United States General Accounting Office

GAO

Report to the Ranking Democratic Member, Committee on Transportation and Infrastructure, House of Representatives

August 2000

AVIATION AND THE ENVIRONMENT

Airport Operations and Future Growth Present Environmental Challenges

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GAO/RCED-00-153

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Abbreviations

DNL	day-night [sound] level
EPA	Environmental Protection Agency
FAA	Federal Aviation Administration
ICAO	International Civil Aviation Organization
NASA	National Aeronautics and Space Administration
NEPA	National Environmental Policy Act
NOx	nitrogen oxide and nitrogen dioxide [collectively]

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United States General Accounting Office
Washington, D.C. 20548

Resources, Community, and
Economic Development Division

B-283109

August 30, 2000

The Honorable James L. Oberstar
Ranking Democratic Member
Committee on Transportation and Infrastructure
House of Representatives

Dear Mr. Oberstar:

This report responds to your request that we review the key environmental concerns and challenges associated with airports' current operations and future growth and the efforts of major airports and federal agencies to address these concerns. The report contains recommendations to the Secretary of Transportation and the Administrator of the Environmental Protection Agency to further assist airports as they attempt to balance their operations and growth with the impact of their activities on the environment. To further assist airports with these activities, the report also includes related matters for congressional consideration.

As agreed with your office, unless you publicly announce its contents earlier, we plan no further distribution of this report until 14 days after the date of this letter. At that time, we will send copies to interested Members of the Congress; the Honorable Rodney Slater, Secretary of Transportation; the Honorable William S. Cohen, Secretary of Defense; the Honorable Jane Garvey, Administrator, Federal Aviation Administration; the Honorable Carol M. Browner, Administrator, Environmental Protection Agency; and the Honorable Daniel Goldin, Administrator, National Aeronautics and Space Administration.

Should you or your staff need further information, please contact me at (202) 512-2834. Key contributors to this report are listed in appendix VI.

Sincerely yours,

Gerald L. Dillingham

Gerald L. Dillingham, Ph.D.
Associate Director, Transportation Issues

Executive Summary

Purpose

Many of the nation's commercial service airports are operating at or near capacity and are under increasing pressure to expand their operations to accommodate the growing demand for domestic air travel—forecast by the Federal Aviation Administration (FAA) to increase by 3.6 percent annually through 2011. This growing demand has heightened concerns among some communities, environmental groups, and others that airport operations may have an increasingly detrimental effect on the environment. Recognizing this concern, officials from almost all of the nation's busiest commercial service airports have reported that balancing operations with their impact on the environment is more difficult than it was a decade ago. For example, actions to lessen environmental effects, such as performing required environmental reviews and limiting flights to certain hours, have increased the time and cost of development and have imposed restrictions on flight patterns, airport use, and airport capacity. Representatives of airports, communities, and federal and state regulatory agencies are striving to balance these competing demands. Balancing these demands is particularly relevant given that the Congress recently authorized nearly $10 billion for airport infrastructure development—including associated environmental concerns—over the next 3 years.

In light of the expected growth in domestic air travel and the current and anticipated future environmental effects of airport operations, the Ranking Democratic Member of the House Transportation and Infrastructure Committee asked GAO to review (1) the key concerns and challenges associated with airports' current operations and future growth—particularly concerns about aircraft noise, water quality, and air pollutant emissions—and the actions being taken by the nation's busiest airports to balance environmental concerns with such operations and growth and (2) the actions taken by FAA and other federal agencies to address environmental concerns associated with airports' current operations and future growth.

Background

Over the past several decades, federal laws and regulations have established processes for federal agencies—primarily FAA and the Environmental Protection Agency (EPA)—and states and local governmental entities to manage the environmental impact of airport operations and growth. These laws and regulations address environmental concerns about the noise generated by aircraft operations, the impact on water quality associated largely with stormwater runoff, including that from deicing/anti-icing and fueling operations, and the impact on air quality

of burning fossil fuels to operate automobiles, airport service vehicles, and aircraft.

FAA works actively with airport officials to help them minimize the environmental effects of expansion projects, including providing grants to reduce the impact of noise on surrounding communities. In addition, the agency is responsible for preparing documents to comply with the National Environmental Policy Act (NEPA), which has three levels of review. These levels are (1) environmental impact statements (the most detailed reviews), which are required when projects have significant effects on the environment; (2) environmental assessments, which provide sufficient evidence and analysis to determine whether an environmental impact statement or a finding of no significant environmental impact is warranted; and (3) categorical exclusions, which allow projects to be excluded from further environmental review providing there are no extraordinary circumstances. The act sets forth a broad national policy aimed at protecting the quality of the environment and requires that federal actions receive an environmental review, the level of which depends on an action's potential impact on the environment. EPA reviews environmental impact statements prepared by federal agencies, including FAA. In addition, EPA oversees the implementation of the Clean Air Act, as amended—which regulates the emission of air pollutants from area, stationary, and mobile sources—and of the Clean Water Act—which sets the basic structure for regulating discharges of pollutants to waters of the United States. However, the day-to-day responsibility for overseeing the implementation of the Clean Water and Clean Air acts is generally delegated to the states. EPA has also encouraged voluntary measures to reduce aviation emissions and has undertaken numerous regulatory actions, such as setting standards for aircraft engine emissions. Other federal agencies play more limited roles in assisting airport officials with managing the environmental impact of airport operations.

GAO surveyed officials from the nation's 50 busiest commercial service airports to obtain their views on the key environmental concerns and challenges affecting airports' current operations and future growth and to identify the efforts under way to address these concerns (see app. III for a list of the airports). In addition, GAO visited 11 of these airports—which represented a diverse group in terms of size, location, and environmental issues—to obtain more in-depth information about their key environmental concerns and their efforts to balance operations and growth with the impact on the environment. GAO also interviewed a wide range of interested parties, including federal, state, and local officials;

representatives from aviation industry groups; nongovernmental organizations; and citizens' groups to obtain their views on these issues. See chapter 1 for GAO's objectives, scope, and methodology.

Results in Brief

As airports attempt to grow and balance their growth with its effects on the environment, the primary environmental concern and challenge facing them now and for the foreseeable future is noise, specifically noise generated by aircraft operations. Airport officials' next greatest concern and challenge is water quality—primarily the potential harmful effects of deicing and anti-icing operations. Air quality is the third greatest concern and challenge reported by airport officials, particularly managing the effects on air quality of the increases in emissions due to airport growth. However, a greater number of airport officials reported that in the future, air quality issues will become a greater concern and challenge for them. Other issues of concern cited by some airport officials were wetlands, endangered species, environmental justice, and historical preservation. Airport officials have undertaken a range of activities—either independently or in cooperation with government and industry partners—to more effectively balance airports' current operations and future growth with the environmental impact of these activities. For example, they have established airport/community groups to address environmental issues.

