FEDERAL AVIATION ADMINISTRATION

the Designee NEWSLETTER

Aircraft Certification Service, Transport Airplane Directorate

Edition 18, October 1994

Inside this Issue...

Lead Topic

General News

Policy and Guidance

Designee News

Rulemaking

Lead Topic

Development of Communication Systems in the Future U.S. Air Traffic Management System

INTRODUCTION

Projected increases in traffic will place ever greater demand on the air traffic management system. To respond to this demand, improvement in air traffic communication systems will be necessary. The FAA's goal is to continue to operate an efficient, seamless, and robust communication system with performance adequate to meet the needs of a broad user spectrum, while allowing smooth evolution, growth, and global interoperability. The FAA will take advantage of new technologies, leverage commercially available services, lead the development of industry-preferred standards, and promote partnerships with industry in order to minimize system implementation risk and speed introduction of air traffic and airline operational services to the aviation community.

The future vision for the Air Traffic Management (ATM) communication system includes:

- a reduced need for user involvement in the communication process,
- increased use of data communication to enhance both the capacity and efficiency of the systems,
- greater interoperability among diverse systems, and
- expanded coverage through the application of satellite technology.

This article provides a broad view of plans for development of the ATM system to support orderly evolution of the National Airspace System. A brief overview of the current communication infrastructure is provided. Major drivers for change within the ATM system are described along with their impact on communication operations and architecture.

The key current objectives for improvement of the ATM communication system include:

- advanced in-flight delivery and display of information, including direct air-ground exchanges among computers;
- expanded delivery of real-time weather reports to users;
- sharing extensive weather databases across the aviation community;
- improved communication capacity and performance to support increased oceanic route capacity;

- increased communications capacity and reduced response time to support more accurate and timely weather and flow control updates; and
- increased system capacity, availability, and efficiency to meet increased demand for air traffic services and to deliver those services with increased quality.

BACKGROUND

The National Airspace System Plan, for which implementation began in 1981, set in motion a series of developments, the majority of which are nearing completion: Voice Switching and Control System (VSCS), Tower Voice Switch Replacement (TVSR), NADIN II, Aeronautical Data Link, Aeronautical Telecommunications Network (ATN), Routing and Circuit Restoral (RCR), among others.

Current ATM communication planning efforts focus on the integration of existing programs and the identification of needs for new programs to meet expanding capacity requirements and to enhance the functionality of the system. With respect to the potential need for new programs, the assessment of future user needs in relation to the capabilities of currently planned communication systems indicates there are three areas in which there are needs for enhancement of the current plan:

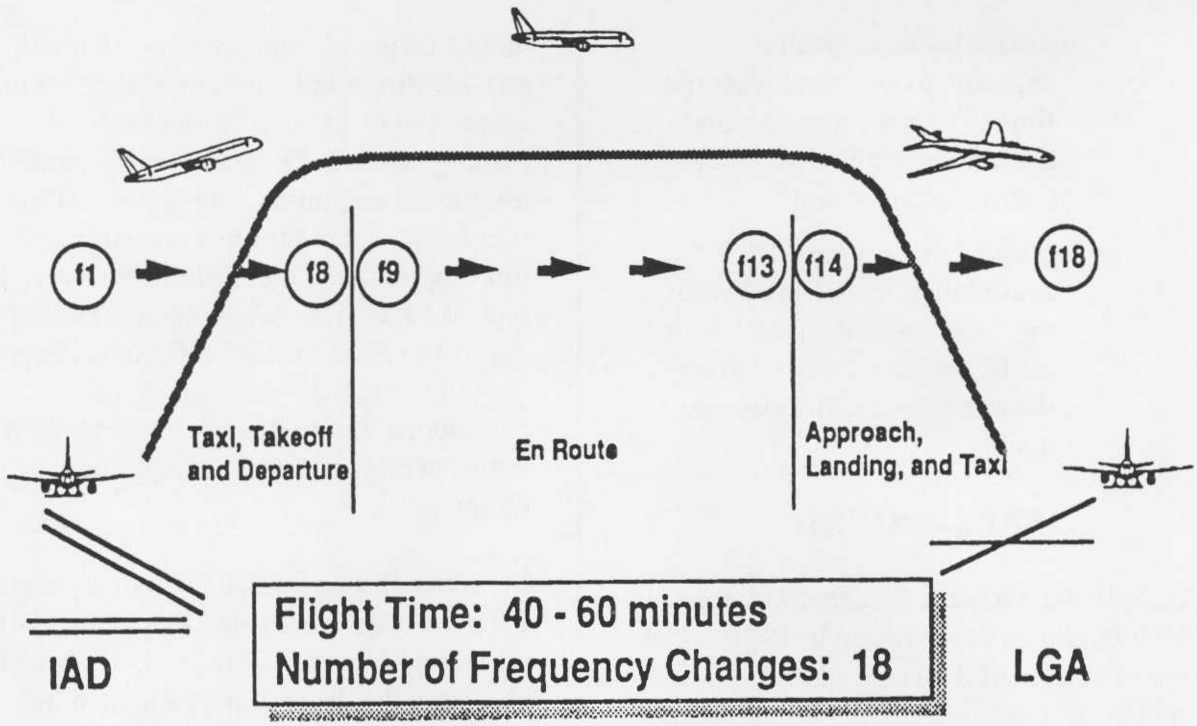
1. network management,
2. digital transmission, and
3. air/ground communication.

Planning system enhancements to meet user needs in these areas begins with identification of improvements that will provide direct and substantial benefits to the users. For example in air/ground communication, the design of the current air/ground communication system affects user (pilot and controller) procedures, limiting pilot and controller efficiency. In a typical flight from Washington's Dulles Airport to New York's La Guardia Airport, the pilot-controller air/ground communication frequency is changed 18 times, or approximately every 2 or 3 minutes.

Modern communication technology contains the means for eliminating this element of pilot and controller work load. It also would eliminate the distractions generated by frequency changes. Hence, one of the improvements that is under consideration is automatic communication channel management. This potential improvement and others are discussed in the following sections.

FUTURE VISION: EVOLVING WITH TECHNOLOGY

Air traffic communications will evolve away from voice communication to use data as the principal mode of communication. The needs of the key operational domains and functional areas will be met by an integrated communications infrastructure that will support multiple complementary air/ground and ground/ground transmission systems to provide highly reliable communication in all phases of operations. The system will dynamically adapt to changes in connectivity, and it will provide efficient, reliable computer-to-computer data transfer to support the integration of cockpit and ground system automation.



Washington, Dulles-to-New York, Laguardia Flight Scenario

Reduction of User Involvement in Managing Communication Resources

Automation of communication resource management will make it possible for future users of the air traffic management system to focus more directly on their principal tasks -- for example, piloting aircraft -- without diverting attention to details of communication resource management. Tasks that can be eliminated include tuning to the next air traffic control frequency. In addition to reducing workload, automatic frequency management also reduces errors due to mistakes in manual tuning.

Call processing controls will eliminate the contention, such as simultaneous keying of transmitters, that occurs today in busy, manually operated systems, in which a controller may be responsible for as many as fifty aircraft. It is estimated that communication system improvements could reduce a controller's workload by about 10%. Complementary improvements will be made in cockpit communication systems to aid pilots by reducing distractions from urgent tasks. Attention to cockpit human factors, including integration of equipment design and operational procedures will ensure safe and efficient operation. The technology for these improvements is readily available in commercial communication systems.

A technological key to many of the benefits of modern air traffic communication systems will be software-controlled networking. Placing the network of the future under software control will facilitate the improvements discussed above and make it possible for the network to adapt quickly to meet changing demands -- establishing new routes and hubs, for example.

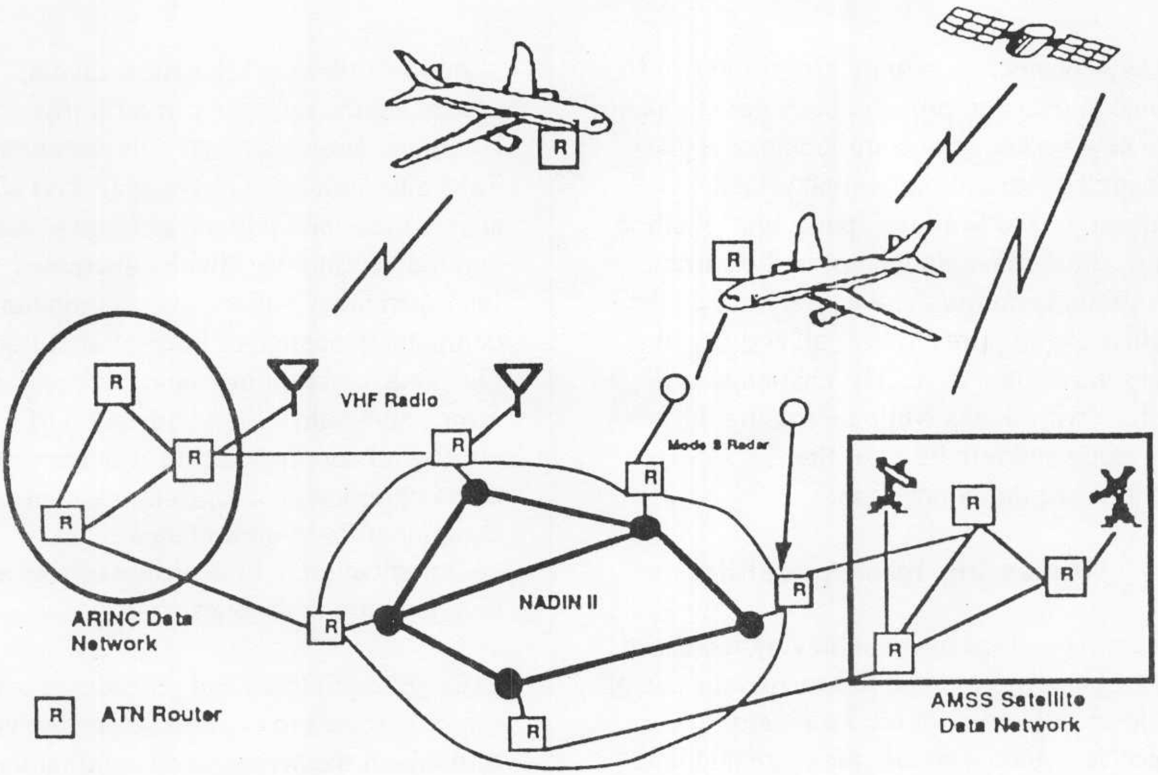
Advanced network management systems will facilitate end-to-end management of communication services. Diverse voice and data transmission facilities will be integrated to enable speedy recovery from catastrophic failures such as the recent public telecommunications network failures.

Increasing Data Communication Use

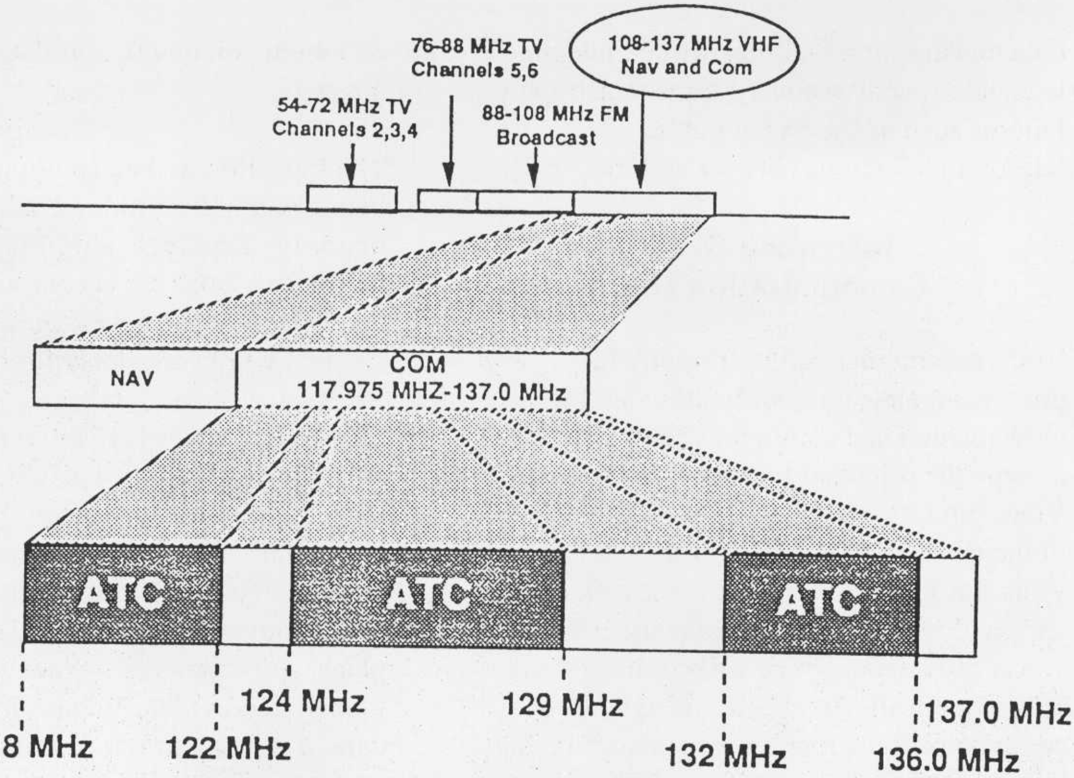
Voice communication is currently the principal means for coordinating aircraft movement. Data communication will assume the principal role in the future. Voice circuits constitute approximately 75% of the current network. Over the next 10 years, the composition of the network is expected to shift to approximately 50% voice, 50% data. Voice will continue to be a universal means for air/ground and air/air communications, for emergencies, and other tactical communications for all aircraft, as well as the primary means of communication with non-data-equipped aircraft.

