make any additional comments:

Mail to: Los Angeles Aircraft Certification Office,
ATTN: ANM-120L,
3229 E. Spring Street,
Long Beach, CA 90806-2425

Transport Airplane Directorate Designee Newsletter



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