Coordination has occurred across the federal government to assist airport officials in balancing airport operations and growth with the impact on the environment. For example, FAA has developed and continues to refine models to assess the impact on noise and air quality of proposed airport development projects and has assisted state and local governments and planning agencies with establishing land uses around airports that are compatible with airport operations. Furthermore, many airport officials reported that FAA is effective at providing assistance, including answering their questions and addressing their concerns about environmental issues and coordinating activities across the agency. Other federal agencies also assist airports with their environmental responsibilities. For example, EPA helps airports address water and air quality issues through regulatory, voluntary, and research efforts, and the National Aeronautics and Space Administration (NASA) assists them primarily through its research and related technology development to reduce aircraft noise and the emission of air pollutants. While federal coordination efforts have been undertaken, GAO's review identified several areas in which airport officials and others believe federal efforts could be improved—in particular, efforts within

FAA; between and among federal agencies, airports, and other governmental entities; and federal law.

- Many airport officials reported that at least some of their capacity expansion projects (defined in GAO's survey as including taxiways and terminals) did not require an environmental review (i.e., an environmental impact statement, environmental assessment, or categorical exclusion). However, under NEPA, airport projects are subject to various levels of environmental review, depending on the degree of federal involvement and the project's impact on the environment. FAA's policy implementing NEPA also requires that FAA's approvals of airport layout plans and funding for airport development projects receive such reviews, and FAA headquarters officials maintain that all such reviews are taking place. Nevertheless, the responses of airport officials suggest that there is a lack of understanding about when environmental reviews are required. Furthermore, because FAA does not require that all projects that are categorically excluded from further environmental reviews be specifically documented when there is no FAA funding approval, the agency lacks systematic documentation and communication for all categorical exclusion reviews.

- Many airport officials told us that EPA's Clean Air Act guidance is inadequate because it does not clearly communicate airports' responsibilities and that some EPA and FAA officials in the regions lack experience in providing technical assistance to airports. Some EPA and FAA officials acknowledged the need to clarify guidance on air quality analytical requirements for airports and attributed the lack of experience to the infrequency of detailed air quality analyses required for airports by the act. As a result, many airport officials remain unsure of the level of analyses required to meet their responsibilities. Furthermore, officials from airports, FAA, and EPA told GAO that EPA's current guidance offers disincentives for airports to voluntarily reduce air pollution.

- Some overlap exists among federal, state, and local environmental review processes that can lead to difficulties in coordination and result in duplication of effort and delays in airport projects. Both headquarters and regional officials from the Army Corps of Engineers said that overlapping permit requirements for wetlands is a problem in some states. For example, according to an official from one airport GAO visited, the airport has had to negotiate permits for destroying the same wetlands with three different agencies.

- Communities that surround 14 of the nation's 50 busiest commercial service airports and are adversely affected by aircraft noise do not have access to federal funds specifically set aside for noise mitigation because these airports choose not to participate in FAA's noise compatibility program (known as Part 150). Although funding is available from other federal programs and from fees collected from passengers by airports, the federal law governing the noise compatibility program requires airports to participate in order to receive its grant funds. The neighboring communities of participating airports benefit from activities funded by the program, such as acquiring homes or soundproofing residences and other buildings as well as other efforts to reduce land uses that are not compatible with airport operations. Second, the Clean Air Act and another federal law pertaining to airport improvement include somewhat duplicative air quality requirements that can burden airports in some areas.

The report contains recommendations for improving the federal approach to assisting airports in balancing their operations and growth with their environmental responsibilities.

Principal Findings

Noise, Water, and Air Issues Are the Leading Environmental Concerns and Challenges for Airports

Noise: In GAO's survey of the nation's 50 busiest commercial service airports, officials from 29 airports ranked the noise associated with airport operations as their number one concern associated with reducing the environmental impact of current airport operations on surrounding communities. The greatest noise-related challenges reported by airport officials in our survey are (1) the noise levels generated by older aircraft that have been modified to meet today's more stringent noise standards but are still loud compared with new aircraft, (2) the airports' limited control over nearby land uses, and (3) the growing residential populations near airports. To address these challenges, airport officials—in coordination with the aviation industry—have undertaken a variety of measures to reduce the impact of aircraft noise on neighboring communities. These measures include establishing preferred flight paths away from residential neighborhoods, designating locations where pilots test aircraft engines prior to take-off, and preferential use of certain runways.

Water and air quality: Officials from the nation's 50 busiest commercial service airports also reported that water and air quality issues are currently concerns for them. According to GAO's survey, officials from 12 airports cited water quality issues as their primary concern. In addition, the survey and interviews with a range of interested parties found that the primary challenge for airport officials in the area of water quality is the management of runoff from deicing/anti-icing operations and spills from fueling operations. Airport and airline officials work cooperatively to address this challenge, in some cases by sharing responsibility for establishing systems to collect and dispose of the runoff. Although officials from only 6 airports identified air quality as the issue that currently concerns them the most, when asked about future concerns, officials from 16 airports said that air quality would likely become their most significant environmental concern. The air quality challenges most frequently cited by airport officials include an increasing demand for parking that could lead to greater congestion and emissions around airports and uncertainty about the conditions that airport projects must meet to comply with the Clean Air Act. To help meet these challenges, some airports are expanding their use of remote shuttle pickup sites for passengers to reduce the demand for parking and, hence, reduce emissions at the airports. In addition, some airports and their tenants—including airlines—are increasing their use of alternative-fuel vehicles to reduce emissions generated by the airport vehicles that support aircraft operations and provide access to the airports.

The Federal Government Has Coordinated Some Efforts, but Challenges Remain

GAO found that while there has been some coordination of federal agencies' efforts to address environmental issues associated with airport operations and growth, the resolution of several remaining concerns could improve the federal approach.

Federal coordination efforts: Several federal agencies have successfully coordinated some efforts to address environmental concerns. For example, the Federal Interagency Committee on Noise reconfirmed a common federal standard for measuring aircraft noise—concluding that there were no other measurement methods of sufficient scientific standing to replace this method. Second, EPA and FAA are working cooperatively with the aviation industry and other interested parties to develop voluntary reduction goals for the emission of air pollutants, which could lead to an emission reduction agreement by the end of 2000. Furthermore, FAA, EPA, and NASA have undertaken both cooperative and independent efforts to assist airports in balancing their operations and growth with the environmental impact of their activities. For example, FAA and NASA are

partners in aviation noise reduction research, and FAA uses NASA's scientific and technological knowledge to regulate aircraft noise. Similarly, EPA and FAA work together to help ensure that airport expansion projects meet environmental requirements. In addition, an FAA official serves as the U.S. representative to the International Civil Aviation Organization, which is responsible for setting international aircraft noise and emissions standards. EPA also participates in this organization and its environmental committee and working groups. Furthermore, EPA has studied airport deicing operations to determine whether additional regulation is needed to address water-related environmental issues at airports.

In addition, most of the officials at the 50 airports responding to GAO's survey reported a high level of satisfaction with FAA's assistance on environmental issues. For example, officials from 32 of the 50 airports reported that they were satisfied with the way FAA answered their questions and addressed their concerns on such issues. Over half of the airport officials also reported that FAA was effective in coordinating activities among its offices, providing standard rules and guidance, and processing paperwork. However, airport officials reported that FAA was less effective at coordinating with state agencies—an issue that may reflect overlapping state and federal environmental requirements.