The transition to data communication has begun and will continue gradually until the majority of strategic air/ground communications are accomplished by exchange of digital messages. The voice channel will be available for use as needed.

Strategic messages are those that are sent in advance of anticipated action, whereas tactical messages are generally delivered close in time to the anticipated action. Strategic communications such as weather data, Notices to Airmen (NOTAM), flight plans, and clearances, which are typically transmitted by voice today, will evolve to data. As data communication and automation capabilities expand, new data exchanges will be added to the roster of routine communication.



The Aeronautical Telecommunications Network



VHF Air/Ground Spectrum

A key consideration in the transition from voice to data communication is how to adapt the new system to accommodate or replace the situational awareness that pilots currently have from the "party line" method of operation that is inherent in the current air/ground communication system, i.e., the ability for all pilots to hear all activity in their immediate area. The challenge is to reduce work loads while increasing the accuracy and reliability of the controller/pilot connection.

Increasing Interoperability

The principal means to achieving increased interoperability will be to broaden the use of industry and international standard interfaces and protocols for voice and data communication. Standard interfaces and protocols will allow diverse transmission systems to serve as alternative media, enhancing the reliability of air traffic communication services. The Aeronautical Telecommunication Network (ATN) will standardize and facilitate air/ground data communication worldwide. Increased interoperability will facilitate computer-to-computer exchange of international flight plan data, eliminating manual processing, errors, and delay. Standardization of air/ground communication systems will allow commercial aircraft to use common equipment for voice and data communication to both airline offices and civil aviation authorities.

Standard equipment and procedures will improve access to communication services throughout the aeronautical community. They will also promote interchangeability of systems, so that future expansion and addition of new features can be accomplished quickly, at low cost, without special development.

Increasing Communication Capacity

Air Route Traffic Control Center (ARTCC) Instrument Flight Rules (IFR) operations are growing at approximately 2% per year. The air traffic communication system of the future must grow at a pace that accommodates such growth in demand for air traffic services. There are two potential bottlenecks that deserve special attention in planning for system capacity enhancement in the next generation of air traffic communication system:

1. The need to accommodate increased international travel on the Atlantic and Pacific trans-oceanic routes. Trans-oceanic communication will be significantly improved by the application of satellite technology, as discussed in the following section.

2. The need to expand the capacity of the air/ground very high frequency (VHF) radio system. The present air/ground network is based on a post-World War II design. As traffic demand has grown since World War II, air/ground communication has been repeatedly expanded within the originally allocated spectrum by halving the bandwidth of an air/ground channel.

Functionality has remained essentially unchanged from the original design. There is a need once again to expand system capacity but, because of interference limitations, channel splitting is not a viable option. A fundamental redesign of the system is needed.

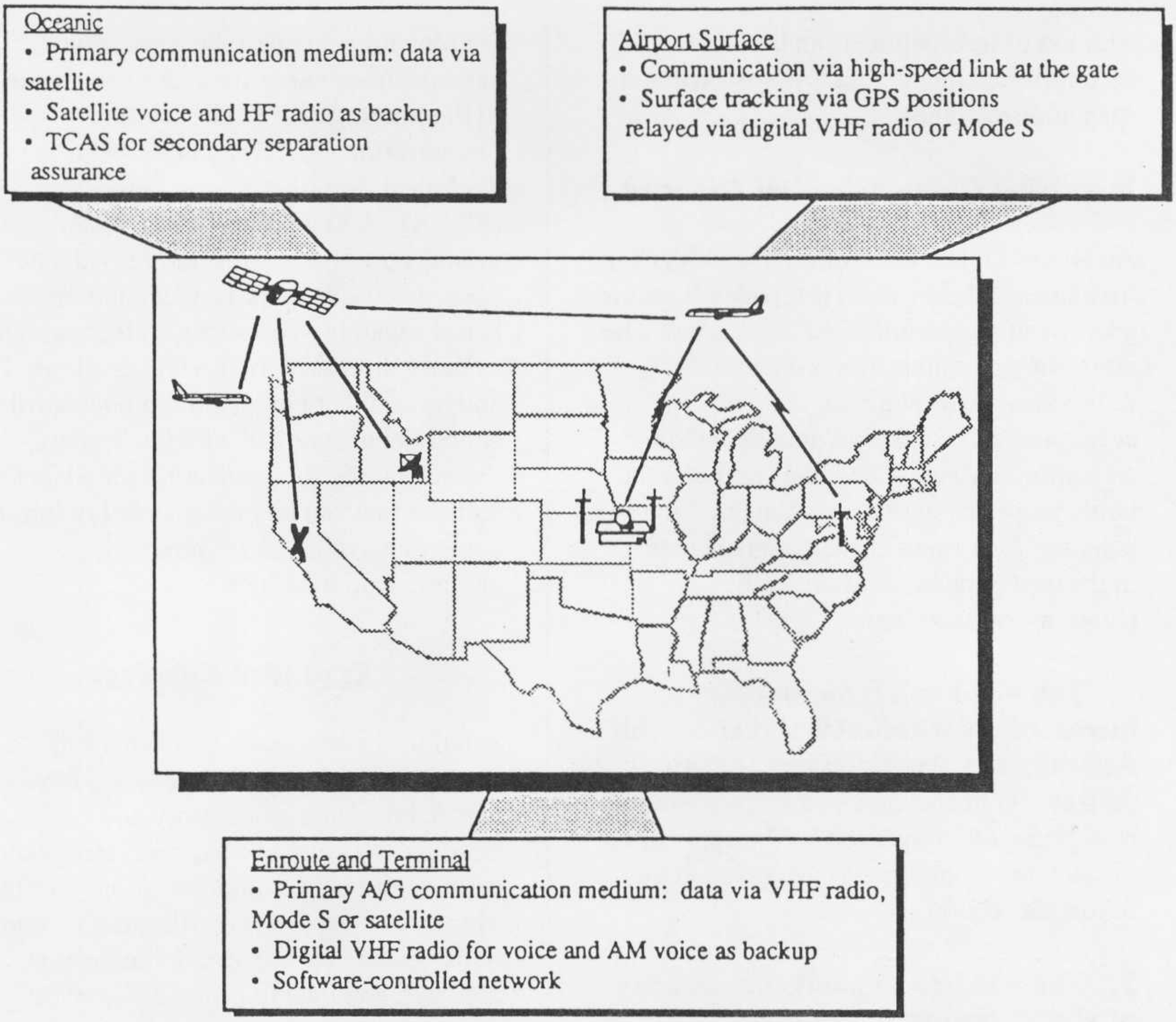
Options for achieving the necessary expansion are currently under consideration in the International Civil Aviation Organization (ICAO) and the Radio Technical Commission for Aeronautics (RTCA). A key option is conversion to a digital system, which would provide the needed capacity improvement and broad-based capability for advanced features such as those discussed in previous sections. It is anticipated that the governing bodies will support conversion to a digital system, thereby laying the foundation for advanced features that can be implemented in future generations of the air/ground communication system.

Expanded Coverage

Satellite communication systems and complementary avionics packages have reached the stage of maturity and cost-effective performance to serve significant roles in air traffic communication. For the future, satellite systems will greatly improve trans-oceanic air traffic communication, and they will continue to provide important options for access to remote areas as well as wide-area broadcast and data collection.

REALIZATION OF THE VISION: Operational Applications Of New Technology

Although there are a number of new developments already underway, there are many choices yet to be made in the development of the next generation air traffic communication system. Following are sketches, based on the capabilities of current technology and estimates of how, in an orderly transition, technological



Future ATM Communication System

improvements could be introduced operationally into the global air traffic management system.

Oceanic Domain

Satellite communication will provide the primary medium for voice and data communication in the oceanic domain. The majority of air traffic control communications will be via satellite data communication. Position reporting will be automatic and based on Global Positioning System (GPS) position determination.

High frequency (HF) radio will provide backup voice and data communication capability and will assume a primary role in polar regions. The Traffic Alert and Collision Avoidance System (TCAS) will provide secondary separation assurance.

In choosing among specific alternatives for improving oceanic domain communication, the key issue is overall communication system reliability/availability, because closer route spacing requires greater assurance that communication services will be available at critical times. Trade-offs are being examined among potential satellite and HF system improvements that will increase overall system availability consistent with increased route capacity goals.

Airport Surface Domain

High-volume airline operational communication will be carried via direct high-speed connection to the aircraft at the gate. GPS position determination relayed via VHF radio or Mode S will be available to track aircraft position on airport surfaces. Airline operational communication and air traffic control communication traffic will use VHF radio and Mode S for data transmission with voice backup via VHF radio and satellite.

Enroute, Terminal, and Flight Services Domains

Air/Ground Communication. Air traffic control air/ground communication will evolve from primarily voice communication to primarily data communication. Aeronautical VHF radio systems will transition to digital modulation to improve voice quality and increase channel capacity. Digital VHF capability will provide a third air/ground data channel (along with Mode S and satellite) for the ATN, increasing data communication capacity and reliability. Voice communication will continue to be used for emergencies and for those aircraft that are not data equipped, and amplitude modulated voice will continue to be supported as well.

Ground/Ground Communication. The air traffic management network will evolve to a predominantly digital, software-controlled network. The data communication infrastructure will include dynamic routing of packet data messages based on the type of service, cost of transmission and other parameters, and improved security in network access and control. Independent and geographically diverse transmission, including demand-access satellite service, expanded transmission system diversity, intelligent switching nodes and data routers, and centralized operation, administration, and maintenance will be implemented to ensure connectivity. National traffic flow management operations will collect comprehensive aircraft position and status data over the ground and space-based networks.

CONCLUSION

The performance and efficiency of the ATN communication infrastructure will be constantly improved. Direct benefits to the users will include greater trans-oceanic route capacity, improved weather reporting, and increased aircraft operating efficiency as well as constantly improving system capacity and efficiency.

The future vision of air traffic communication will, when realized, greatly enhance the safety, capacity, and efficiency of the air traffic management system. Building on current technology, air traffic communication systems are evolving to meet the demands posed by projected increases in air traffic, and to respond more effectively to user needs and preferences.

Material for this article came from the "FAA Strategic Planning Document." For more information on that document, contact:

Office of Strategic Planning,
APO-210,
FAA Headquarters
800 Independence Avenue S.W.
Washington, DC. 20591

■

Lead Topic

Data Link Communications: Key to Future Air Traffic Services

An exciting new communications process is being introduced into the air traffic control system. Called data link, it will allow a broad range of communication services, leading to increased efficiency and capacity, improved air safety, reduced costs, and enhanced human and equipment productivity in the near future. A non-voice, digital data communications capability, data link will allow a vast, interlocking system of computers, satellites, sensors, and communications software to integrate ground automation systems and aircraft computers.

Advance Communications Vital

Everyone agrees that communications between pilots and controllers are fundamental to air traffic control. In an increasingly complex traffic environment, both parties require extensive, detailed information to make informed decisions in dealing with today's mix of high-speed, sophisticated airliners and an assortment of general aviation aircraft.

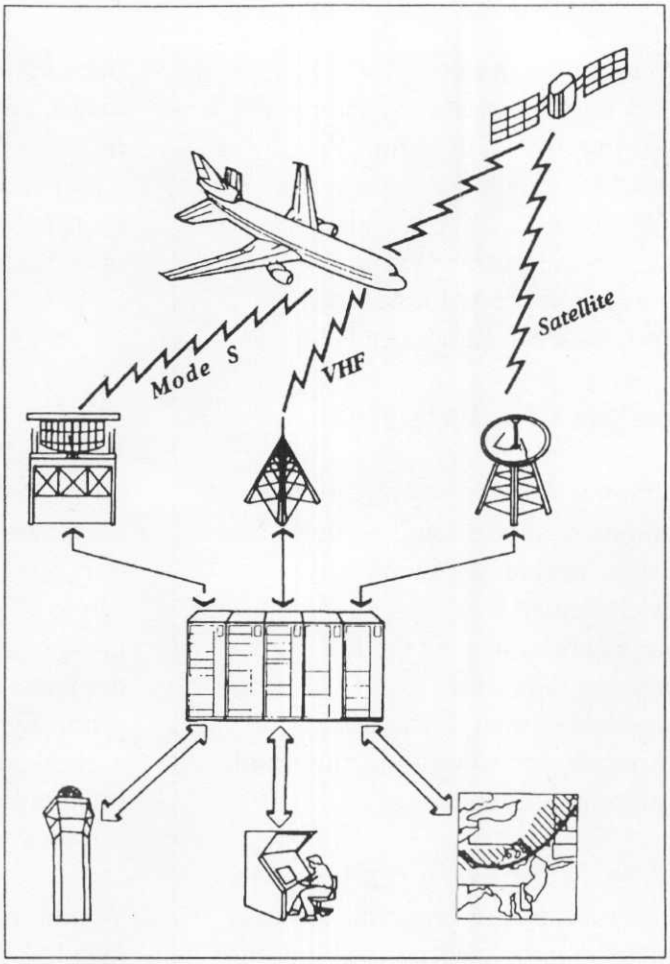
Yet air traffic control's current radio-based voice communications are operationally limiting and approaching capacity in many cases. With increasing traffic and automation, current methods will never support the highly advanced air traffic control system necessary for the future.

Described by the International Civil Aviation Organization (ICAO) Future Air Navigation Systems (FANS) Committee, tomorrow's air traffic management system will be built upon a structure of advanced communications, navigation, and surveillance -- CNS functions -- that support flight planning, aircraft operations, and air traffic control (ATC) services on a global basis. Realization of this "FANS CNS/ATM concept" depends on the capability for controllers, aircraft, and flight planners to exchange complex information rapidly in all flight domains.

Challenges to the Control Process

Currently, voice communications rely primarily on ground-based, very high frequency (VHF) radio in domestic airspace and long-range, high frequency (HF) radio for aircraft not reachable by line-of-sight transmission, such as those in oceanic airspace. Both technologies present challenges to the control processes.

