

2.6 Environment and Energy

Mission

Environmental opposition is the greatest single threat to continued growth and prosperity of the aviation system. The FAA must provide strong international leadership in mitigating aviation's adverse impact on the public while maintaining an effective aviation system. The FAA has adopted the following strategies:

- Balance noise reduction with adequate airport capacity through a cooperative development effort
- Minimize adverse environmental consequences and comply with all Federal statutes
- Reduce noise, emissions, and energy consumption by the aviation sector by stimulating private industry and Government sponsored research
- Harmonize international aircraft noise and engine emissions certification standards

Intended Outcomes

Using its regulatory authority, FAA must serve as an advocate for both the environment and industry. Through an optimal mix of aircraft and engine certification standards, operational procedures, compatible land use, and abatement technology, FAA intends to:

- Reduce the impact of aircraft noise by 80 percent (based upon population) by 2000 and prevent any increase after 2000
- Minimize the global, regional, and local impact of aircraft exhaust emissions

Program Area Outcomes

The findings of aviation environmental research become:

- Noise and emissions standards for certification of new and modified airframe and engine type designs
- Technical guidance on certification procedures and practices for manufacturers and modifiers in the form of technical reports, handbooks, advisory circulars, training courses, and rules

- Computer models and impact criteria for civil aviation authorities to use in environmental assessment of proposed actions

Program Area Structure

The aviation environmental research program is composed of the following major disciplines:

- Aircraft Noise Reduction and Control
- Engine Emissions Reduction and Control
- Aviation Environmental Analysis

These disciplines form a cohesive system of research projects that focus on noise and engine exhaust emissions to support Federal actions that will identify, control, and mitigate the environmental consequences of aviation activity.

Customer/Stakeholder Involvement

Working closely with other Federal agencies, industry, and foreign governments, the FAA uses a unified regulatory research and development (R&D) approach, which:

- Assesses environmental concerns
- Plans research and development efforts
- Shapes technical requirements
- Identifies feasible abatement technologies or other mitigation actions
- Implements aircraft and engine certification regulations to mitigate the potential impacts

FAA collaboration on aviation environmental issues includes these committees:

- *Aviation Regulatory Advisory Committee (ARAC)*. ARAC is a formal standing committee established by the FAA and composed of representatives from aviation associations and industry. ARAC provides industry input in the form of recommendations, advice, and information to be considered in the full range of FAA rulemaking activities. Harmonization working groups under ARAC ensure that certification regulations affecting both domestic and foreign parties do not impose different standards in different countries.

- *International Civil Aviation Organization's (ICAO) Committee on Aviation Environmental Protection (CAEP)*. FAA participates—as the U.S. member—on the CAEP, along with representatives of other civil aviation authorities and observers from aviation industry. CAEP assesses the adequacy of the international aviation environmental standards, especially in the areas of aircraft noise and engine exhaust emissions standards.
- *Federal Interagency Committee on Aviation Noise (FICAN)*. FICAN, established by the FAA and other interested Federal agencies, provides forums for debate over needs for future aviation noise research and encourages new development efforts in this area. FICAN conducts annual public forums in different geographic regions, soliciting general input on aviation noise impacts with the intent to better align research with the public's concerns.

Accomplishments

Since 1993, the program has produced:

- Simplified noise certification procedure for light helicopters, as promulgated by FAA and ICAO. The new procedure should save manufacturers and modifiers at least \$24 million over 15 years.
 - Four reports to Congress on the annual progress of the FAA/NASA subsonic jet noise research program and one report to Congress on quiet aircraft technology for light propeller-driven airplanes and helicopters. The finding of the latter report led to a joint FAA/NASA research project on general aviation noise.
 - Handbook on small airplane noise certification and publication of advisory circulars on the aircraft noise certification database that will improve the efficiencies of both the manufacturers' measurement tests and the FAA's review and approval.
 - Training course on 14 CFR, part 34, "Fuel Venting and Exhaust Emissions Requirements for Turbine Engine Powered Airplanes," for FAA engine certification personnel and applicants. This training will improve the efficiencies of both the manufacturers' measurement tests and the FAA's review and approval.
- Advances in the computer models used for airport and heliport noise analysis. Over 1,000 copies have been sold worldwide. In the United States, these models have been used in over 150 airport studies involving more than \$1.3 billion in airport noise compatibility grants.
 - Four public forums on aviation noise research in Atlanta, San Diego, Seattle, and Washington, D.C.; four FICAN annual reports; one report on Federal aviation noise research projects; a report to Congress on the effects of aircraft noise; and a Federal finding on the relationship between aircraft noise and sleep awakenings. Public participation led to new Federal research projects on commuter airplane noise impacts and the influence of ambient noise on community annoyance.
 - Enhancements to the computer model used for airport air quality analysis and formal acceptance by the Environmental Protection Agency (EPA) as a preferred guideline model which is EPA's highest-ranking; development of a handbook on the procedures for airport air quality analysis for use by civilian and military aviation authorities. Standardizing the civilian and military analytical procedures will improve the quality of environmental assessments that are reviewed by the Federal Government.
 - The Global Aircraft Noise Impact Assessment Model, accepted by CAEP for future use in assessing the benefits of advances in noise reduction technologies.
 - Achieved the mid-term goals of the joint FAA/NASA subsonic jet noise reduction research program.
 - Aircraft noise exposure prediction model for overflights of Grand Canyon National Park.

R&D Partnerships

FAA participates with others in the aviation community in joint R&D efforts:

- Through a series of memorandums of understanding, FAA works NASA and U.S. industry under the NASA Advanced Subsonic Technology (AST) and the High Speed Civil

Transport (HSCT) research programs to identify source abatement technologies.

- FAA also participates in the Aviation Effects on the Atmosphere Project (AEAP) with NASA, industry, and academia to assess the possible global impact of aircraft engine exhaust emissions.
- The Volpe National Transportation Systems Center (VNTSC) continues to provide substantial technical assistance in aircraft noise measurement and assessment.

FICAN is also a forum for partnership. All Federal agencies concerned with aviation noise are represented on the committee, including the military services (Air Force, Army, Navy) the Department of Interior, Department of Transportation, EPA, National Aeronautics and Space Administration (NASA), and the Department of Housing and Urban Development.

FICAN has led to expanded coordinated and cooperative research efforts among the individual agencies, resulting in more efficient use of Federal funds. Participating agencies have signed a letter of understanding defining the purpose, scope, membership, process, and products of FICAN and formally documenting the commitment of the participating agencies.

Long-Range View

Planning for environmental research needs beyond 2000 requires a look at key indicators. These indicators are generally described as driving forces for change, targets of opportunities, or future (environmental) threats. The key indicators that may relate to aviation environmental research include:

- Air transportation growth
- New aircraft designs
- New aviation technologies
- Scientific findings on environmental impact
- Increased globalization of aviation
- Reduced Federal resources

FAA predicts slow and steady growth of the demand for aviation services into the first decade of the next millennium. The growth in aircraft operations to meet this demand will produce increased

environmental impacts and create barriers to further growth.

The key to successful environmental planning is to identify operational mitigation options for those sectors of the growing aviation markets that are most likely to reach environmental critical mass. FAA will need to continue to assess the situation to determine whether research to support mitigation should be directed toward tour operations over national parks, urban vertiports, resurgent general aviation activity, the old standby large jet transport operations, or a new threat.

Several major NASA aeronautics research programs will come to an end in the first few years of the next decade most notably, the AST program. Several new source technologies will come out of the NASA research programs that U.S. industry will turn into the next generations of aircraft in 10-15 years. With the end of the AST program, FAA will close its companion research program on subsonic noise reduction. The agency will use its research findings to identify new environmental certification standards and procedures for the next generation of transport aircraft. FAA will shift future environmental research in the field of new aircraft technology toward other research programs on rotorcraft and general aviation.

The solution to controlling the environmental consequences of new aircraft technologies is through a unified regulatory R&D approach involving the FAA with other Federal agencies, such as NASA, from the early stages of the technology research program.

Technologies, such as the Global Positioning System (GPS), are already beginning to have a profound effect on the aviation system. As these technologies are introduced to improve system efficiency and flexibility, a new FAA paradigm is emerging under the general term, "Free Flight." As the FAA builds more user flexibility into the NAS, what are the environmental consequences (impacts and improvements)? FAA must commit funds to expand on the current suite of environmental analysis tools to address the consequences as the agency moves towards free flight in all domains.