Misunderstandings about environmental reviews: Many airport officials reported that at least some of their capacity expansion projects (defined in the survey as including taxiways and terminals) did not require an environmental review (i.e., an environmental impact statement, environmental assessment, or categorical exclusion). Specifically, officials from 10 of the 50 airports reported that, over the past 10 years, half or fewer of their capacity expansion projects did not require environmental reviews, and officials from another 13 airports reported that at least some of their airport capacity expansion projects did not require such reviews. However, under NEPA, airport projects are subject to various levels of environmental review, depending on the degree of federal involvement and the project's impact on the environment. FAA's policy implementing NEPA also requires that FAA's approvals of airport layout plans and funding for airport development projects receive such reviews.

FAA headquarters officials confirmed that FAA's policy requires that all airport capacity expansion projects receive an environmental review and maintained that all such reviews are taking place. The responses of airport officials suggest that there is a lack of understanding about when environmental reviews are required. Furthermore, categorical exclusions

are not required to be documented under the NEPA regulations issued by the Council on Environmental Quality, and FAA's policy also does not require that all projects that are categorically excluded be documented. Without documentation, when no FAA funding approval is involved, a reliable determination cannot be made about whether categorical exclusion reviews are taking place.

Guidance and coordination lacking for Clean Air Act: Many airport officials told GAO that they are having difficulty understanding their responsibilities under the Clean Air Act for conducting reviews for projects that expand airport capacity, in part because of insufficient guidance and technical assistance. Specifically, 22 of the nation's 50 busiest commercial service airports reported that uncertainty about complying with the act's requirements was a major concern for them. Because EPA's Clean Air Act regulations group airports together with very different sectors—such as ski resorts and coal mines—the regulations are general and do not clearly specify how the act applies to airports. Although federal guidance and technical assistance on these matters are available to airports, airport officials are still confused about their responsibilities. While EPA told GAO that the agency has undertaken efforts to improve the conformity rules and guidance in the past, these efforts have been delayed because of resource constraints. In addition, EPA officials maintain that airports have a responsibility to communicate with local, regional, state, and federal officials about air quality and other environmental issues. FAA, EPA, and airport officials said that another factor contributing to the airport officials' confusion is a lack of experience among some FAA and EPA regional staff with applying the act's requirements to airport projects. As a result, airport officials may not comply with the act's requirements in some instances and may do more analysis than is needed in other instances. Furthermore, EPA has not set up a process for providing "credits" to airports for some of their voluntary efforts to reduce air pollution that they can bank or sell—thereby discouraging airport sponsors from undertaking efforts to reduce the emission of air pollutants.

Difficulties in federal, state, and local coordination persist: Although efforts have been undertaken to coordinate federal, state, and local environmental review processes for airports, difficulties persist—frustrating FAA and airport officials and, in some cases, resulting in duplication of effort. According to airport and FAA officials, if these efforts are not properly coordinated, this type of duplication can delay airport projects without adding commensurate environmental benefits.

Provisions in a federal law limit the eligibility of some airports and communities to receive federal noise funds and create somewhat duplicative air quality requirements: As part of its voluntary Part 150 noise compatibility program, FAA provides noise mitigation funds to assist local communities through grants to airports that participate in the program. Such assistance includes soundproofing residences and other strategies. Many airports have chosen to participate in the program, which has made billions of dollars available to reduce the impact of noise around airports, thereby helping to improve community relations. However, 14 of the nation's 50 busiest commercial service airports, accounting for about one quarter of all air carrier operations in 1998, do not participate. Under federal law, FAA can only provide funds from its Part 150 program to assist a community with noise mitigation if the airport there is participating. Consequently, the more than 320,000 people living near those 14 nonparticipating airports cannot benefit from the Part 150 program. (The program is only one of a number of ways airports can fund noise mitigation efforts, however.) A change in the law could allow communities to directly access Part 150 funds even if their local airports do not participate in the program, under rules and restrictions similar to those that are placed on participating airports. FAA has twice proposed legislation that, among other things, would extend funding directly to communities in some cases; however, the proposals were not adopted.

Furthermore, federal laws include somewhat duplicative air quality processes that can place burdens on airports in some states. Federal law requires the governor of each state to certify that federally funded airport runway additions conform to local air quality standards—called state air quality certification.[1] Similarly, the Clean Air Act requires the federal agency—in this case, FAA—to determine that emissions from airport projects conform to a state's plan to implement national air quality standards. This sometimes requires airport officials to demonstrate compliance with air quality requirements twice. In addition, FAA officials and representatives of a working group of airports told us that they have recommended the elimination of the state air quality certification requirement because it overlaps with the Clean Air Act. Even without the

[1]The law also states that the governor must certify that a runway project meets local water quality standards, but no airport, federal, state, or local official mentioned this as a problem. However, states retain the right to implement stricter water quality guidelines than the federal government requires in the Clean Water Act, regardless of the state certification process.

state air quality certification process, states will retain the right to implement more stringent air quality standards under the Clean Air Act.

Recommendations

To provide systematic documentation that categorical exclusions are taking place as required for airport development projects and that airport officials are aware of all FAA environmental reviews, GAO recommends that the Secretary of Transportation direct the Administrator of FAA to communicate to airport officials the requirements for environmental reviews for airport expansion projects and that the results of all categorical exclusion reviews be systematically documented by FAA and communicated to airport officials.

To help airports meet their responsibilities under the Clean Air Act, GAO recommends that the Administrator of EPA, in coordination with FAA and airport officials, (1) clarify the guidance in areas such as general conformity determinations and guidelines for states to provide airports with credits for voluntary emission reduction efforts and (2) provide airport officials with the necessary expertise to meet air quality requirements.

Matters for Congressional Consideration

Because 14 of the 50 busiest commercial service airports do not participate in FAA's noise compatibility program and, thus, the people who live in communities surrounding these airports who are affected by aircraft noise are not eligible to receive funds from this program (under 49 U.S.C. 47104 and 48103), the Congress may wish to consider the impact of this restriction on the affected communities. In addition, because the state air quality certification requirement (49 U.S.C. 47106 (c)(1)(B)) is somewhat duplicative and may impede some airports as they attempt to grow and implement their environmental responsibilities, the Congress may wish to consider eliminating this requirement.

Agency Comments

GAO provided the Department of Transportation; the Department of Defense; NASA; EPA; and an advisory panel that included the Air Transport Association of America, Inc., Airports Council International-North America, Frederic R. Harris, Inc., and the Natural Resources Defense Council with copies of the draft report for their review and comment.

GAO met with officials from the Department of Transportation, including FAA's Director, Office of Airport Planning and Programming. These officials generally agreed with the facts in the report and provided clarifying comments, which were incorporated as appropriate.

The Department of Defense and NASA concurred with the report. NASA offered clarifying comments, which were incorporated as appropriate. NASA's and the Department of Defense's written comments appear in appendixes IV and V.

GAO met with senior officials from EPA's Office of Enforcement and Compliance Assurance and the Office of Air and Radiation, including the Senior Scientist/Policy Adviser for the Office of Air and Radiation. These officials generally agreed with the facts in the report and provided technical and clarifying comments, which were incorporated, as appropriate.

The advisory panel of experts—with the exception of the Natural Resources Defense Council—generally agreed with the contents of the report and provided technical and clarifying comments which were incorporated, as appropriate. The Natural Resources Defense Council provided no comments.