In domestic airspace, communications problems result mostly from the limited number of radio frequencies available for VHF air traffic control transmissions. Combined with increasing air traffic, these limitations have individual controllers handling more than 25 aircraft simultaneously. To respond quickly to air



With Data Link, digital flight information may be initiated by an air traffic controller, automated systems, or the pilot.

As data is transmitted computers select the optimum method of transmission to and from the aircraft. Based on predetermined priorities, the computer may choose from Mode S, satellite, VHF, or other proposed Data Link transmission systems.

traffic control directives, each aircraft crew must listen to the constant, fast-paced exchange of information among all parties. Since only one person at a time can use a designated channel, the situation is very similar to many people vying to use the same telephone line at once.

Naturally, problems associated with direct voice communications increase in proportion to the higher levels of air traffic. During peak periods, the need for constant, speedy transmission of control information can lead to error through misinterpretation, resulting in potential safety hazards. Estimates are that between 30 and 50 percent of all operational errors are caused either directly or indirectly by miscommunications. Additionally, communications-related delays and reduced efficiency in the current system hike costs in time and fuel.

Even more severe are communications problems associated with HF radio for oceanic air traffic control. An unreliable communications link, HF radio transmissions between a pilot and ground radio operator to the oceanic controller, which is an additional source of delays, information errors, and misunderstandings. As air traffic increases, the HF voice link becomes more congested, heightening the probability of significant delays and lost messages.

Because HF radio communications are problematic, air traffic control rules for oceanic airspace must be restrictive. For instance, very large separation standards between aircraft are required as compensation for the uncertainty for reaching the aircraft via HF radio. Yet aviation forecasts predict increasing air traffic in U.S.-controlled oceanic airspace over the next several years. Without improved communications for oceanic air traffic control, how can future needs be met?

Possible with Data Link

Simply upgrading the current voice-based communications equipment and procedures cannot solve the problems of today's aviation system, much less support the air traffic management system of the future. The current voice radio-only system must be supplemented and in many instances replaced by data-based communications and associated automation tools.

In the mid-1980s after several years of work, research and development programs related to data link began to be incorporated into the FAA's National Airspace System Plan. Since then, the FAA and the aviation industry have been heavily involved in developing hardware, software, and interface standards and requirements for related ground and airborne automation systems. Organizations active in the development include the Radio Technical Commission for Aeronautics (RTCA), Airlines Electronic Engineering Committee (AEEC), and ICAO. Initial aeronautical data link services have been introduced into the air traffic control system during the past few years, and development of additional services by the FAA is moving rapidly.

Widely recognized as advantageous, adding data link capability to support communications between pilots and controllers aids the pilot in recalling significant information and reduces the chance of human error in hearing and transcribing data. By allowing direct data exchange between automation systems, data link can also support advances in ground automation and avionics in high-precision route calculation and flight control operations.

Use of Data Link in Air Traffic Control

When fully implemented, data link will allow communication with aircraft nearly anywhere in the world, through a variety of transmission systems such as VHF, satellite, Mode S secondary radar, and airborne and ground communications networks. In domestic airspace, its near-term uses will be primarily for provision of such air traffic control communications as clearances and for weather and other flight information services.

Within oceanic airspace, pilot-controller data link communications will be available in the near term, followed by a surveillance capability called automatic dependent surveillance (ADS). Using ADS, an aircraft automatically transmits position data derived from its onboard navigation system to ground air traffic control automation. ADS, in combination with highly accurate and reliable navigation data provided by the Global Positioning System (GPS), will greatly enhance the ability of controllers to monitor aircraft positions in airspace not reachable by ground-based radar.

The basis of the communications infrastructure that allows data link to be provided "seamlessly," even while using a variety of transmission systems, is called the Aeronautical Telecommunication Network (ATN). Made up of a collection of existing and planned subnetworks -- such as Mode S, VHF, satellite, and HF -- and connecting packet routers conforming to internationally agreed-upon protocol standards, the ATN allows air traffic control automation or avionics systems anywhere in the world to exchange information without the user or end system knowing which actual subnetworks the data traverses.

Service for the Near Term

Initial data link services are currently available over the Aircraft Communications Addressing and Reporting System (ACARS), a VHF, character-based communications system established by Aeronautical Radio, Inc., for airline operational and administrative communications. Predeparture clearance (PDC) messages are now provided via data link to ACARS-equipped aircraft at 30 airports, and a data link Automatic Terminal Information Service (ATIS) is in the making at the same airports.

In oceanic airspace, several aircraft use converted ACARS equipment that supports satellite communications to exchange data link messages with the HF radio operator. The FAA has approved the operational use of data link to transmit oceanic position reports, allowing them to be sent from the aircraft to the ground more quickly and clearly than by conventional methods.

Also, the next few months should bring approval for properly equipped aircraft to use data link to exchange some air traffic control messages, including clearances and requests, with the controller via satellite data link communications.

A Look Ahead

Data link services will be implemented in stages, with each new service and capability building on the capabilities of previous stages. In the next two years, additional services will include pilot-controller communications and automatic dependent surveillance in the oceanic environment. Soon after, pilot-controller communications will be provided via data link in all air traffic domains, and some initial weather services and weather graphics capabilities will be accessible.

Once these services are available over the Aeronautical Telecommunication Network (ATN), with the necessary reliability and integrity, significant improvements in air traffic operations can be made to help airspace users. This includes reduced separation standards in oceanic airspace and more flexible and direct routing in domestic airspace.

The future data link system will support the exchange of complex information between ground and airborne automation systems, including detailed winds information and four-dimensional approach and departure paths. These future services will allow airspace users to take more efficient routes and will also eliminate much of the controller's burden of manually processing traffic separation information. In addition, advisories and hazardous weather information will be transmitted automatically via data link, reducing the weather distribution workload for controllers and providing more accurate information for airspace users in all phases of flight.

In later stages, data link will increase the interaction of pilots and airline dispatch officers in the planning and management of air traffic flow. Extensive information exchange, negotiation, and access capabilities should then allow the air traffic control system to accommodate airspace users' needs and preferences.

A Change of Infrastructure

Using the Aircraft Communications Addressing and Reporting System (ACARS) as the infrastructure for initial data link services has helped begin the transition to the high-performance platform needed for technical and operational changes that will define future air traffic management. ACARS, however, has limitations that affect its ability to support the evolving Data Link System -- its capacity and performance levels, for example. As the number and complexity of available data link services increase and the needs of the air traffic system change, ACARS will no longer be able to satisfy requirements.

To support advanced data link services, the expected operational changes, and the future globally "seamless" air traffic management environment, the Aeronautical Telecommunication Network must be in place. It can provide better meshing of systems, as well as heightened performance, reliability, and integrity.

Currently, the FAA is involved in implementing its part of the ATN infrastructure, including work on the Mode S, VHF, satellite, and HF air/ground subnetwork and ATN routers. To quicken the pace, the agency and a consortium of private industry are working towards a cooperative agreement through a public/private investment model. Through such a consortium, the FAA could assist the airline industry with expediting ATN development.

By 1996, the ATN infrastructure should be well enough established to begin providing a number of new data link services over ATN-based networks. Other communications technologies will also be developed to improve on and add to current communications links in the ATN. For example, communications links may be developed for such special purposes as local, high-rate transmission of airport surface dependent surveillance information.

Spectacular Potential

Data link has the potential to become the vehicle for a dramatic advancement in air traffic safety and efficiency. Full use of enhanced communication, navigation, and surveillance capabilities, for which data link is the critical component, will give those who operate the aviation system a better handle on advanced automation in managing information and tasks. Also, when fully implemented, significant operating costs will be saved by the FAA and airspace users.

Clearly, the challenge is to ensure logical, coordinated development and implementation of the numerous elements of the system, so that these benefits can begin to be realized by the aviation community.

Airworthiness Approvals

In April 1994, the FAA's Aircraft Certification Service issued Notice N8110.50 to ensure standardization among Aircraft Certification Offices (ACO) in their in assessment of airborne data link systems and applications for airworthiness approval. *(See article elsewhere in this edition on this topic.)* An advisory circular is forthcoming. Designees should contact their local ACO or Government Printing Office to obtain copies of Notice N8110.50 and other guidance material that may be available concerning the airworthiness approval of airborne data link systems and applications.

Material for this article was previously published in FAA World magazine, October 1993.

■

General News

FAA Notice N8110.50: "Guidelines for Airworthiness Approval of Airborne Data Link Systems and Applications"

On April 24, 1994, the FAA issued this Notice to support the introduction of data link applications for air traffic services (ATS). Ultimately the International Civil Aviation Organization (ICAO) will use data link applications to implement the communication, navigation, and surveillance (CNS) concepts that describe the future air navigation system (FANS).

This Notice will ensure standardization among the Aircraft Certification Offices (ACO) in their assessment of airborne data link systems and applications for airworthiness approval, and implement the recommendations of the FAA's Communications/Surveillance Operational Implementation Team (C/SOIT).

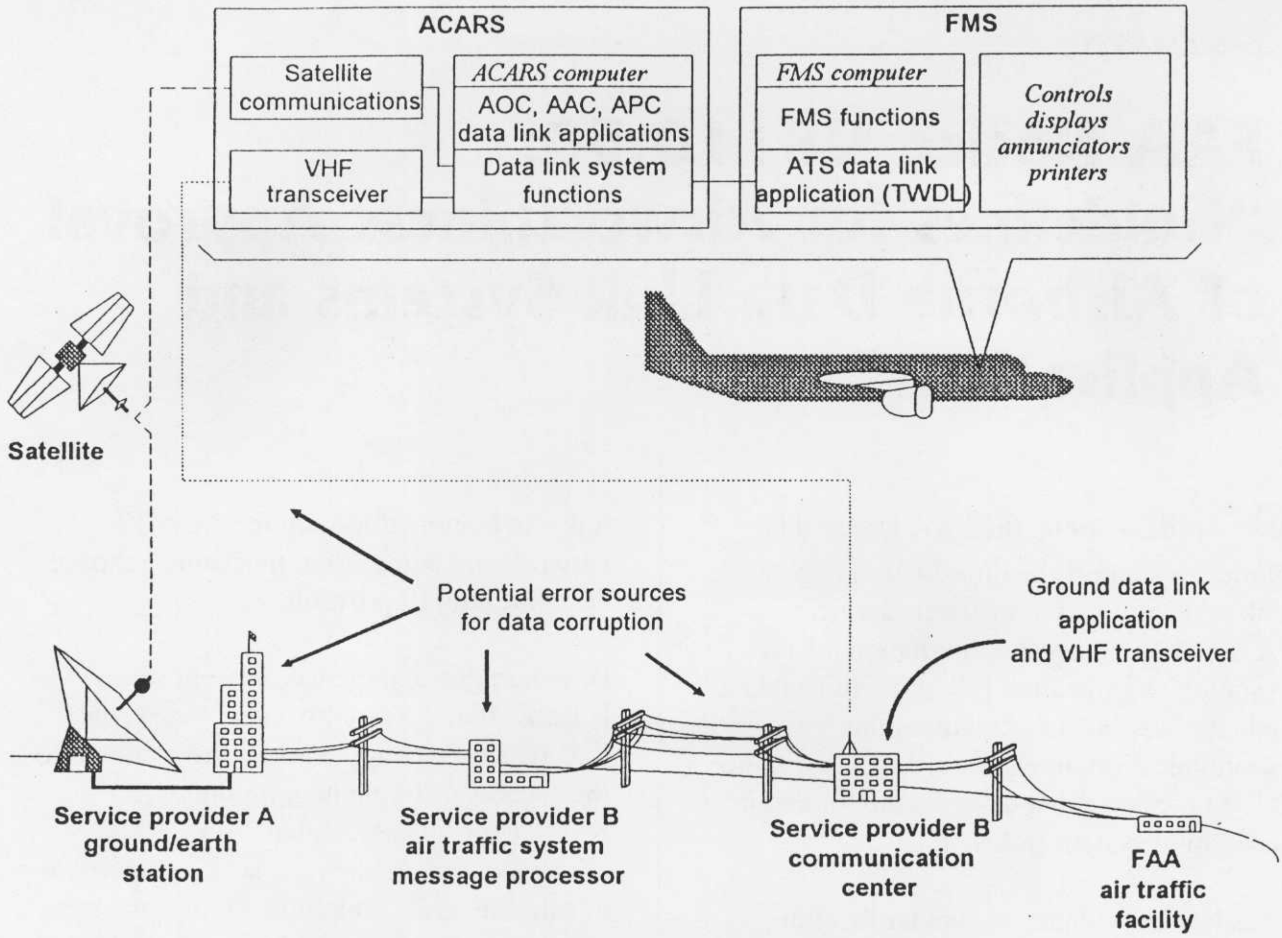
Background

Aircraft operators have been using VHF-based Aircraft Communications Addressing And Reporting System (ACARS) data link systems for aircraft operational control and aeronautical administrative control for more than a decade. Recently, the use of these data link systems have been approved for limited ATS, such as pre-departure clearance at domestic airports, and their use in air traffic management operations is continuing to expand. As a supplement to HF voice radio communications, satellite-based data links, in conjunction with the ACARS network, are being used in oceanic airspace to report aircraft position.

Based on this experience, the industry believes that the satellite subnetwork, data link system, and applications are essential to the success of implementing the ICAO FANS concepts associated with CNS. Aircraft operators are now seeking approval of satellite based data links to improve two-way communications and surveillance for air traffic management in oceanic and remote airspace.

Current data link systems and applications installed on aircraft have been approved as "non-essential" equipment and shown not to interfere with more critical functions on the aircraft. That is, the applicants have substantiated that the effects of failures and design errors would contribute to only minor failure conditions for the data link applications. However, when data link systems are used for ATS applications, failures and design errors of the data link system and applications may contribute to failure conditions whose classification is more severe than minor.