While human (animal) behavioral research is not the duty or responsibility of the FAA, the agency

must devote some research resources to translate any pertinent scientific findings on environmental impacts into Federal guidance and policy. For example, NASA's AEAP will conclude in 2003. One potential outcome is a finding on the effects of supersonic and subsonic aircraft cruise operations on global climate change and the ozone layer. FAA must be prepared to produce appropriate aviation environmental policy, guidance, and interpretation for these and other scientific findings.

As stated in FAA's 1996 Strategic Plan, "The globalization of aerospace is another factor driving FAA to change." What is the potential effect of expanding international and multinational manufacturing centers on the harmonization of international aircraft noise and engine emissions certification procedures and recommended practices? FAA must plan for research efforts to support continued maintenance of international harmonization and standardization of the aviation environmental certification standards and procedures.

A09a Environment and Energy

GOALS:

Intended Outcomes: The FAA intends to reduce the impact of aircraft noise by 80 percent (based on population) by 2000 and prevent any increase thereafter through an optimal mix of new aircraft certification standards, operational procedures, compatible land use, and abatement technology; define and minimize the impact of aircraft emissions through an optimal mix of new aircraft certification standards, operational procedures, and abatement technology; and mitigate the environmental consequences of aviation operations.

Agency Outputs: The aviation environmental research findings have resulted in the publication of significant standards, rules, and technical guidance, including:

- Standards for certifying new and modified designs for reducing aircraft noise and engine exhaust emissions
- Technical reports, handbooks, advisory circulars, training courses, and procedures for manufacturers and modifiers
- Computer models and impact criteria for civil aviation authorities when making environmental assessment of proposed actions

Customer/Stakeholder Involvement: The FAA uses a unified regulatory R&D approach, working closely with other Federal agencies, industry, and foreign governments to guide R&D efforts into the area of aviation impact on the environment. Lessons learned from this research identify and shape technologies, regulations, and certification criteria with real potential to improve our present and future global environment.

The ARAC is a formal standing committee of representatives from aviation associations and industry. Established by the FAA, ARAC provides industry input in the form of recommendations, advice, and information to be considered in the full range of FAA rulemaking activities. ARAC's harmonization working groups will ensure that the aircraft noise certification regulations that impact both domestic and foreign parties do not impose different standards in different countries.

The FAA represents the United States on the ICAO CAEP, along with representatives of other

civil aviation authorities and observers from the aviation industry. CAEP assesses the adequacy of international aviation environmental standards, especially in the areas of aircraft noise and engine exhaust emissions standards.

FAA and other interested Federal agencies established FICAN to provide forums for debate over needs for future aviation noise research and to encourage new efforts in this area. FICAN conducts annual public forums in different geographic regions to solicit general input on aviation noise impacts to better match research to public concerns.

The Aviation Environmental Research Program directly supports the General Aviation Action Plan in demonstrating noise abatement technologies for light propeller-driven airplanes.

Accomplishments: Through this program, FAA has produced a simplified noise certification procedure for light helicopters and promulgated it with ICAO. The new procedure should save manufacturers and modifiers at least \$24 million over 15 years. FAA has also produced a handbook on small airplane noise certification and published advisory circulars on the aircraft noise certification database.

These publications improve the efficiencies of industry's measurements of engine exhaust emissions as well as FAA review and approval in this area. A training course is available for FAA engine certification personnel and applicants that will improve the efficiencies of both the manufacturers' engine exhaust emissions measurement tests and the FAA's review and approval.

The FAA's advances in computer models used for airport and heliport noise analysis have resulted in the worldwide sale of over 600 copies of the model. In the United States, these models have been used in over 150 airport studies involving more than \$1 billion in airport noise compatibility grants. The FAA has conducted four public forums on aviation noise research in Atlanta, San Diego, Seattle, and Washington, D.C.; four FICAN annual reports; one report on Federal aviation noise research projects; and one report to Congress on the effects of aircraft noise. Public participation has led to new Federal research projects on commuter airplane noise impacts and

the influence of ambient noise on community annoyance.