Introduction

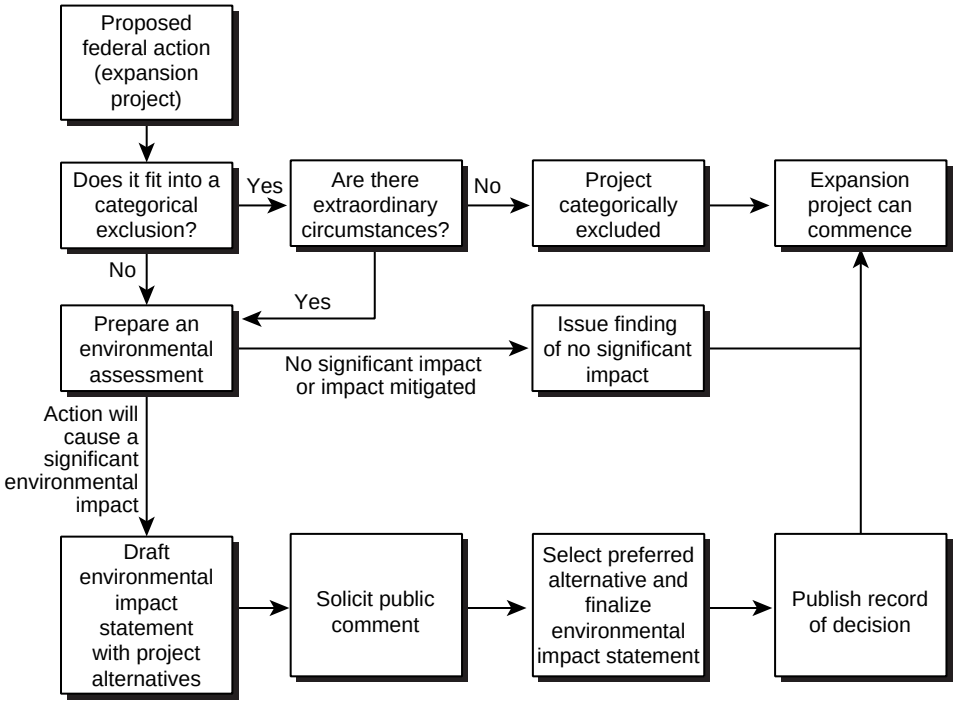
Airports are subject to many federal, state, and local regulations designed to protect the environment. Among other things, these laws regulate the environmental impact of such airport operations as expansions of airport infrastructure, emissions of air pollutants, discharges of chemicals into surrounding water bodies, and noise from aircraft. These various federal environmental laws give primary environmental oversight authority to the Federal Aviation Administration (FAA) and the Environmental Protection Agency (EPA). These agencies set policy at the national level but leave the day-to-day implementation to their regional offices. EPA can also delegate some authority to the states. In addition, airports can be regulated by local entities.

Federal Laws Guide Environmental Compliance Requirements for Airports

The National Environmental Policy Act of 1969 (NEPA) sets forth a broad national policy intended to protect the quality of the environment. Depending on the level of federal involvement and the potential impact on the environment, NEPA requires that federal actions, including airport expansion projects, receive an environmental review. Specifically, NEPA procedures are meant to ensure that environmental matters are considered for federal actions, and for certain reviews there is an opportunity for public officials and citizens to comment on proposed projects before federal decisions are made and actions are taken. For airport projects, FAA is the lead agency responsible for administering the law. FAA must approve all airport expansion projects.[1] Initiating an expansion project generally constitutes a federal action that triggers an environmental review under NEPA. (See fig. 1.) EPA reviews environmental impact statements prepared by FAA and other federal agencies.

[1]According to FAA, airports have a blueprint for airport development—known as an airport layout plan—which reflects projects approved by FAA.

Figure 1: General Overview of the Federal Environmental Review Process Under NEPA



The Noise Control Act[2] assigned responsibility to the Administrator, EPA, for coordinating the programs of all federal agencies relating to noise research and noise control, including the impact of noise from aircraft. Although the Administrator still has responsibility for coordinating these programs, EPA has not received funding specifically for them since 1982. In 1979, the Aviation Safety and Noise Abatement Act was enacted to help airport operators develop noise mitigation programs. The act authorized FAA to assist airport operators in developing programs to reduce the level of aircraft noise and mitigate its impact on surrounding communities. In addition, the Airport Noise and Capacity Act of 1990 authorized the Secretary of Transportation to reduce aircraft engine noise through a program to phase out noisier aircraft.[3] The law also limited airport operators' abilities to place noise or access restrictions on airports in the interest of avoiding an overly burdensome patchwork of individual operational limitations across the United States.

The Clean Water Act,[4] as amended, addresses the release of pollutants to surface waters, such as lakes, rivers, streams, and wetlands. It governs direct discharges of pollutants released into navigable waters. Airports can potentially affect water quality through activities such as deicing/anti-icing, as well as aircraft and vehicle fueling and maintenance. The Clean Water Act established the National Pollutant Discharge Elimination System, a permit program that controls discharges of pollutants from point sources, such as pipes and drainage ditches at airports, including some categories of stormwater discharges. EPA, as the responsible agency, can delegate authority to the states to administer their own National Pollutant Discharge Elimination System permit programs. In addition, section 404 of the Clean Water Act establishes another major permit program applicable to airport projects that governs discharges of dredged and fill material into wetlands and other waters. The act also addresses the reporting of oil and hazardous substance spills, the disposal of dredge materials, and the establishment of enforcement programs.

[2]42 U.S.C. 4901-4918.

[3]The act required the phased elimination of older, noisier civil subsonic aircraft—known as Stage 2—weighing over 75,000 pounds that use airports in the contiguous United States by Dec. 31, 1999. However, some Stage 2 aircraft have been modified to meet the quieter standards required of Stage 3 aircraft.

[4]The Federal Water Pollution Control Act, 33 U.S.C. 1251-1387, is generally referred to as the Clean Water Act.

The Clean Air Act, as amended, was designed to protect and enhance the nation's air quality to promote public health and welfare. For aircraft or aircraft engine emissions, the act gives jurisdiction to EPA in consultation with FAA. EPA and FAA have implemented international standards for commercial jet aircraft emissions established by the International Civil Aviation Organization (ICAO). Enforcing and monitoring compliance with these standards are responsibilities of FAA[5]—implemented, in part, through the agency's process for certifying that aircraft engines meet air pollutant emissions standards.

[5]FAA is also responsible for the safe design of aircraft and the safe and efficient use of navigable airspace under 49 U.S.C. 44701 and 40103(b), respectively.

The act and its amendments direct EPA to establish national standards for ambient air quality.[6] In turn, states can adopt these or more stringent air quality standards; however, EPA's responsibility is limited to ensuring that the national ambient air quality standards are met. EPA has set such standards for carbon monoxide, lead, nitrogen dioxide, particulate matter, ozone, and sulfur dioxide—all of which are pollutants directly or indirectly generated by airport activities.

The Federal Government Takes a Decentralized Approach to Implementing Environmental Laws at Airports

Other than setting national emissions standards for aircraft engines, FAA and EPA—which play significant roles in managing the environmental impact of airport operations—have taken a decentralized approach to their responsibilities. While each agency has a national-level policy-setting or oversight office, much of the day-to-day environmental work with airports occurs through each agency's regional offices or FAA's district offices. EPA relies on regional staff or the states to oversee FAA's and airports' compliance with environmental laws and regulations.