To adequately assess the effects of failures and design errors, Notice N8110.50 describes a means, using a specific safety



Example of Data Link Applications

assessment, to identify safety requirements for the operational environment in which the airborne data link system and applications will operate, and the requirements for interoperability with the air/ground subnetwork, ground data link system, and ground applications. Although these safety and interoperability requirements will be defined to support the airworthiness approval of the airborne data link system and applications, they also will be used to facilitate the operational authorization to use the data link applications as they evolve.

The Notice discusses in detail the evolutionary development of data link, as well as its applications, subnetworks, institutional considerations, and international implications. It provides guidance to applicants when planning for airworthiness approval of an airborne data link system and applications, and describes the activities involved in the airworthiness approval process, such as:

- conducting a safety assessment that takes into account the loss of airborne data link applications, the effects of undetected errors in the system, human/machine interface on the flight deck, and aircraft integration aspects;

- validating the safety requirements established by the safety assessment;

- validating the requirements for the airborne data link system and applications;

- validating the interoperability requirements;

- ensuring that the implementations provided by the aircraft systems meet the requirements for the airborne data link system and applications; and

- evaluating flight crew operations and flight manual provisions.

The Notice also provides some design considerations for airborne data link systems and applications. Some of the considerations discussed provide guidance on the following topics:

Environmental qualification

The hardware for the system should be qualified to the appropriate sections of RTCA DO-160C document, or as determined by the certification basis and the original means of compliance for the particular aircraft.

Software qualification

Applicants should use Advisory Circular 20-115B (RTCA DO-178B document) to show that the software aspects of the system comply with applicable airworthiness requirements.

Application integrity

The end systems should provide a means to check the integrity of messages that are originated and used by the ATS applications. The means should be commensurate with the integrity required for the airborne applications as determined by the safety assessment. The airborne systems should not process messages that fail the integrity check for flightcrew interaction.

Recording of data link messages for accident investigation

For airworthiness approvals issued in accordance with Notice N8110.50, the FAA will not require the recording of data link messages on the aircraft for accident investigation. However, ATS messages should include the time to the nearest second that the messages are sent by the flight crew, using the same time reference used by the flight data recorder and cockpit voice recorder.

(The FAA's Aircraft Certification Service is planning to initiate appropriate action to determine the requirement for recording data link messages for accident investigation.)

Message priority and urgency

Message priority refers to the communication protocol priorities required by the International Telecommunications Union (ITU) radio regulations and determines the implementation requirements for the aeronautic telecommunication network (ATN) compliant data link systems.

Message urgency refers to the processing of data link messages by the end systems according to their relative importance, which is defined by the RTCA for the data link applications. (Specific guidelines are included in the Notice.)

Flight deck annunciation and display

An aural and visual alert should be provided for each uplink ATS message, unless otherwise substantiated by the safety assessment. The system should be capable of alerting the flightcrew of probable airborne system failures and should provide the status of the data link system to the flight crew (e.g., loss of the data link connection). If message storage and/or printing is available, the system should alert the flight crew when these services are not available.

In addition to the guidelines provided in the Notice, applicants should consider the guidelines contained in Society for Automotive Engineers (SAE) aerospace recommended practice (ARP) 4791 for developing the human/machine interface on the flight deck.

Flight deck control capability

A means should be provided for the flightcrew to positively acknowledge receipt of and respond to ATS messages. Additionally, a means should be provided for the flight crew to list, select, and retrieve the most recent (approximately 10) ATS messages received and sent by the flight crew during the flight segment, together with their status and the time the messages were received or sent. A means also should be provided for the flightcrew to clear messages from the display, as well as to create, store, retrieve, edit, delete, and send messages.

Designees may obtain copies of Notice 8110.50 from their cognizant ACO or from their local Government Printing Office.

■

General News

The Aircraft Certification Service's International Strategic Plan

In 1992, the FAA's Aircraft Certification Service (AIR) published its *"Strategic Plan for Change,"* which set the direction, organizational principles, and long-term strategies for AIR. With dynamic changes in world economies and demands for increasing international certification services, AIR management determined that a plan focusing solely on international strategies was needed to complement the 1992 plan. A working group, with representatives from the four FAA Directorates and various FAA Divisions, was tasked by the Aircraft Certification Management Team with developing such a plan.

International activities are an AIR priority and an integral part of how AIR does business. The Aircraft Certification Service and its predecessor aircraft certification organizations have been active in international activities since the early days of civil aviation. ***Partnership*** has been, and continues to be, the hallmark of AIR relationships throughout the world.

Where We Have Been: The Aircraft Certification Service International Experience

The FAA implemented the first bilateral airworthiness agreement (BAA) in 1929. As of today, 27 such agreements are now in place between the United States and other governments. Bilateral airworthiness agreements are the cornerstone of how the FAA ensures the airworthiness integrity of U.S.-approved aeronautical products -- aircraft, aircraft engines, and propellers -- used throughout the world. Many existing BAA's were concluded in the early 1970's when countries still manufactured complete aircraft from all domestically-produced parts.

Aviation safety begins with safe aircraft, regardless of their country of origin. . .

Without the support and assistance of aviation authorities from other countries, the FAA would need to assign aviation safety engineers and aviation safety inspectors worldwide. The FAA's partnerships with other aviation authorities, through BAA's, help AIR to leverage its limited resources and still be responsive to the aviation industry and the traveling public.

The Aircraft Certification Service has enjoyed long and cooperative relationships with its counterparts, especially in Canada and Europe. The FAA has made progress in "harmonizing" its regulatory standards with those of the Joint Aviation Authorities (JAA) of Europe, so that industry will not face costly certifications. However, much more remains to be done.

Where We Are Going

The world has changed greatly since the early days of aviation, and we are facing new challenges from the global civil aviation system. Rarely is a single country manufacturing a complete aircraft. Even small aircraft are assembled from parts manufactured in many different countries. Serious financial difficulties plague U.S. aircraft manufacturers. As U.S. industry seeks new markets and new customers, AIR similarly finds itself looking outward to new customers and counterparts.

Our BAA's need to be updated to make them more flexible and to reflect AIR's working relationships with airworthiness authorities and industry's multi-country operations. A new format -- the Bilateral Aviation Safety Agreement (BASA) -- has been approved to allow the FAA to cooperate closely not only in aircraft certification, but also in maintenance, environmental certification, and other areas.

In the future, the FAA will be broadening its efforts to harmonize standards, practices, and procedures beyond the current effort with the JAA. Common aircraft design and construction standards are needed to reduce the costs of repetitive approvals by many countries.

Completing a certification once -- through cooperative and concurrent certifications with multiple airworthiness authorities --

will be the rule rather than the exception. AIR will need to train its work force and others in these new ways of doing business.

AIR's mission is to work in partnership with the global community. . .

With the global diversification of the U.S. aviation industry comes cooperation with aviation authorities eager to establish and demonstrate their own airworthiness capabilities. While assisting emerging countries to become technically respected regulatory partners, AIR personnel are learning how to deal effectively with different cultures. This requires not only an understanding of technical requirements and differences, but an understanding of how people from other cultures think and work together.

The FAA faces the challenge of meeting increased international demands with reduced staff and funding. The projected international workload could very easily overwhelm AIR.

However, AIR will not sacrifice safety because of resource concerns. Rather, priorities must be established and choices made between competing needs. These choices need to be made with full understanding of the direction of AIR's international initiatives.

AIR has a long and proud history in international civil aviation activities, and is committed to making the future even better than the present.

AIR's Vision

AIR has stated its vision as:

> *"We will achieve the highest level of public confidence in the safety of the international air transportation system."*

Internationally, this means a global network of airworthiness authorities working cooperatively to promote the highest level of public confidence in the safety of the international air transportation system with the lowest practicable regulatory burden to this system.

AIR's mission is to work in partnership with the global aviation community to continuously improve the safety of the international air transportation system and achieve international harmonization of aircraft certification standards, practices, and procedures.

The Aircraft Certification Service values the safety of the international transportation system above all else. This is best accomplished internationally through cooperation and cross-cultural understanding, in partnership with other airworthiness authorities and the aviation industry. These efforts will result in international airworthiness competency and global aviation economic development.

Goals and Objectives

Goal # 1 ***To provide leadership and promote partnership in standardization of aircraft certification within the global aviation system.***

Objective A:

Implement and sustain Bilateral Aviation Safety Agreements (BASA) with other governments.

1994-1996 Milestones:

- Develop generic language for BASA implementation procedures that can be modified to meet the specific needs of any country.
- Work towards conclusion of BASA's with Russia and Malaysia, and expanded agreements with China and Indonesia.
- Convert existing BAA's with Canada, England, France, Germany, and Singapore into BASA formats. Establish priorities for converting other BAA's into BASA's.
- Review existing working relationships with each BAA country in order to improve the quality of service and sustain good communication and working relations.

Objective B:

Promote international harmonization of aircraft certification standards, practices, and procedures.

1994-1996 Milestones:

- Complete harmonization of Joint Airworthiness Regulations (JAR) and Federal Aviation Regulations (FAR) Parts 23, 27, 29, and associated advisory material.
- Progress toward harmonization of JAR/FAR Parts 21, 25, 33, 35, and associated advisory material, as specified in the JAA/FAA Harmonization Work Program.
- Establish procedures to maintain the currency of harmonized standards, practices, and procedures.
- Pursue a coordinated approach to harmonization by working in partnership with the Flight Standards Service, Office of Rulemaking, and other FAA organizations

Objective C:

Provide technical assistance to other airworthiness authorities.

1994-1996 Milestones:

- Complete FAR Part 25 training in China.
- Continue to provide technical assistance to China, Indonesia, and Malaysia.
- Provide reimbursable technical assistance, including FAA Academy and on-the-job training, to other airworthiness authorities as resources will permit.

Objective D:

Promote FAA international cooperative programs and initiative.

1994-1996 Milestones:

- Complete Partnership 21 seminar for Latin American authorities.

- Participate with other organizations in research and development (R& D) projects of mutual interest.

- Participate in aging aircraft initiatives with other authorities.

Objective E:

Develop and refine FAA international aircraft certification policy and procedures.

1994-1996 Milestones:

- Finalize FAA/JAA cooperative and concurrent certification working procedures.

- Update import and export certification policy and guidance materials (e.g., Advisory Circular 21-23, FAA Order 8130.2, Advisory Circular 21-2, etc.

- Reassess and refine FAA's present policy and procedures for surveillance and control of suppliers (including suppliers in bilateral and non-bilateral countries) to U.S. production approval holders.

Objective F:

Conduct import and export aircraft certification activities.

1994-1996 Milestones:

- Export certification activities: Assist other airworthiness authorities with certification validations of various U.S. products.

Transport Aircraft:

- Boeing 777;
- Boeing 737-300;
- McDonnell Douglas MD-11 and MD-80/MD-90 series aircraft;
- Learjet 60 series;
- Gulfstream G-III and G-IV;
- Cessna 500 series and 650.

Small Aircraft:

- Beech C-90a, B200, and 1900D;
- Beech 300;
- Lake 250

Rotorcraft:

- Bell and Schweitzer 269C;
- McDonnell Douglas System MD-900 Explorer

Engines and Propellers:

- General Electric GE90-75B, -76B, -85B turbofan engines;
- Pratt & Whitney PW4073, PW4084, PW4164, and PW4168 turbofan engines;
- CFE 738 turbofan engines; Allison Engine (AE) 3007 turbofan engine;
- Continental IO-360 engine;
- Allied Signal TFE731-20/40/60 series turbofan engines;
- Hartzell, McCauley, and Hamilton Standard propellers.

- Import certification activities: Complete FAA type certification validations of various products.

Transport Aircraft:

- Airbus A321, A319, and A300-600 Freighter;
- de Havilland DHC-8-400;
- Falcon 2000;
- SAAB 2000;
- CASA 3000,
- Fokker F28 Mark 0700;
- IAI Galaxy;
- Embraer 145;
- Let 610;
- Canadair CL-604.

Small Aircraft:

- Let 420;
- Grob;
- Agusta;
- Aviation (Scotland) LTD ARV Seabird Seaker;
- Pilatus PC 12; various PZL and Zlin-Moravan aircraft.

Rotorcraft:

- Eurocopter EC-135;
- European Helicopter Industries EH-101;
- August A-109 D/E;
- Eurocopter P-120;
- Eurocopter "fly-by-wire" development and certification.

Engines and Propellers:

- Rolls-Royce RB211-800 and -700 series engines;
- AVIA M337AD and 400A;
- Moterlet M601E and F;
- BMW BR710;
- Rotax 912;
- Turbomeca Arrius and Ariel derivative model engines;
- Pratt & Whitney Canada JT15-D and PT6 derivative model engines.
- MT, Hoffman, and Dowty Rotol propellers.

- Conduct cooperative and concurrent certifications, as requested.

Goal # 2: ***To optimize AIR's ability and structure to effectively meet the AIR international mission.***

Objective A:

Identify training needs and support the development of the AIR workforce to function effectively in the dynamic international environment.

1994-1996 Milestones:

- Work with the AIR Technical Training Steering Committee to identify training requirements.
- Maintain the currency of the international modules of FAA's aircraft certification courses.
- Provide cultural awareness and sensitivity training.
- Provide training to AIR personnel to assure standardization of import and export certification activities.

Objective B:

Identify and allocate appropriate resources within AIR to accomplish the expanding international workload.

1994-1996 Milestones:

- Enhance the Staffing Standards guide to better reflect and capture the resource allocation for international activities.

- Expand the pool of AIR participants qualified to provide international technical assistance and support to BAA assessment programs.

- Work with U.S. industry and other airworthiness authorities to identify international certification activities, anticipate workload, and better forecast AIR resource requirements.