R&D Partnerships: Through a series of memorandums of understanding, the FAA works closely with NASA and U.S. industry on NASA's AST and the high speed civil transport (HSCT) research programs to identify source abatement technologies. FAA also participates in AEAP with NASA, industry, and academia to assess the possible global impact of aircraft engine exhaust emissions. The Volpe National Transportation Systems Center (VNTSC) continues to provide substantial technical assistance in the areas of aircraft noise measurement and assessment. FICAN is also a forum for partnership, as all Federal agencies concerned with aviation noise are represented on the Committee. FICAN has led to expanded coordinated and cooperative research efforts among the individual agencies, which resulted in more efficient use of Federal funds.

MAJOR ACTIVITIES AND ANTICIPATED FY 1999 ACCOMPLISHMENTS:

Aircraft noise reduction and control

- Harmonized FAA subsonic jet airplane noise certification regulations with those of the European Joint Aviation Authorities that govern the procedures used by airframe manufacturers
- Published revised Advisory Circular 36-4D, *Noise Certification Handbook*, which will provide technical guidance to FAA field personnel, airframe manufacturers, designated engineering representatives, and aircraft modifiers

Engine emissions reduction and control

- With the assistance of NASA and U.S. industry, continued comprehensive scientific assessment of the atmospheric effects of aviation

Aviation environmental analysis

- Published a new airport air quality assessment handbook that will provide technical

guidance to airport authorities, FAA field offices, and other Federal reviewers of environmental assessments

- In cooperation with ICAO CAEP and the Society of Automotive Engineers (SAE), initiated validation of methodologies and databases used in airport noise modeling

KEY FY 2000 PRODUCTS AND MILESTONES:

Aircraft noise reduction and control

- Continue the three cooperative FAA/NASA noise reduction research programs to identify feasible technologies for U.S. manufacturers to develop quieter subsonic jet transport airplanes, helicopters, and light propeller-driven airplanes, respectively

Engine emissions reduction and control

- Develop a simplified engine exhaust emissions measurement procedure to reduce manufacturers' test costs

Aviation environmental analysis

- Continue to examine and validate the methodologies used to assess aircraft noise exposure and impact

FY 2000 PROGRAM REQUEST:

Although several major NASA aeronautics research programs (most notably, the AST) will end in the first few years of the next decade, several new source technologies will have emerged from NASA's research. This will be the basis in 10 to 15 years for the next generation of U.S. industry aircraft. With the end of the AST program, FAA will close its companion research program on subsonic noise reduction and will use its research findings to identify new environmental certification standards and procedures for the next generation of transport aircraft. FAA will shift future environmental research in the field of new aircraft technology toward other research programs for rotorcraft and general aviation.

1999 FAA NATIONAL AVIATION RESEARCH PLAN

A09a - Environment and Energy Product and Activities	Program Schedule					
	FY 1999	FY 2000	FY 2001	FY 2002	FY 2003	FY2004
091-110 Aircraft Noise Reduction & Control						
Airplane and Rotorcraft Noise Reduction Technologies, Noise Certification Standards & Procedures						
Harmonized FAA Noise Certification Regulations with European Joint Aviation Authorities	◆					
Final Assessment of FAA/NASA Subsonic Jet Noise		◇				
Final Assessment of FAA/NASA Light Propeller-Driven Airplane Noise Reduction Technology Research			◇			
Publish Advisory Circular 36-4d			◇			◇
Developed Simplified Noise Certification Procedures or Requirements for Helicopters	◆					
Develop New Basis for Certification Standards and Procedures for High Speed Civil Transports			◇			
Initiate Development of Supersonic Noise Certification Standards and Procedures				◇		
091-111 Engine Emissions Reduction & Control						
Engine Exhaust Emissions Reduction Technologies, Standards and Procedures, and Impact Assessments						
Develop Simplified Engine Exhaust Emissions Certification Procedures	◆					
Harmonize FAA Engine Exhaust Emissions Certification Regulations with European Joint Aviation Authorities		◇				
091-113 Aviation Environmental Analysis						
Develop Noise & Air Quality Assessment Methodologies						
Initiated the Validation of the Methodologies and Databases Used in Airport Noise Modeling	◆					
Initiate Noise Modeling Validation	◆				◇	

Budget Authority (\$ in Thousands)	FY 1996 Enacted	FY 1997 Enacted	FY 1998 Enacted	FY 1999 Enacted	FY 2000 Request
Contracts	3,800	3,600	2,891	2,239	2,856
Personnel Costs	0	0	0	607	589
Other Costs	0	0	0	45	36
Total	3,800	3,600	2,891	2,891	3,481