Three principal FAA headquarters offices deal with the environmental impact of airport operations. The Office of Airport Planning and Programming, Community and Environmental Needs Division, is responsible for airport program matters pertaining to environmental and social requirements, while the Office of Environment and Energy develops, recommends, and coordinates national aviation policy relating to environmental matters and develops and maintains computer models for aircraft noise and air quality analyses. In addition, the Office of Air Traffic Airspace Management within Air Traffic Services, Air Traffic Environmental Programs Division, has assumed a major role in the agency's efforts to address environmental issues associated with changes in air traffic procedures and flight patterns near airports and establishes policies and procedures for air traffic environmental actions.

[6]Ambient air is any unconfined portion of the atmosphere—open air or surrounding air.

Although EPA has been regulating airport environmental issues for many years, the aviation sector presents challenges for the agency because it requires the unified implementation of environmental laws. On the national level, the EPA offices that are primarily involved in airport environmental issues include the Office of Air and Radiation, the Office of Water, and the Office of Federal Activities. The Office of Air and Radiation implements national programs, technical policies, and regulations for controlling air quality. Within this office, the Office of Transportation and Air Quality is responsible for developing national emissions standards for aircraft and ground support equipment and other motor vehicles operating on airport grounds. This office also participates in a number of airport-specific initiatives, including research on toxic substances in the air and efforts to set emissions standards for aircraft engines through ICAO. Both the Office of Transportation and Air Quality and the Office of Air Quality Planning and Standards are responsible for overseeing the implementation of the Clean Air Act. For airports, the Office of Transportation and Air Quality generally has primary responsibility for emissions from aircraft, vehicles, and other mobile equipment, while the Office of Air Quality Planning and Standards is responsible for other emissions and for ensuring that airport projects conform with states' plans to comply with the Clean Air Act. EPA's Office of Water regulates point source discharges[7] from airports by requiring airport operators, and in some cases airport tenants, to obtain National Pollutant Discharge Elimination System permits. Finally, the Office of Federal Activities reviews the sufficiency of all environmental impact statements associated with airport projects. Although these various headquarters offices have oversight of these environmental issues, much of EPA's direct interaction with FAA and airports occurs in the regions. In addition, the states are primarily responsible for implementing the Clean Air and the Clean Water acts' requirements.

The nation's 50 busiest commercial service airports all interact with FAA and EPA on environmental issues; however, several other federal agencies have a direct, though narrower, role in airport environmental issues. For example, the Council on Environmental Quality—which sets the regulations for implementing NEPA[8]—has responsibility for mediating interagency disputes, the National Aeronautics and Space Administration conducts research on aircraft noise and emissions, the Department of

[7]EPA defines point sources as discrete conveyances such as pipes or man-made ditches.

[8]40 C.F.R. part 1500-1508.

Energy supports the use of alternative-fuel vehicles at airports, and the Department of Defense—specifically, the Army Corps of Engineers—issues permits when airport projects have an impact on wetlands. Other agencies, including the Department of the Interior's Fish and Wildlife Service and the Advisory Council on Historic Preservation, also participate in civil airport environmental issues and processes. In addition, like FAA and EPA, some of these agencies rely on regional or field staff to help ensure compliance with laws under their jurisdiction. State and local agencies also play a significant role, especially when certain responsibilities have been delegated to states, such as the responsibility for achieving clean air goals or ensuring compliance with water quality standards.

Airport sponsors[9] and FAA are responsible for systematically considering environmental issues in a timely manner when evaluating proposed airport planning and development activities and for involving local and state officials and individuals with appropriate expertise. Airport officials are responsible for managing environmental impacts as trustees for the land at airports. Specifically, airport officials are responsible for identifying needs, developing conceptual alternatives, and other airport actions as required by various laws and regulations. FAA is responsible for preparing environmental reviews under NEPA. EPA also plays a role when airport expansion projects require an environmental impact statement, given its authority to offer comments on these documents to federal agencies, including FAA.

[9]A sponsor is any public agency or private owner of a public-use airport, as defined under 49 U.S.C. 47102(19)(A)(B), that applies to receive federal financial assistance or anyone proposing an airport action for which a federal authorization is required.

Airports do not have full control over the environmental effects of their activities because multiple parties contribute to these effects. Our survey of the nation's 50 busiest commercial service airports found that airports were concerned about their inability to control various environmental impacts. For example, while airports are responsible for developing flight paths, FAA is responsible for approving, implementing, and enforcing the accepted flight paths, and airlines manage the number and frequency of flight operations.[10] Hence, the noise generated by these activities is largely outside the control of airport operators. According to FAA and airlines, in the interest of flight safety, airlines and FAA tower operators cannot always follow preferred flight paths and other procedures intended to reduce the impact of noise on surrounding communities.[11] However, the responsibility for managing the environmental impact of aircraft operations is shared among airports, airlines, and FAA. In addition, local government entities control zoning and, in turn, the degree to which land uses near airports are compatible with airport operations. Lack of control over water quality is also a concern for airport officials. For example, while airlines apply deicing chemicals to their aircraft, airport operators are ultimately responsible for managing the wastewater generated by these activities.

Objectives, Scope, and Methodology

In view of the growing demand for domestic air travel and the current and future environmental effects of airport operations and growth, the Ranking Democratic Member of the House Committee on Transportation and Infrastructure asked us to provide information on (1) the key concerns and challenges associated with airports' current operations and future growth—particularly concerns about noise, water pollution, and air pollutant emissions—and the actions being taken by the nation's busiest airports to balance environmental concerns with such operations and growth and (2) the actions taken by FAA and other federal agencies to address environmental concerns associated with airports' current

[10]FAA has statutory responsibility under 49 U.S.C. 40101(d)(4) and 40103 to control the use of the navigable airspace and regulate civil and military operations in that airspace in the interest of safety and efficiency. Under this authority, FAA must approve any take-off or landing flight paths for a particular airport. FAA also has enforcement authority and may assess civil penalties for a pilot's deviation from air traffic controller instructions to follow approved flight paths under 14 C.F.R. part 91.123. A pilot may deviate from an air traffic controller's instructions only in an emergency safety situation or if they have the air traffic controller's approval.

[11]Safety and operational parameters are usually indicated in FAA NEPA documents and Part 150 approvals.

operations and future growth. As requested, we are also providing information about similar concerns in Europe (see app. II).

Our review focused on the impact of noise, water pollution, and air pollutant emissions associated with airports' current operations and future growth, as requested. We focused on the nation's 50 busiest commercial service airports because they are central to the efficiency of the National Airspace System. While we recognize that other environmental effects are associated with airports, they were not the focus of our review.

To address the first objective, we interviewed and collected material from federal officials at FAA, the Department of Defense, EPA, the National Aeronautics and Space Administration, and the Department of Energy. We also interviewed and collected material from representatives of the Aerospace Industries Association, the Airports Council International-North America, the Air Transport Association of America, Inc., and the National Association of State Aviation Officials. In addition, we interviewed officials from airports, state and local governments, nongovernmental organizations, airlines, and citizen/community groups.