Objective C:

Optimize the AIR organizational structure, policy, and procedures to effectively accomplish the AIR international mission.

1994-1996 Milestones:

- Implement an AIR system for cost recovery and tracking reimbursable technical assistance activities.

- Consolidate and maintain certification policy and guidance materials to share with other airworthiness authorities.

- Work to ensure that the international role and responsibilities of each AIR organization are clearly understood.

- Promote partnership with other FAA offices to ensure a coordinated intra-agency approach to international aviation safety.

Worldwide Activity

AIR is committed to continuing and strengthening its working relationships with Canada and the JAA countries. Harmonization of standards, practices, and procedures and implementing new BASA's will be a major workload for AIR. Over the next 10 years, AIR sees several additional geographic areas of emphasis:

- the Commonwealth of Independent States, especially Russia and Ukraine;

- the Asia-Pacific region, especially expansion of activities in China and Indonesia, and new support for Malaysia, India, Korea, and possibly other Southeast Asia countries (e.g., Vietnam);

- Latin America: Mexico, Chile, and Colombia.

As of 1994, six countries had formally requested new BASA's with the United States:

Chile	Malaysia
India	Taiwan
Ireland	Ukraine

Once a new agreement is in place, significant import and export certification activity will follow, especially in the case of Russia, where a full-scale aviation industry is in place and many joint ventures with U.S. companies are underway. AIR will anticipate these requirements and work towards a harmonized certification system worldwide.

■

General News

Electronic Bulletin Boards: Getting the Government On Line

Computer bulletin board systems (BBS) have been around since about 1978, well before the introduction of the original personal computer, and for years, were considered the domain of kids and computer hackers. However, since about 1987, BBS's have really taken off, becoming powerful wide-area communications tools that can help users save time and money.

It is estimated that there are more than 45,000 public and 120,000 private BBS's currently operated within the continental United States. Twelve and a half million people in the U.S. call BBS's every month. By the year 2000 there may be between 20 and 40 million BBS users in the U.S. alone.

Over the past few years, a number of Department of Transportation (DOT) offices have begun using microcomputer-based BBS's to get a variety of transportation-related information out to a wide and diverse public audience. BBS's are helping to improve our level of customer service and growing in popularity every working day.

On-Line for Aviation Safety

Currently, there are 11 BBS's operated by the FAA that can be accessed by the public, offering a variety of public documents, including press releases, speeches, newsletters and rulemaking advisories. (To access any of the following FAA bulletin boards, set your communications software to 2400 baud or faster, no parity, 8 data bits, 1 stop bit, and ANSI terminal emulation):

FAA Headquarters BBS: (202) 267-5697

Supported by the Office of Aviation Policy and the Office of Public Affairs, this BBS provides on-line access to FAA and DOT press releases, speeches by the FAA Administrator, FAA legal interpretations, and civil penalty notices. If you are looking for the electronic version of the new FAA Strategic Plan, you'll also find it here. In addition to these items, the caller will discover over 30 separate aviation message areas. This board has a user base of over 1,000 and receives between 25 and 30 calls a day from U.S. and international callers.

Airports BBS: (202) 267-5205

This BBS was developed in early 1992. The idea was to start a BBS at FAA Headquarters to get technical information and airport related news to airport operators and designers. An example of the kind of information available is a program authored by Luigi Iori, a supervisor in Airport Safety and Standards, that computes runway lengths and orientation. Also developed is a specialized program for pilots to report bird strike incidents while on-line.

In addition, the Advisory Checklist and FAA Series 150 Advisory Circulars originated by the Office of Airport Safety and Standards are available. These circulars can be ordered from the Government Printing Office for about $15 -- about $85 on disk. But the gap between when the advisory is issued and when GPO publishes it can be weeks or months. Now, thanks to bulletin boards, once the circulars are approved, the information is available to users the next day. Previously, an advisory circular checklist was published yearly that was obsolete the minute it hit the streets. Now airport operators can be sure the information they receive through the bulletin board is the most up-to-date and accurate. Once the document is downloaded, a customer can also use the "search" command to find the specific information needed -- in less time than it takes to flip through a large document. The BBS has over 2,000 registered users.

Orlando Flight Standards District Office (FSDO-15) BBS: 1-800-645-3736 or (407) 648-6963 or -6309)

This BBS was started in December 1991. Since then, the BBS has logged over 33,000 calls (about 110 a day) with a base of 3,500 registered users. The BBS maintains FAA Advisory Circulars, summaries of different operating rules relating to the certification of pilots, as well as Accident Prevention pamphlets dealing with safety issues affecting pilots. A user can download a brochure and print it or read it. The printed information is originally obtained from either the Orlando FSDO or the Government Printing Office, and a scanner is used to convert the pamphlets to text files, and then imported into the BBS. In one month, more than 3,000 files were downloaded by users.

This BBS also provides for on-line reporting of Service Difficulty Reports (also known as malfunction or defect reports), as well as the Bird Strike Report for Pilots where incidents can be reported. Recently, the BBS started posting Airworthiness Alerts monthly. In addition, the board carries the FAA *Aviation News* magazine and selected sections of the *Federal Aviation Report*.

Pilot Examiner BBS: (405) 954-4530

The main purpose of the Pilot Examiner BBS is to disseminate technical information to the flight instructor and pilot examiner community. Since it inception in April 1991, this BBS has received over 10,500 calls from all over the world. The bulletin board is also the primary source of safety bulletins and a newsletter directed towards the interests of flight instructors and pilot examiners, maintaining 1,400 newsletter files and close to 1,500 safety bulletin files.

Portland Flight Service District Office BBS: (207) 780-3297

Since June 1985 the Portland BBS has been providing access for commercial air carrier to all the Minimum Equipment Lists that are published by FAA. The BBS has a user base of over 3,500 commercial air carriers, including regional air taxi service providers. Additionally, several guides have been developed for smaller air taxi services, and these guides can be downloaded by users. These guides include a certification guide, sample operations manual, and a sample training program.

Air Transport Division Flight Standards Service BBS: (202) 267-5231

Operated by the Flight Standards Service, Air Transport Division, this bulletin board provides information on Transport Category

Aircraft, Small Aircraft, and Rotorcraft/ Helicopters. The BBS carries Flight Standardization Board Documents, as well as master minimum equipment lists, selected parts of the FAR, and sections of the *Federal Register* relating to the FAA or aviation. The BBS has a user base of over 5,000, and logs close to 20,000 calls annually.

Other DOT Bulletin Boards

The Federal Highway Administration (FHWA) has established its **Electronic Bulletin Board System (FEBBS), (202) 366-3764 or -3175,** which is operated out of FHWA's Office of Information and Management Services. This BBS is designed to receive up to 12 calls simultaneously. The system is available 24 hours a day. New users must wait overnight for security clearance. Conference areas have been established for most program areas of FHWA, including safety, policy, and program development, as well as group conferences.

FHWA posts its electronics form library, organizational charts, and vacancy announcements on the BBS. Congressional reports, vehicle rulemaking actions, Federal Register notices, and safety recalls are all available.

There is also a section that is used to distribute information on the Americans with Disabilities Act. The BBS can provide electronic documents to the handicapped community and is accessible through TDD and other communication devices.

The Maritime Administration (MARAD) established the **Marlinspike BBS, (202) 366-8505,** last summer, initially to speed the flow of information about Midwest flooding to shippers and barge operators in the area. It has since been expanded to include carrier bulletins, scheduled and shipyard bulletins, and other news. Most recently, a new area was added called "General Sales Leads," created specifically for U.S.-flag carriers to provide them with information on new business opportunities. Other bulletins and announcements cover areas such as public affairs, international trade, domestic trade, technology assessment and pending legislation.

IRMA BBS, (202) 366-3373. IRMA is operated by the Office of Information Resource Management (IRM) at the Office of the Secretary of Transportation. When you access this board, you can get information on the IRM organization, policy and planning, telecommunications, the Transportation Computer Center, as well as office automation for the Office of the Secretary. The BBS also contains organizational information and the phone numbers of the key IRM staff.

And in Other Parts of Government

The **Department of Defense** leads the bulletin board list in government -- maintaining 24 boards. Second, with 17, is the **Environmental Protection Agency**, where most of the subject matter is aimed at specific environmental issues. The **FAA's** system, with 11, is third.

There is even a magazine for bulletin board lovers on the Federal side, titled *Government Computer News*. It lists more than 120 boards available throughout government.

The **FedWorld** BBS is operated by the **Department of Commerce** as a pilot project, connecting the user to many federal agencies. From FedWorld, you can access more than 130 computer bulletin board systems operated by the U.S. government -- with information on everything from job openings to the *Federal Register*. The system also contains White House files, including key personnel appointments, speeches, and daily press briefings.

Use your communications software package to dial FedWorld at **(703) 321-8020**. FedWorld also can be reached via Telnet (at **fedworld.gov**). There's also a number to call if you experience technical problems in accessing the board: **(703) 487-4608**, weekdays, 10 a.m. to 4 p.m. Eastern time.

Just recently, the FAA entered into an agreement with FedWorld to provide the **Airworthiness Directive (AD) Biweekly Supplements** in electronic format on that BBS. The AD's on FedWorld are ASCII text files that can be downloaded or viewed directly on-line.

Large Aircraft, Small Aircraft, and Rotorcraft Biweekly supplements 94-01 through 94-26 and a current Biweekly Index will be available for $145 in the United States, Canada, and Mexico; and $215 for other international subscribers. [Re-sellers should contact the National Technical Information Service (NTIS) at **(703) 487-4630**.]

Customers wishing to take advantage of this service can fax orders to **(703) 321-8547**; major credit cards accepted. The order number for this service is **PB94-592610**. [For other information, call FAA in Oklahoma City **(405) 954-4103** or fax **(405) 954-4104**.]

How to Use a BBS

In order to call and access a BBS, you must have a computer, a modem, and a communication software program installed on your computer. For those of you who have never called a BBS, here's a quick primer:

1. **Set up the modem according to the manufacturer's instructions.**
2. **For most BBS use, set the terminal emulation to ANSI or ANSI-BBS.**
3. **Parity should be "N" or "none," data bits should be "8", and the stop bit should be set at "1".**
4. **Don't forget to set the serial port speed to the highest speed your modem supports.**
5. **Next, enter the BBS's phone number in the communication program's dialing director.**
6. **After these steps have been completed, you are now ready to dial up the BBS.**

When you are connected to a BBS, you are remotely controlling the BBS software from your computer. You can search for files, or read various informational bulletins. You can also "talk" to the System Operator or other BBS users by leaving messages in special areas called conferences.

Some BBS's are connected to various worldwide BBS networks that link individual bulletin boards together through the use of special message transfer software. Through the use of these wide area networks, information becomes truly international.

Material for this article was previously published in DOT Today, June 1994

■

General News

Leaving the Laboratory: FAA Joins Helicopter Operators in Testing GPS Approaches

The FAA and four civilian helicopter operators have joined forces to flight test Global Positioning System (GPS) nonprecision approaches, a procedure that will greatly improve a helicopter's ability to land in low visibility conditions and result in saved fuel costs and shorter flight times. At a ceremony marking the joint effort, the Helicopter Association International presented the Vertical Flight Program Office with a meritorious service award in recognition and appreciation of "outstanding service to the civil helicopter industry."

The Erlanger Medical Center Life Force Helicopter in Chattanooga, Tennessee, will be the first operator to test the GPS approach.

"We're taking research and development out of the laboratory, designing a program based on real operational needs," said acting FAA Southern Regional Deputy Administrator Naomi Saunders at the Erlanger ceremony. "And we are doing it at minimal cost to the government since the operators are donating their helicopters, pilot time, and fuel."

Other participants of this industry-sponsored "test bed" include the Mayo Clinic in Rochester, Minnesota; Petroleum Helicopters, Inc., of Lafayette, Louisiana; and the University of Wisconsin Hospital.

Testing is being jointly conducted by the Office of Aviation System Standards, Oklahoma City, and the Vertical Flight Program Office in Washington, DC, with the support of the Satellite Program Office.

During the tests, each of the four instrument flight rules (IFR) certified helicopters will be equipped with GPS receivers and data gathering equipment. All flights will be conducted under visual flight rules (VFR) high-visibility conditions, with only the FAA-designated safety/project pilot and data technician on board. For the test, pilots will wear vision-limiting devices to simulate actual instrument flight rule conditions.

Each test crew will fly 50 steep-angle approaches to the heliport during a period of about two weeks. Data gathered from test flights will serve as the basis for new GPS, nonprecision approach criteria unique to helicopters. It will also demonstrate and establish low-altitude helicopter IFR enroute capabilities.

"It is feasible the helicopter industry could become the greatest single beneficiary of FAA nonprecision GPS initiatives," said Steve Hickok, the agency's program manager for the project.

Pointing out that similar initiatives have been accomplished for fixed-wing aircraft and airports, he said that this is a "critical" step in solving several of the obstacles that have historically plagued helicopter IFR operations.

■

General News

Panel Recommends Joint Management of GPS

A Federal task force has recommended that the Department of Transportation (DOT) should have a more substantive role in the management of a Department of Defense (DOD) satellite positioning system. A joint DOD-DOT task force, studying how to get maximum use of the Global Positioning System (GPS) by military and civilian users, made the recommendation in its report to the Secretary of Defense and Secretary of Transportation (Federico Peña) in late December 1993.

GPS, now being used increasingly by motorists, aircraft pilots, surveyors, bus transit systems, and ship captains, relies on a network of 24 satellites. The navigation systems provide very accurate three-dimensional position, velocity, and time to users worldwide.

Although the satellite system is under the control of the Department of Defense, both DOT and DOD agree that it is in the country's best interest to encourage maximum civil use of the system, consistent with national security needs.