We conducted computer literature searches to identify the environmental effects of airport operations. Our searches covered several bibliographic databases and included the following key words and phrases: airport/aviation and pollution, airport/aviation and environment, and airport/aviation and wetlands.[12] Our searches identified about 250 studies and articles. Of these, we selected approximately 20 that were most relevant to our work and discussed in detail the environmental effects of airport operations.

To obtain the views of airport officials on key environmental concerns and challenges that significantly affect airports' current operations and future growth and to determine the efforts under way to address these concerns, we conducted a mail survey from October 1999 through February 2000 of the 50 busiest commercial service airports in the United States. In selecting the airports for our survey, we used the number of air carrier operations for 1998 as reported by FAA. The top 50 airports accounted for 80 percent of all air carrier operations in 1998. To design our survey, we conducted in-person pretests at four airports. In addition, we conducted on-site interviews at seven other airports, covering the topics in the survey. These

[12]The databases searched included DIALOG, NEXIS, and WESTLAW.

visits and our interviews with industry and federal officials assured us that the key environmental issues for airport management are noise, water pollution, and air pollutant emissions. During the four pretesting visits, we observed airport officials filling out our survey questionnaire. In addition, we discussed the survey questions and answers with them to ensure that (1) the questions were understandable, (2) the terms used were clear, (3) the survey did not place an undue burden on airport staff that would result in a lack of cooperation, and (4) the survey appeared independent and unbiased in its point of view. Appropriate changes based on our pretesting were incorporated into the final survey. The survey topics included the opinions of airport executives on environmental concerns, information about the 50 busiest commercial service airports' operations, and airport officials' experiences with various approaches to environmental issues. The survey confirmed that noise, water pollution, and air pollutant emissions are the major concerns and challenges facing these airports. See *Aviation and the Environment: Results From a Survey of the Nation's 50 Busiest Commercial Service Airports* (GAO/RCED-00-222) for the survey document and additional analysis. We consulted with FAA to select the most appropriate official at each airport to answer our questions. We received completed surveys from all 50 airports.

During our visits to 11 of the nation's 50 busiest commercial service airports mentioned above, we also obtained more in-depth information on the types of environmental activities that these airports were undertaking and observed their implementation, where practical. In deciding which airports to visit, we attempted to select a diverse group on the basis of size, location, and environmental issues. We interviewed airport officials and obtained supporting documentation from them to supplement the survey, as necessary.

To address the second objective, we relied on interviews and documents from the previously cited individuals and organizations, as well as visits to selected airports. We also used the survey to solicit airport officials' views on the federal effort to assist airports in balancing operations and growth with environmental impacts.

During the review, the following environmental and aviation experts reviewed our methods and report drafts for accuracy and balance: William Fife of Frederic R. Harris, Inc. (New York); Scott Belcher of the Air Transport Association of America, Inc. (Washington, D.C.); Richard Kassel of the Natural Resources Defense Council (New York); and Richard Marchi of the Airports Council International-North America (Washington, D.C.).

We conducted our review from July 1999 through August 2000 in accordance with generally accepted government auditing standards.

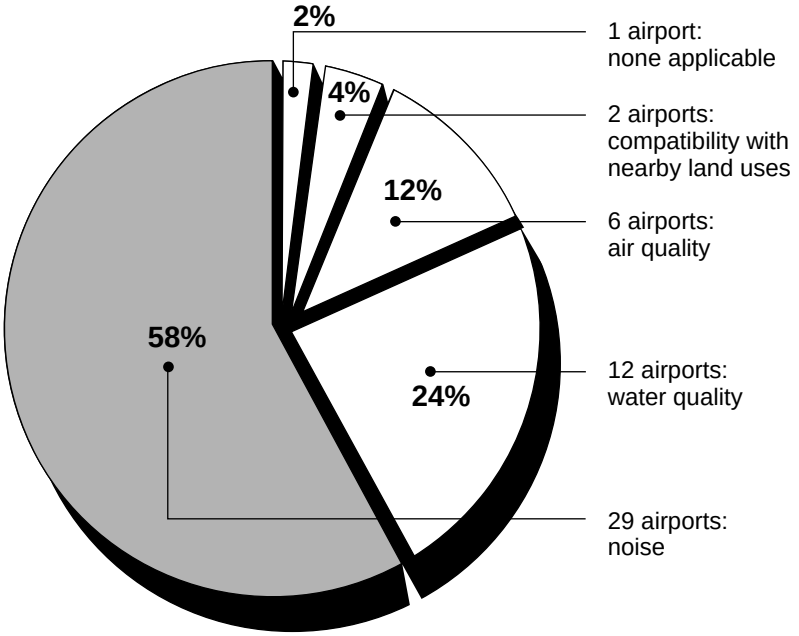
Noise Issues Are the Primary Environmental Concern and Challenge for Airports

Noise is primarily generated at airports by arriving and departing aircraft, and the noise from aircraft engines is the most significant environmental concern facing airports now and in the future. The most frequently cited challenge was addressing the noise generated by older aircraft that have been modified but are still loud—even though they are in compliance with current standards they are louder than new aircraft. Airport officials' next two most significant challenges involve local zoning—which can lead to land uses that are incompatible with airport operations and the related issue of increasing residential populations near airports. Airports and airlines have implemented a range of noise mitigation strategies to help reduce the impact of aircraft noise on surrounding communities, but some citizens and local officials do not believe that their concerns about aircraft noise are being adequately addressed.

Airports Reported Noise Concerns as Their Most Serious Environmental Challenge

According to our survey of officials from the nation's 50 busiest commercial service airports,[1] noise issues currently represent the most significant concern for 29 of these airports. Figure 2 shows how airport officials responded to the question in our survey about the environmental issue that was the greatest concern for their airport.

Figure 2: Environmental Issues That Currently Most Concern Airports



Source: GAO's survey of the nation's 50 busiest commercial service airports.

In addition, officials from 22 of the airports surveyed reported that noise would remain their biggest challenge in the future—primarily because of the expected increase in operations. FAA and EPA officials, as well as some citizen/community groups, concurred that noise issues are currently the most serious environmental problem facing airports.

[1]We used FAA's statistics on the number of air carrier operations in 1998 to identify the nation's 50 busiest commercial service airports for inclusion in our survey.

Noise Generated by Older, Hushkitted Aircraft Are Airports' Primary Concern

Among the noise issues reported by airport officials, the most frequently cited major or moderate concern—by 41 of the 50—was the loudness of aircraft with engines that have hushkits[2] or other modifications to comply with Stage 3 noise standards. Although these aircraft are in compliance with current standards, they are still louder than new aircraft in the same weight range. Federal law required the phaseout of older, noisier aircraft—known as Stage 2—by December 31, 1999.[3] Aircraft owners could retire these aircraft or modify them to meet the new noise standards. Representatives of airports, aviation industry associations, an association of local officials, and EPA told us that Stage 2 aircraft that have been modified to meet noise standards for Stage 3 are louder than many of the more recently built aircraft. Although hushkits make older aircraft quieter than they would be without hushkits, an FAA official responsible for technology issues related to aircraft noise told us that hushkitted aircraft are still louder than new aircraft in the same weight range that meet Stage 3 requirements without modification. Furthermore, an airport industry representative stated that aircraft built to meet Stage 3 standards are significantly quieter on departure than aircraft that have been modified to meet Stage 3 standards.

Airline officials told us they are also concerned about noise issues and take them very seriously. However, those officials said the cost of purchasing new aircraft, among other factors, prohibits them from replacing their fleets as the only means of meeting the current noise standards. For example, one airline industry representative told us that an aircraft has a life span of about 30 years and an airline takes about 22 years to pay for the aircraft. Therefore, a more economically feasible alternative to purchasing new aircraft is to fit older aircraft with hushkits. Additionally, according to aviation industry representatives, modifications to aircraft to reduce noise may add to the weight of an aircraft, and, in turn, cause it to burn more fuel—resulting in higher pollutant emissions.

[2]To meet Stage 3 standards, older aircraft engines are fitted with hushkits to muffle the noise they generate.

[3]Airport Noise and Capacity Act of 1990.

Incompatible Land Uses Near Airports Are a Major Concern and Challenge

The primary responsibility for integrating airport considerations into local land-use planning rests with local governments—presenting a difficult problem for many airports, because they cannot control development in surrounding communities. However, airports are held accountable by these communities when airport noise adversely affects uses such as schools and residences built close to airports. Using a federally agreed upon method, FAA set the standard that airports use to measure the level of noise to which communities around airports are exposed over time and has issued guidelines that identify land uses that would and would not be compatible with the noise generated by a nearby airport's operations. The agency considers land uses such as homes and schools to be incompatible with the high noise levels that occur very close to an airport, while noting that other uses, such as industrial and commercial uses, could successfully be located close to an airport without interfering with their activities.[4] (See fig. 3.)

Figure 3: Adverse Impact of Aircraft Noise on Residents Near Los Angeles International Airport

[4]To measure the impacts of airport-related noise on nearby communities, FAA uses the day-night sound level method, which places a greater weight on noise from flights occurring between 10 p.m. and 7 a.m.

Perceptions of noise can vary from individual to individual. For instance, Denver International Airport receives one of the highest numbers of noise complaints in the country, although it is not close to any residential communities. However, in many cases, individuals submitting complaints were not exposed to aircraft noise before the Denver International Airport opened in 1995. Similarly, FAA reports that in recent years, complaints have come from populations exposed to comparatively low levels of noise, sometimes miles from an airport. Our survey results were consistent with these reports, with officials from 35 airports reporting that over half of their noise complaints during the last year came from people living in areas where aircraft noise falls below the level FAA considers incompatible with residential uses. However, officials from 47 airports reported that increasing populations in nearby areas pose a concern.

Strong pressure exists to develop residential areas around heavily used airports, particularly in metropolitan areas with more than 50,000 people—areas where all of the 50 busiest commercial service airports are located. Officials from 22 of the 50 airports that we surveyed cited airports' limited control over local zoning as a major concern. A representative of a leading environmental organization told us that better dialogue is needed with communities to improve land-use choices and reduce the potential for incompatible land uses in the future. EPA agrees that noise problems at the local level are the result of incompatible land-use planning around airports. Although FAA has no control over zoning, the agency has undertaken an initiative to provide information to state and local governments for their use in controlling and preventing incompatible land uses near airports. Officials from airports, EPA, and FAA agree that a compatible land-use policy is one of the best noise mitigation techniques that can be used to minimize the impact of aircraft noise on surrounding communities. This is particularly important for future airport expansions, because land-use decisions that conflict with aviation activity and airport facilities can make it difficult for airports to grow to meet the increasing demand for air travel.

Population Increases Near Some Airports Pose Challenges for the Future

Increasing residential populations near airports present challenges for airports when planning expansion projects to meet the growing demand for air travel. Our survey found that officials from 13 of the nation's 50 busiest commercial service airports view increases in residential populations near their airport as a major concern. In addition, officials from 10 airports reported that the populations within these airports' 65-decibel day-night level (65 dB DNL) noise contours[5] have moderately increased over the past 5 years, and officials from many other airports reported that these populations were remaining stable. However, FAA reports that the number of people exposed to significant noise levels (65 dB DNL and above) has dropped over 75 percent—from 7 million in 1975 to 1.7 million in 1995—mainly because louder aircraft have been phased out. FAA used what it considers to be a substantially credible model to project that the number of people exposed to airport noise at 65 db DNL will fall from 862,000 in 1998 to below 470,000 by the end of 2000. Despite this drop in the affected populations, as measured by a federally accepted definition of significant noise levels, EPA officials expressed concern that the impact of noise on populations is not being adequately captured. EPA officials told us that the DNL measure alone does not adequately capture the impact of aircraft noise on people and could be supplemented to more fully account for the impact of single loud noises. However, FAA officials noted that this issue was addressed in a report of the Federal Interagency Committee on Noise, which supported the use of the DNL measure, and reported that other noise metrics simply provided additional information and could be used at a federal agency's discretion.

[5]Under land use compatibility guidelines in FAA's regulations, the noise levels within which some land uses, such as residences and schools, are considered incompatible with airport operations.

Although nearly half of the nation's 50 busiest commercial service airports reported that, compared with 5 years ago, fewer people live within their 65 dB DNL contours, the balance of these airports reported that the populations within these contours have remained stable or have moderately increased over the past 5 years. At the 50 airports we surveyed, 45 had noise statistics available. Using these statistics, we conservatively estimated that approximately 675,000 people live in areas with airport noise levels of 65 dB DNL or greater. Therefore, the number of people affected may be somewhat greater than FAA has estimated. However, our estimate and FAA's are not directly comparable because our population statistics are for different years.[6]

A representative for state aviation officials expressed concern that as quieter aircraft have been phased in, the boundaries of airport noise contours have shrunk and people have moved into these areas that were previously impacted by noise. However, in the future, as the number of aircraft operations increases, the areas impacted by noise may expand again at some airports, despite quieter aircraft—making this new residential development incompatible with airport operations. These increasing populations pose challenges for airports in their relations with surrounding communities.

[6]Our estimate is based on airport officials' responses to our survey, provided from October 1999 through February 2000. FAA's estimate is based on a model that projected the 2000 population using 1998 statistics.