To ensure that civilian needs are fully considered in policy decisions, the task force recommended that DOD and DOT form a joint executive board to resolve the differences between civil and military interests.

The panel also recommended that DOT designate a high level official to chair a DOT executive committee and to speak and make decisions on GPS services on behalf of civilian users.

The official would work with Federal agencies as well as state and private sector users to see that their needs are addressed.

Several government agencies are developing different GPS for their own uses. The task force recommended a study of all such planned enhancement systems to help officials determine how best to provide GPS services to all civilian users. These agencies include the Coast Guard, FAA, U.S. Geodetic Survey, the Army Corps of Engineers, and others.

The panel also recommended that all U.S. government efforts to promote international acceptance of GPS should be continued.

"This sophisticated technology will have enormous impact," said Secretary Peña. "Its full use will mean increased accuracy, productivity, safety and efficiency in aviation, sea navigation, even driving to work." GPS offers "tremendous potential for dual-use technologies and the many applications these technologies have in the transportation arena," Peña concluded.

Material for this article was previously published in DOT Today, February 1994.

■

General News

Aircraft Certification Accident Investigation Exposure Control Program For Bloodborne Pathogens

It is now presumed that whenever there is an injury or a fatality in an accident or incident and blood and body fluids are present, bloodborne pathogens such as Hepatitis B virus (HBV) and the human immunodeficiency virus (HIV) are present.

Because of the risk associated with exposure and possible contact with certain bloodborne pathogens, the FAA has recently developed guidance and training that meet the requirements of the Occupational Safety and Health Administration (OSHA) regulation, 29 CFR parts 1910 and 1960. FAA personnel assigned to on-scene accident or incident investigations or examinations of wreckage specimens will be trained to control their exposure to bloodborne pathogens and offered HBV vaccine.

The development of an FAA "*Accident Investigation Bloodborne Pathogen Exposure Control Program (ECP),*" FAA Order 8020.14, which was issued on September 6, 1994, has been a collaborative and cooperative effort between a variety of groups interested in advancing safety during accident investigations. These groups include: the FAA's Flight Standards Service, Aircraft Certification Service, Office of Accident Investigation, Office of Aviation Medicine, and Civil Aeromedical Institute; the FAA Academy; the National Transportation Safety Board (NTSB); the Transportation Safety Institute; the Professional Airway System Specialists; and ad-hoc advisors from organizations such as the U.S. Office of Labor and Employee Relations.

The FAA Order contains guidance for an exposure control program and a model exposure control plan (ECP). Each FAA office whose employees are assigned to on-scene investigations will develop an ECP to control exposure to bloodborne pathogens.

An ECP generally contains the following:

- Engineering and housekeeping controls;
- Record keeping requirements and procedures;
- Hepatitis B virus (HBV) information and vaccine;
- Special procedures to be followed to control exposure to bloodborne pathogens at the accident site;
- Selection process for appropriate Personal Protective Equipment (PPE);
- Procedures for qualifying an accident/incident site as a biohazard;

- Biohazard waste disposal controls;
- Initial and recurrent training requirements for accident investigators, and for protection of investigators, media, industry, and spectators.

Currently, the FAA's Aircraft Certification Service is preparing guidance for initiating the HBV vaccination process, coordinating the process for providing training to Aircraft Certification personnel, and providing procedures for obtaining PPE for accident investigating personnel.

Although there have been no documented cases of bloodborne pathogens infecting FAA accident investigators to date, the FAA is making a concerted effort to comply with the OSHA regulations and to control exposure to the possible dangers associated with bloodborne pathogens.

■

Policy and Guidance

Engine Inoperative Ten Minute Takeoff Thrust/Power Rating

The Joint Aviation Requirements (JAR) allow the use of takeoff thrust/power for up to **ten minutes** after the shutdown or failure of one or more engines. However, Part 1 of the Federal Aviation Regulations (FAR) defines *rated takeoff thrust/power* as limited to **five minutes** of operation. At some airports (mostly foreign) the maximum allowable airplane takeoff weight is limited by the climb gradient capability (at maximum continuous thrust/power) needed to clear distant obstacles after takeoff. The availability of takeoff thrust/power for use up to ten minutes enables some foreign operators to dispatch at an increased gross weight relative to U.S. operators under these conditions. U.S. operators have expressed a desire to be treated equally in similar circumstances in order to be competitive.

The Transport Airplane Directorate has reviewed Part 25 and determined that no revisions are needed to provide the flexibility for an engine inoperative "10-minute" takeoff thrust/power rating. The limiting phrase is found in Part 1 in the definition of *rated takeoff thrust/power*.

The Engine and Propeller Directorate is proposing a regulatory change to Part 1 to harmonize the FAR with the JAR. The proposed wording would extend the current definition of *rated takeoff thrust/power* for turbine engines in Part 1 as follows:

> ". . . and limited in use to periods of not over 5 minutes for takeoff operation, ***and, for turbojet (including***

turbofan) and turbopropeller engines, when specifically requested by the engine type certificate holder, to periods of not over 10 minutes for engine inoperative takeoff operations."

The Engine and Propeller Directorate has verified that the engine inoperative "10-minute" rating is well within the boundaries of the engine certification standards of FAR 33 for turbine engines.

Since the FAR Part 1 definition is not limiting with respect to ratings selected by the engine manufacturer for abnormal operations, the Transport Airplane Directorate has adopted the following procedure to allow the FAA approved transport category Airplane Flight Manual (AFM) to be revised to incorporate instructions regarding the engine inoperative "10-minute" takeoff thrust/power rating for airplanes with turbine engine installations:

Upon receipt of a written request from an applicant seeking an engine inoperative "10-minute" takeoff thrust/power rating the following items will be addressed:

a. The engine type certificate holder must request in writing to the cognizant Aircraft Certification Office (ACO) or Engine Certification Office (ECO) for approval of an engine inoperative "10-minute" takeoff thrust/power rating for the relevant turbine engine models.

b. The ACO or ECO shall ensure that the relevant engine type certification data sheet is revised to note the extended turbine engine rating.

c. The transport category airplane type certificate holder must request in writing to the cognizant ACO its desire to establish the engine inoperative "10-minute" takeoff thrust/power rating for the relevant airplane/engine model(s). The request should include the engine type certificate holder's "endorsement" of the extended turbine engine rating.

d. The transport category airplane type certificate holder must present the appropriate AFM revisions concerning the engine inoperative "10-minute" takeoff thrust/power operation to the ACO for review and approval.

e. The ACO shall ensure that the relevant airplane type certification data sheet is revised to note the extended turbine engine rating.

The engine inoperative "10-minute" rating operation should be processed as an engineering approval unless there are actual hardware changes.

The AFM revision should specify that using takeoff thrust/power for more than five minutes (not to exceed ten minutes) is approved for use only in the event of an inoperative engine(s) due to shutdown or failure. The AFM obstacle clearance charts [see FAR sections 121.189(d) and 135.379(d)] should be revised to reflect the increased climb capability.

This interim procedure, which is available upon request, may be used to provide the additional obstacle clearance capability for U.S. operators . When the Part 1 amendment is effective, the normal certification procedures will apply.

■

Policy and Guidance

Policy Information Regarding In-flight Thrust Reverser Deployment for Aft Mounted Engines

This article is provided in response to requests for policy regarding the FAR section 25.933 requirement to demonstrate controllability following an in-flight thrust reverser deployment.

This policy is applicable to new, amended, and supplemental type certificates of airplanes with engines mounted on the aft fuselage, and where new or significantly modified engine and reverser system installations have been incorporated.

Based on information gathered from the 1992 accident involving a Lauda Air Model 767, 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 the document *"Criteria for Assessing Turbojet Thrust Reverser Safety,"* Revision A, dated June 1, 1994.

During its review of airplane service history following thrust reverser deployment, the AIA determined that thrust reverser plume effects on airplane controllability for airplanes with the engines mounted on the aft fuselage were distinctly different from effects on other airplane configurations.

The tail mounted engine configurations, therefore, were grouped together and referred to as "Group IV." The committee prepared an analysis of the effects of an inadvertent thrust reverser deployment on the Group IV airplanes and that report has been accepted by the FAA as showing controllability for these airplanes.

The Transport Airplane 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 with the existing regulation. Based upon our recent understanding of the effects of thrust reverser deployment on airplane controllability, the FAA has determined that 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.

Based on service experience, the policy applicable to airplanes with aft fuselage mounted engines is as follows:

a. Flight test demonstration of controllability should be conducted at or near critical points within the normal flight envelope. The degree of investigation of critical conditions will vary with airplane type and must be determined on an individual basis.

Previous policy focused on demonstration of controllability at low flight speeds where it was presumed that less control margin existed. The return landing capability following deployment at high speed was usually considered the critical case. The engine deceleration to idle following inadvertent deployment was assumed to be rapid, and airplane control surface effectiveness was high; therefore, the reverser plume was assumed to have a negligible effect on airplane control.

The need for additional flight testing at higher speeds and/or engine power levels should be determined based on analysis of the effects of the reverser plume on adjacent empennage control surfaces. The effects of buffet also should be considered.

Previous service history provided by the applicant on airplanes with similar aerodynamic/reverser configurations should be taken into consideration when determining the need for high speed/high engine power flight test data.

b. Airplane controllability during an inadvertent thrust reverser deployment immediately following takeoff and just prior to touchdown may not be possible on most airplane types. Therefore, airplanes that cannot demonstrate controllability following thrust reverser deployment during these flight phases must show that the likelihood of deployment is extremely improbable.

(That is, analysis per Appendix C, of Revision A of the Thrust Reverser Safety Assessment document must show that the inadvertent deployment rate is no greater than 1×10^{-9} for this exposure time.)

c. Based on the service history provided in fleet safety assessment criteria document, compliance with the FAR section 25.1305 requirement to provide indication of reverser system position (unlock) should be reviewed to ensure that reverser unlock is annunciated to the flight crew in a graphic manner. Evaluation of the annunciation means should be made by human factors and cockpit annunciation specialists.

The preflight checklist should also be reviewed to ensure that the airplane will not be dispatched with a reverser unlock indication. As described within Appendix C, if dispatch with a reverser locked out is proposed for MMEL operation, the lock-out procedure should be a required inspection item.

d. Inadvertent deployment of the thrust reverser at any speed up to Vc, and at likely thrust settings, must not result in loads or buffeting on the airframe that would damage the primary structure.

Damage to the thrust reverser is allowed and departure of parts from the airplane may be allowed during inadvertent extension for certain configurations where it can be shown that the departure trajectory clears other primary structures and does not present any hazard to the airplane.

If you have and further questions on this subject, please contact Mr. Mike Dostert of the Transport Airplane Directorate's Airframe & Propulsion Branch, at telephone (206) 227-2132.

■

Policy and Guidance

Airworthiness Approval of Flight Management Systems that Display Part 25 Airplane Performance Information

This article provides guidance for the approval of Flight Management Systems (FMS) that are capable of displaying Part 25 Airplane Flight Manual (AFM) performance information on cockpit display units [e.g., Multi-Function Display (MFD) units]. This guidance supplements and clarifies material contained in Advisory Circular (AC) 25-15, "Approval of Flight Management Systems in Transport Category Airplanes," dated November 20, 1989.

A case was recently brought to the attention of the Transport Airplane Directorate where a modification center was requested to install an FMS, with the capability to present AFM performance information to the flightcrew, with no airworthiness review.

An outside party had compiled a database of AFM performance information and supplied it to the FMS manufacturer. The FMS manufacturer added the AFM performance database to the system as Programmable Read Only Memory (PROM). The affected FMS design (i.e., manufacturer's model designation) has been approved for installation in several transport category airplane types, including airplane type design approvals that provided for the display of AFM performance information.

Flight management systems with the ability to present AFM performance information on cockpit display units should not be installed without suitable airworthiness review to assure compliance with the pertinent requirements of Part 25. This applies to FMS's being incorporated as part of a type design, or by modification to a type design by either the manufacturer or a second party.

These stipulations are supported by the guidance provided in AC 25-15 as referenced below:

- **Paragraph 5.f.** of AC 25-15 addresses the display of AFM performance information under the subject of *"performance management"* functions. That paragraph provides guidance relative to system accuracy, resolution of data, substantiation of displayed data, and the integrity of FMS generated performance data, depending on whether it is to be used as primary or advisory information.

  Paragraph 5.f.(9) states that, when the FMS-generated data is used as the "primary" reference for airplane performance information, *"[i]t is incumbent upon the applicant to provide documentation to the FAA to show that the computer memory* *contains authentic performance data* ***for each airplane/engine combination*** *for which the approval is sought."*

Paragraph 5.f.(10)(ii) states that takeoff and landing approach performance information, even when presented as "advisory information," must meet the same integrity criteria as data presented as "primary information."

- **Paragraph 5.l.(1)** of AC 25-15 addresses software changes and discerns between "major" and "minor" changes. That material classifies any change to software that affects FMS performance management functions as a major change. Any FMS change related to the display of AFM performance information is therefore considered a "major" change and should receive FAA review.

- **Paragraph 5.l.(1)** of AC 25-15 also notes that, *"Software changes incorporated in equipment already installed in an aircraft may require additional evaluation. . ."* In the case of FMS's that display AFM performance information, this statement should be interpreted as also applying to database changes.

- **Paragraph 5.n.** of AC 25-15 addresses the type and extent of testing necessary to verify that the installed FMS performs its intended function, and does not adversely affect any other airplane systems and sensors.

  Under the heading of "Ground Tests," that paragraph alludes to the extensive amount of testing needed to verify the large matrix of airplane performance data generated by the FMS. In the case of AFM performance information, the verification of the data presented by the FMS is also crucial from the standpoint of assuring accurate information is presented to the flight crew when determining airplane weights associated with performance limited conditions (e.g., takeoff field length limited).

Any change to an FMS performance management function, including hardware, software, or database changes, should be reflected as a change in the manufacturer's identifying part number(s). A change in part number(s) will ensure that this change, and its impact on other functions, is reviewed under an airworthiness approval and that interchangeability is not compromised.

Additionally, whether the FMS is to be used as a "primary" or "advisory" reference for AFM data, flightcrews will be tempted to use it as the sole source of performance information. Consequently, these systems should receive the same level of review, and type of approval, as the paper AFM.

This review and approval process applies to any revisions and supplementary additions made to the performance database contained in the FMS.

If you have any questions related to this guidance material, please contact Mr. Colin S. Fender of the Transport Airplane Directorate's Flight Test and Systems Branch (ANM-111) at telephone (206) 227-2191.

■

Policy and Guidance

Seat Strength Policy Regarding FAR Section 25.562

The Transport Airplane Directorate continues to receive questions regarding failure criteria to use in evaluating the structural performance of seats during the dynamic seat tests. Of particular concern is the amount of damage allowed to primary load paths during the tests. The following guidance is provided to achieve a more consistent understanding of the rule.

During development of the provisions in FAR 25.562 (Amendment 25-64) concerning the dynamic test conditions for seat strength, the FAA recognized that seat structures would be allowed to deform and yield in order to absorb some of the impact energy. In fact, deformation of the structure was considered a desirable means of limiting loads in the floor and of keeping the impact injuries within acceptable limits of human tolerance. Special energy absorbing devices were also considered an acceptable means of absorbing impact energy. The question frequently asked is, "how much structural damage should be allowed without being considered a seat failure."

There is general agreement that primary structural elements, including energy absorbing structures, should not completely fail during these tests. The problem is in defining the maximum structural damage associated with acceptable structural performance.

There are two schools of thought concerning acceptable structural performance: One is to allow no structural damage; the other is to allow any damage, provided the seat remained attached to the airframe.

The FAA considers that to prohibit all structural damage is unnecessarily restrictive and counterproductive relative to the energy absorption capability of the seat. On the other hand, to allow all types of damage could result in unacceptable performance during crash conditions. In order to ensure that a seat design will perform acceptably in a crash situation, the following guidelines should be adhered to when demonstrating compliance with FAR 25.562.

Structural yielding is defined as the point where permanent set or plastic deformation has occurred. The load carrying capacity of a yielded (plastically deformed) structure continues beyond the point of structural yielding. Acceptable structural yielding for energy absorption is characterized by deformation occurring in a controlled and predictable manner while the ability to carry load is maintained.

The primary structural load path includes those elements that transfer loads from the occupant to the restraint system, to the seat structure, and to the airframe. Damage to primary load carrying structure that complies with the above characteristics of structural yielding is acceptable. Separation and general instability failures in primary load paths are not forms of structural yielding and are therefore not acceptable.

Examples of typical noncritical structure used in seats are: clips, brackets, straps, etc. Noncritical structures are not used for transferring the principal loads from one primary load carrying element to another.

For the purpose of showing compliance with the structural requirements of FAR 25.562, some of the types of acceptable damage to primary load carrying structural elements include:

- **bending deformation,**
- **tension deformation,**
- **compression crippling, and**
- **shear buckling.**

Minor cracking of primary structural elements and the shearing or separation of some rivets and minor delamination of composite panels may be allowed, provided:

- The primary load path remains intact, within the criteria described above;
- The seat structure remains attached at all points of attachment;
- The occupant restraint system remains attached at all points of attachment; and
- The seat does not deform to the extent that it impedes rapid evacuation of the seat occupant or other airplane occupants.

Any questions on this subject should be directed to Mr. Iven Connally of the Transport Airplane Directorate's Transport Standards Staff at telephone (206) 227-2120.

■

Policy and Guidance

Recommended Method of Identification: Susceptibility to Ice Contaminated Tailplane Stall

The information contained in this article describes a flight test maneuver that may be used to determine the susceptibility of transport category airplanes to Ice Contaminated Tailplane Stall (ICTS). Airplanes believed to be susceptible to this phenomenon should be tested to determine if the presence of ice on the tailplane may lead to lack of adequate pitch control during approach to landing. This applies to airplanes that have a history of tailplane stall incidents, airplanes that have been identified in the FAA Technical Center ICTS susceptibility study as likely to have ICTS problems, and transport category airplanes currently in the certification process.

Following a number of accidents and incidents involving airplanes certificated under parts 23 and 25 of the Federal Aviation Regulations (FAR) for flight in icing conditions, and, specifically, an accident involving a British Aerospace BA-3101 airplane on December 26, 1989, the National Transportation Safety Board (NTSB) issued Safety Recommendation A-90-087, which recommended that the FAA:

> *"Amend the icing certification rules to require flight tests wherein ice is accumulated in those cruise and approach flap configurations in which extensive exposure to icing conditions can be expected, and require subsequent changes in configuration, to include landing flaps."*

In response to this recommendation, the FAA's Icing Certification Steering Group, comprising representatives of all the Certification Directorates, Headquarters, and the FAA Technical Center, was tasked to investigate ICTS as one area needing immediate attention.

Two international workshops have been held to address the ICTS phenomenon, characterized as a sudden, often uncontrollable nose-down pitching moment that occurs when lowering the flaps during final approach while operating in or recently departing from icing conditions, which occurs due to increased angle-of-attack of the horizontal tailplane. If the tailplane is contaminated with even small quantities of ice, tailplane stall may occur. In addition to loss of pitch control required to maintain longitudinal control, the pressure differential between the upper and lower surfaces of the stalled tailplane may result in a high hinge moment forcing the elevator trailing edge down. This may cause the control column to be drawn forward with forces that exceed the combined force that the pilot and copilot can exert. One of the recommendations resulting from the ICTS workshops was to devise a flight test procedure that may be used to identify susceptibility to ICTS.

In 1993, the FAA reviewed the aerodynamic data used and the results obtained in an FAA Technical Center study to predict ICTS susceptibility of a number of currently certificated airplanes. That study, conducted by an aerodynamicist under contract to the Technical Center, identified a number of airplanes that may be susceptible to ICTS, and the FAA wanted to verify the results of the study. The next step would be to determine what action would be appropriate to reduce the risk of accidents for susceptible airplanes.

This article provides interim guidance developed by the Transport Airplane Directorate flight test community in cooperation with the Joint Aviation Authorities for use initially by all Aircraft Certification Offices (ACO) involved in the certification of transport category airplanes with the potential of being susceptible to ICTS.

This material will be included in a revision to Advisory Circular (AC) 25-7, *"Flight Test Guide for Certification of Transport Category Airplanes,"* at the next opportunity.

Background

Under the general requirements of Section 25.143(a) of the FAR, for the airplane to "be safely controllable and maneuverable...," the potential for tailplane stall should be investigated. As tailplane stall is approached, the elevator hinge moment may increase sharply, resulting in large increases in control column forces. A tailplane leading edge contaminated with ice may have a significant effect on the available angle-of-attack range, resulting in decreased tailplane lift capability. The loss of control, transient or sustained, due to flow separation at the tailplane can occur with either manual or powered control surfaces. Experience has shown that turboprop airplanes with non-powered elevators are the most at risk to encounter the phenomenon of large stick-force changes, but it is recommended that all airplanes be assessed for controllability problems in this respect.

The possibility of encountering a tailplane stall condition is increased considerably during operations in icing conditions. Experience has shown that even a thin layer of rough sandpaper ice (similar in roughness to 40 grit sandpaper) on the tailplane surfaces can cause longitudinal control problems. Consequently, the pushover maneuver described by Section 25.145(a) of the FAR should be evaluated with regard to tailplane stall, with expected in-service ice accretions present on the tailplane surfaces.

In addition, sideslip maneuvers can also result in increased angle of attack on the horizontal tail. Therefore, the susceptibility to ICTS during steady state sideslips should also be examined. The applicant must determine the critical icing accretion (ice shapes) with regard to location, shape, thickness, and texture. The aircraft certification office working with the applicant should be consulted for concurrence as to the ice shapes predicted.

The procedures described in the following paragraphs have been devised to produce a large angle of attack on the horizontal tail to show any susceptibility to tailplane stall. The first maneuver is called the "*zero g pushover maneuver*," and is essentially a nose-down pitching maneuver that results in the normal force on the airplane reaching zero. The second maneuver is called the "*steady state sideslip maneuver*," and is intended to determine if ICTS may occur from the increased angle of attack on the horizontal tail due to sideslip.

WARNING

The maneuvers described below may result in a sudden and violent loss of pitch stability or control due to an aerodynamic stall condition on the stabilizer and/or elevator. In addition to the loss of tail lift, large stick forces may make recovery difficult. Testing should be progressive and systematic and approach the limiting condition with a non-flying pilot ready to immediately retract the flaps, and be prepared to help overcome large nose-down stick forces should they occur.

Procedures: Tailplane stall investigation with ice accretion

a. **Configuration:**

(1) All normal combinations of wing flaps and landing gear, except the cruise configuration.

(2) Critical weight and center of gravity position.

(3) Speeds from $1.2V_S$ or V_{REF}-5 knots, as appropriate to the wing flap position, up to the maximum speed to be encountered operationally in a given flap/gear configuration that will not result in exceeding V_{FE} or V_{LE}, as applicable, during the recovery.

(4) Power or thrust: Flight idle to maximum takeoff.

(5) Icing condition: The applicant should specify the critical ice case(s) to be investigated in terms of location, shape, thickness, and texture, and obtain FAA concurrence as to the ice shape(s) to be investigated. If ice accretion on the wings can result in increased angle of attack on the horizontal tail, ice shapes will also be required on the wing surface, and should be representative of the ice accumulation that would normally be expected in the icing condition defined to be critical for the tailplane. The critical ice case(s) should include an allowance for any time delays in activation of the ice protection system associated with ice detection or observation systems, or that may be reasonably expected in service. It should be noted that ice accreted with the flaps retracted may result in a more critical condition than ice accreted with the flaps extended. Ice accretion thickness need not be greater than that resulting from exposure to the icing conditions defined in Appendix C to Part 25 of the FAR.

b. **"Zero g Pushover Maneuver" Test Procedure:** This is essentially a nose-down pitching maneuver. It should be preceded by experimentation by the test pilot to determine initial entry speeds and pitch attitudes to achieve the target load factor and target airspeed as the airplane pitches through approximately level flight. The airplane should be fitted with the ice shapes defined in paragraph a.(5), above.

(1) Begin the maneuver with the airplane trimmed at the test power and configuration, and at the test speed and pitch attitude such that a pushover will result in the target load factor at the test speed as the airplane passes through level flight. At low power settings, a pull up to a positive pitch attitude at a speed greater than the test speed will be necessary to achieve the test load factor at the test speed.

(2) The pushover is begun by moving the control column forward at a slow rate while evaluating for any reduction of required control force or force reversal. Continue the test by incrementally increasing the rate of control movement until a zero g flight condition is obtained or, if limited by elevator power, to the lowest load factor attainable.

(3) A push longitudinal control force must be required throughout the test maneuver.

(4) The airplane should demonstrate suitable controllability and maneuverability throughout the maneuver with no force reversal and no tendency to diverge in pitch.

c. **"Steady State Sideslip Maneuver" Test Procedure:**

(1) For the test conditions described in paragraph a., above, establish the airplane in a straight, steady sideslip, up to the sideslip angle appropriate to normal operation of the airplane used to demonstrate compliance with Section 25.177(c) of the FAR.

(2) The airplane should demonstrate suitable controllability and maneuverability throughout the maneuver with no tendency to diverge in pitch.

■

Policy and Guidance

FAA Notice N8110.51, "Parts Approval Action Team Phase II: PMA by Identicality"

This Notice was issued by the FAA on April 13, 1994. It provides guidance for evaluating an application for a parts manufacturer approval (PMA) by a supplier of an FAA production approval holder (PAH). An applicant is eligible for a PMA under this Notice if the applicant can demonstrate that the design of its replacement part is identical to the design of a part covered under a type certificate.

Background. On July 16, 1992, the FAA issued Advisory Circular (AC) 21-29A, *"Suspected Unapproved Parts Detecting and Reporting Program."* That AC provided the public with methods to detect and report suspected unapproved parts to the FAA. Initial reports received under the program indicated that suppliers to PAH's have shipped large numbers of parts directly to customers other than the PAH's. Although these supplier-shipped parts may conform to approved data, they are not "approved" parts.

The FAA initiated a dialogue with industry on unapproved supplier parts, with a kick-off meeting on July 9, 1992. On July 12, 1992, the FAA established the Parts Approval Action Team (PAAT) to address the problem of ensuring regulatory compliance by produces of replacement and modification parts.

As a result of the PAAT initiative, the FAA has issued not only this Notice, but Notice N8110.44, *"Formation and Charter of the Parts Approval Action Team,"* and Notice N8110.45, *"Parts Approval Action Team, Phase I: Parts Manufacturer Approval under Evidence of Licensing Agreement,"* as well.

The FAA's Directorates are responsible for processing the PMA applications eligible for consideration under this Notice. All applications should be sent directly to the geographic Directorate with jurisdiction over the applicant's facility. Applications for PMA, under the procedures of this Notice, that are received by an Aircraft Certification Office (ACO) or a Manufacturing Inspection District or Satellite Office (MIDO or MISO), are forwarded to the appropriate geographic Directorate.

The Notice explains in detail what an application for PMA should include and contains samples of a letter of application, PMA supplement, and PMA response letter. It also covers the procedures that are followed by FAA personnel when reviewing and evaluating applications

■

Policy and Guidance

Guidance on FAR 21.2, "Falsification of Applications, Reports, or Records"

BACKGROUND

On September 9, 1992, Section 21.2 of the Federal Aviation Regulations (FAR) was adopted. Although originally adopted as part of the "primary aircraft" rule (which provides for an additional category of aircraft -- primary category aircraft), it applies to any application for an approval or certificate issued under Part 21 ("Certification Procedures for Products and Parts") of the FAR.

The scope and effect of Section 21.2 is identical to other sections of the FAR that relate to falsification of records, such as Section 61.59(a), which deals with the falsification of records pertinent to pilot certificates.

THE RULE ITSELF

Section 21.2 reads as follows:

(a) No person shall make or cause to be made --

(1) Any fraudulent or intentionally false statement on any application for a certificate or approval under this part;

(2) Any fraudulent or intentionally false entry in any record or report that is required to be kept, made, or used to show compliance with any requirement for the issuance or the exercise of the privileges of any certificate or approval issued under this part;

(3) Any reproduction for a fraudulent purpose or any certificate or approval issued under this part.

(4) Any alteration of any certificate or approval issued under this part.

(b) The commission by any person of an act prohibited under paragraph (a) of this section is a basis for suspending or revoking any certificate or approval issued under this part and held by that person.

Under case law that has been developed for parallel sections of the FAR, the FAA must prove **three** things in order to sustain a violation of this section:

1. **the statement given is false; and**

2. **the statement is material,** i.e., the statement would be likely to make a difference to the FAA in its review of the certificate, application, record, or report; **and**

3. **the statement was made knowingly,** i.e., the maker of the statement knew it was false.

As an example: An applicant for an experimental certificate for an aircraft that is to be used for market surveys is required to show, in accordance with Section 21.195(d)(2), that the airplane had been flown at least 50 hours. In order to obtain the certificate for that purpose, the applicant falsifies the time on the aircraft and certifies on the application that the aircraft had been flown 50 hours when, in fact, it had not. In consideration of the three elements described above, a violation of Section 21.2 could be sustained against this applicant because:

1. the applicant's statement that the airplane had flown 50 hours is false; and

2. that statement is material (without that statement, the applicant could not receive the certificate); and

3. the (false) statement was made knowingly (the applicant knew, in fact, that the airplane hadn't been flown 50 hours).

CONSEQUENCES OF A VIOLATION

If a violation of Section 21.2(b) is sustained, any certificate or approval that had been issued to the applicant could be suspended or revoked. In addition, the person making the false statement may be subject to a civil penalty of $1,000 per violation.

CONCLUSION

Historically, whenever the FAA had encountered false statements in the context of Part 21, its options for recourse were limited: If a false statement was discovered before the certificate was issued, the FAA simply required that the applicant correct the statement before proceeding with certification. If a false statement was discovered after the certificate was issued, the FAA's only recourse was to refer the matter to criminal investigative agencies, such as the FBI, for investigation of criminal fraud.

Section 21.2 now provides the FAA with additional tools for addressing this problem.

■

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

Designee News...General

The FAA's Use of Designees and Delegations

The FAA's Aircraft Certification Service (AIR) uses private citizens (*designees*) and companies (*delegations*) to supplement government staff in aircraft certification. Designees and delegations are reviewed by the AIR staff to ensure that qualifications are such that they can function in certain certification work on behalf of the Administrator.

AIR delegates a portion of its work to these individuals or organizations, thereby relieving the Service of performing the work delegated. Using designees and delegations results in a shift of work for FAA engineers and inspectors: In many instances, FAA engineers will not be doing detailed design approvals and FAA inspectors will not be doing conforming inspections and issuing airworthiness certificates. Instead, the work of FAA engineers and inspectors entails the responsibility of overseeing the work of designees and delegations.

Authority for Delegating Functions Outside the FAA

There are several documents that describe the authority of the FAA to delegate aircraft certification functions to parties outside of the FAA. Those documents are:

- **Section 314 of the FAAct of 1958**
- **FAR Part 183**, *"Representatives of the Administrator"* for Delegated Engineering Representatives (DER), Designated Manufacturing Inspection Representatives (DMIR), and manufacturing Designated Airworthiness Representatives (DAR) and Organizational Designated Airworthiness Representatives (ODAR).
- **FAR Part 21, Subpart M,** for Designated Alteration Stations (DAS)
- **FAR Part 21, Subpart J,** for Delegated Option Authorization (DOA)

Difference between Designees and Delegations

Designees are individuals with backgrounds in engineering or manufacturing inspection who are appointed by the FAA. They may also be consultants or individuals who are hired by a company, but are approved by, and work for, the FAA.

Delegations are organizations or manufacturing facilities authorized by the FAA to do some of their own certification work with minimal supervision.

The following tables offer a clear picture of the roles of designees and delegations.

Roles of Designees

	Designated Engineering Representative (DER)	Designated Manufacturing Inspection Representative (DMIR)	Designated Airworthiness Representative (DAR/ODAR))
Role	Makes compliance findings in support of type certificates (TC), supplemental TC's (STC), and field approvals	Determines that products and parts submitted to them conform to the approved type design, are in condition for safe operation , and meet other pertinent requirements. May issue: - Original airworthiness certificates or approvals - Experimental certificates - Export certificates of airworthiness - Conformity approvals	Conducts conformity inspections and issues airworthiness approvals
Who Appoints and Supervises	Appointed by Aircraft Certification Office (ACO) manager; supervised by ACO engineer	Appointed by Manufacturing Inspection District Office (MIDO) manager or Directorate Manufacturing Inspection Office (MIO) through MIDO; supervised by Aviation Safety Inspector (ASI) in MIDO	Appointed by MIDO manager or MIO manager; supervised by ASI or manger in MIDO
Guidance	FAR Part 183, "Representatives of the Administrator" FAA Order 8100.4, "TC Handbook" FAA Order 8110.37, "DER Guidance Handbook"	FAR Part 183, "Representatives of the Administrator" FAA Order 8130.2B, "Airworthiness Certification of Aircraft and Related Approvals"	FAR Part 183, "Representatives of the Administrator" FAA Order 8000.62, "Designated Airworthiness Representatives Qualification Criteria, Selection, and Appointment Procedures" Advisory Circular 183-33A, "Designated Airworthiness Representatives" FAA Order 8130.23, "Appointment of ODAR's"

Roles of Delegations

	Designated Alteration Station (DAS)	SFAR 36 Organization	Designated Option Authorization (DOA)
Role	Does engineering approvals for STC's and issues STC certificates Also issues: - Experimental certificates - Amended standards airworthiness certificates	FAA has approved facilities to make repairs on aircraft, engines, propellers, or appliances	FAA reviews company and approves company as one that can design and approve its own data, and manufacture specific types of aircraft May issue: - Experimental certificates - Airworthiness certificates (other than experimental certificates) - Airworthiness approval tags and export airworthiness approval tags
Who Appoints and Supervises	ACO	Flight Standards Service	Appointed by Directorate; supervised by ACO
Guidance	FAR Part 21, Subpart M Advisory Circular 21.431-1A, "Designated Alteration Station Authorization Procedures"	Special FAR (SFAR) 36	FAR Part 21, Subpart J FAA Order 8120, "Production and Approval and Surveillance Procedures"

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, DC 20402-9328

Designee News...For DER's

Clarification of FAA Notice 8110.49, "The Designated Engineering Representative System"

Several parts of Notice 8110.49, *"The Designated Engineering Representative System,"* dated September 1, 1993, have been the source of confusion among Designated Engineering Representatives (DER). The FAA has reviewed this Notice in depth and is now providing clarification on those points. The revisions described below will appear in the next version of the Notice:

Paragraph 3.d.(12), page 3, should read:

"Project ACO - The ACO which verifies compliance with the FAR on certification projects for products and parts. It is the ACO where the products and parts are located and for which the DER if verifying compliance with the FAR."

Reason: There has been some confusion about the use of the word "project" when discussing repairs where there is not usually a project assigned. The definition has been expanded to show that the word does not always mean a large engineering effort; it means any size technical data approval effort on the part of the DER.

Following paragraph 6.b.(4)(j), the following Note should be added:

"Note: The appointing ACO will determine what limitations, if any, will be placed on the DER's software approval level. These limitations may be expressed in the terms used in DO-178B and defined on the DER's FAA Form 8110-25."

Reason: The high-level experience requirements of paragraphs 6.b.(4)(a) through (j) are too restrictive from some levels of software approval. The note is meant to emphasize the appointing ACO's role in establishing limitations for each DER's approval level.

Paragraph 12.h.(1), page 27, should read:

"DER's who do not already have a delegation of approval of technical data for major repairs and alterations must obtain specific authorization from their appointing ACO prior to initiating approvals for repairs and alterations."

Reason: Existing instructions appear to require a double authorization prior to initiating approvals for repairs and alterations. If necessary, the appointing ACO may verbally authorize, and confirm in writing by authorization letter or on FAA Form 8110-25, that the DER may approve technical data for major repairs and alterations without first notifying the ACO, except where the part is critical or life-limited.

Paragraph 12.h.(2), page 27, should read:

"The DER will submit the original FAA Form 8110-3 and, if specifically requested, a copy of the approved data, to the project ACO. The DER should also submit a copy of FAA Form 8110-3 to the appointing ACO to show activity. The DER ***should note****..."*

Reason: Not all ACO's want the extensive paperwork associated with some repairs and alterations. This change will allow the ACO to instruct the DER on what approved data it needs from the DER in individual cases.

Paragraph 12.h.(5), page 27, should read:

"DER's must obtain specific authorization from the project ACO before approving the technical data for any major repair or alteration where the part is critical or life-limited."

Reason: Existing instructions prevent the DER from approving technical data for repairs or alterations on parts that are critical or life-limited. In the past, some DER's were authorized to approve data in some instances. The change allows the ACO to give specific authorization in individual cases. The change also deletes the references to AD's and other airworthiness considerations which are not appropriate to this section.

For further information on this subject, DER's should contact their appointing ACO.

■

Reminders to Airframe DER's

Reminder #1: FAA Notice N8110.49 made a significant change in how DER's are to function in support of major repairs and major alterations (approval of repair or modification data via FAA Form 8110-3). Unless your DER authorization includes major repair and/or major alteration, you must receive *specific authorization* from your cognizant Aircraft Certification Office (ACO) before approving any major repair or major alteration data by FAA Form 8110-3.

Reminder #2: DER's may participate in making findings in support of Parts Manufacture Approval (PMA) design approvals based on identicality (ref. FAR 21.303), if so authorized. Unless your DER authorization includes PMA Design Identicality Findings, you must receive *specific authorization* from your cognizant ACO before approving any PMA design identicality data by FAA Form 8110-3.

Reminder #3: In order to be authorized to approve Weight and Balance Statements, an airframe DER must be authorized in Function /Area G8 or G9. If you do not have such an authorization, you should contact your cognizant ACO to request such authorization, on a case-by-case basis, to develop data to substantiate your request for expansion of authorization.

■

Recent FAA Rulemaking Projects

Notice 94-14, "Review of FAA Standard for Maximum Allowable Carbon Dioxide Concentration in the Crew and Passenger Compartments."

Published May 2, 1994. The period for public comment closed August 30, 1994. This notice proposes to revise the standards for maximum allowable carbon dioxide concentration by reducing the allowable maximum concentration from 3 percent to 0.5 percent in occupied areas of transport category airplanes. This action is in response to a recommendation from the National Academy of Sciences to review the carbon dioxide limit in airplane cabins, and would provide a cabin carbon dioxide concentration equivalent to that recommended for buildings.

Notice 94-15, "Revision of Certain Flight Airworthiness Standards to Harmonize with European Airworthiness Standards for Transport Category Airplanes."

Published April 22, 1994. The period for public comment closed July 21, 1994. This notice proposes to amend part 25 of the Federal Aviation Regulations (FAR) to harmonize certain flight requirements with standards proposed for the European Joint Aviation Requirements (JAR 25). This action responds to a joint petition from the Aerospace Industries Association of America, Inc. (AIAA), and the Association Europeenne des Constructeurs de Materiel Aerospatial.

Amendment 25-80, "Airplane Lightning Protection."

Published April 28, 1994. This amendment adds a new standard for electrical and electronic systems installed in transport category airplanes. It is the result of increasing concern for the vulnerability of these systems to the indirect effects of lightning, and is intended to enhance safety by providing specific lightning protection requirements for electrical and electronic systems that perform essential and critical functions. These requirements have been imposed on many recent designs by special conditions.

Amendment 25-81, "Design Standards for Airplane Tie-Down and Jacking Provisions."

Published April 28, 1994. This amendment to the airworthiness standards for transport category airplanes adds a new design standard for airplane tie-down and jacking provisions. This amendment is needed to provide manufacturers with design standards or jacking conditions and is intended to provide protection of primary structure during jacking operations and gusty wind conditions while the airplane is tied down.

■

Transport Airplane Directorate Designee Newsletter

Federal Aviation Administration
Transport Airplane Directorate
1601 Lind Avenue, S.W.
Renton, Washington 98055-4056

Manager:	Ronald T. Wojnar
Assistant Manager:	Darrell M. Pederson
Editor-in-Chief:	R. Jill DeMarco
Contributing Writer/Editors:	June Quemado, Rose Upton Judy Golder, Sandi Carli, Lori Butler

The purpose of the Designee Newsletter is to provide designees with the latest information concerning regulations, guidance material, policy and procedure changes, and personnel activities involving the certification work accomplished within the Transport Airplane Directorate's jurisdictional area. Although the information contained herein 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 methods, or other materials or documents. If you are in doubt about the status of any of the information addressed, please contact your cognizant Aircraft Certification Office (ACO), Manufacturing Inspection District Office (MIDO), or other appropriate FAA office.

Department of Transportation
Federal Aviation Administration
Transport Airplane Directorate
1601 Lind Avenue, S.W.
Renton, WA 98055-4056

FIRST CLASS MAIL
POSTAGE AND FEES PAID
FAA
Permit No. G44