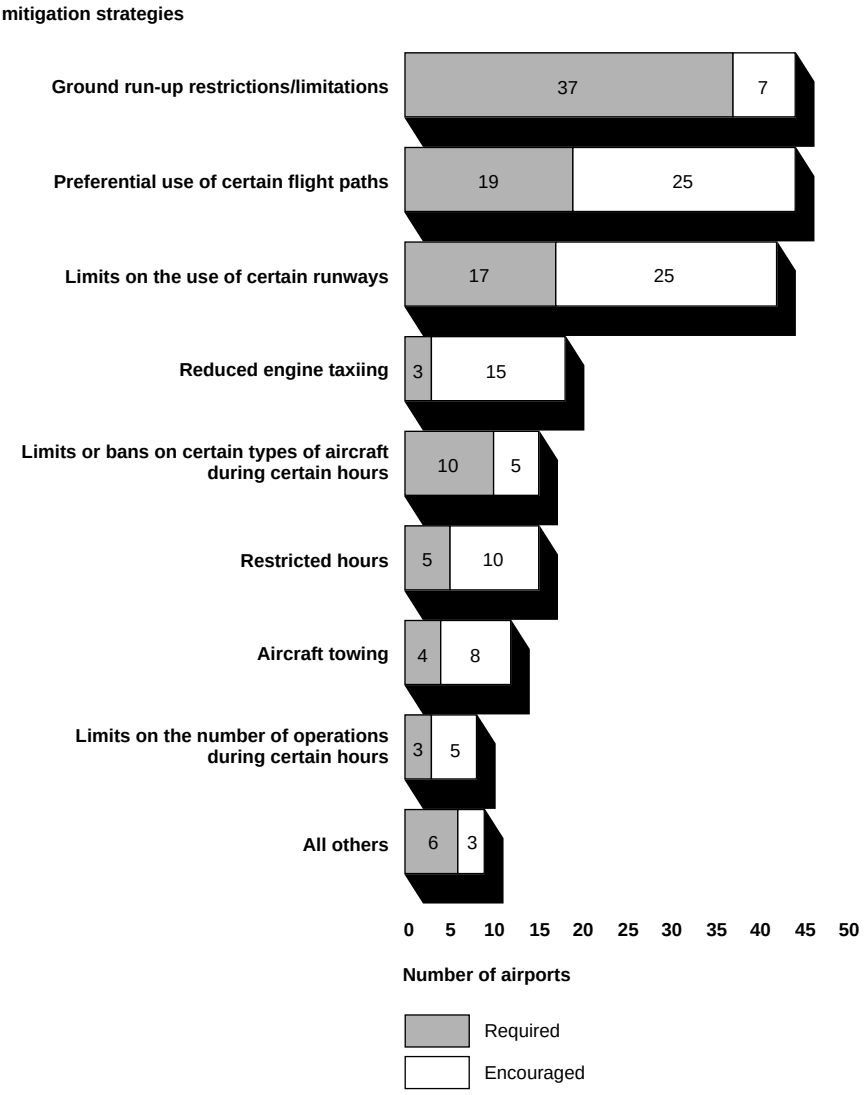
Airports Have Implemented Various Measures to Reduce the Impact of Aircraft Noise, but Community Concerns Persist

Most of the 50 busiest commercial service airports we surveyed have implemented a range of strategies to help reduce the impact of aircraft noise on surrounding communities—including both voluntary and mandatory measures. The three activities most often encouraged or required by airports include (1) restrictions or limitations on engine testing prior to take-off, (2) the use of certain flight paths, and (3) limits on the use of certain runways.[7] Airport officials also reported that they use other mechanisms to reduce the impact of aircraft noise, including reduced engine taxiing, limits or bans on certain types of aircraft during certain hours,[8] and aircraft towing rather than taxiing. (See fig. 4.)

[7]The use of "restrictions" and "limitations" was based on the wording of GAO's survey of airports and is not intended to reflect the special meaning under Federal Aviation Regulation part 161.

[8]Any mandatory bans in place as of the date of this report predate the Aircraft Noise and Control Act of 1990 and were exempted from review under Federal Aviation Regulation part 161.

Figure 4: Noise Mitigation Strategies Required or Encouraged by Airports



Source: GAO's survey of the nation's 50 busiest commercial service airports.

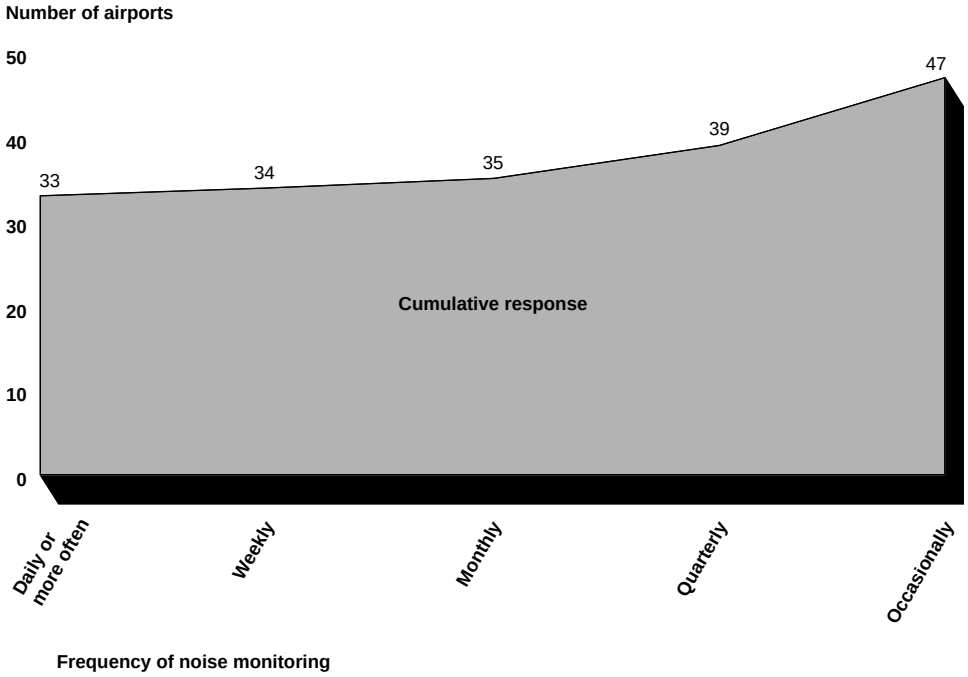
Airports also reduce the impact of noise on surrounding communities by undertaking land-use mitigation measures, including acquiring noise-sensitive properties, relocating people, modifying structures to reduce noise, encouraging compatible zoning, and assisting in the sale of affected properties.

FAA supports airports' efforts to mitigate aircraft noise through its voluntary noise compatibility program—known as the Part 150 Noise Compatibility Program—and has developed guidance for local governments and other interested parties to encourage compatible land uses near airports. Over 200 airports have undertaken comprehensive airport noise compatibility planning and used federal funding under FAA's airport grant program to implement noise mitigation projects. Airport operators also fund noise mitigation related to new development, such as new runways. Airports can use airport grant funds, passenger facility charges,[9] and airport revenue to mitigate the impact of noise from airport developments and operations.

In addition to these efforts, most airports have voluntarily established some type of noise monitoring system—the more sophisticated of which allow airport officials to combine data from flight operations with specific "noise events" to identify the responsible aircraft. For example, officials from 47 airports reported that their airport monitors noise occasionally, and over half of those surveyed reported that they monitor noise daily or more often. (See fig. 5.) Officials from one airport reported that they do not monitor aircraft noise, and two others are in the process of installing noise-monitoring systems.

[9]A passenger facility charge is a boarding fee charged to passengers to help pay for airports' capital development and noise-related projects.

Figure 5: Cumulative Totals for the Frequency of Airport Noise Monitoring



Source: GAO's survey of the nation's 50 busiest commercial service airports.

Some airports have dedicated staff or created offices to operate these noise-monitoring systems and, in some cases, to oversee noise abatement activities. For example, the Noise Abatement Unit for Boston's Logan International Airport serves as a liaison between the community and FAA's control tower. Airport officials told us that this office suggests flight patterns and/or operational procedures to the air traffic control tower in an effort to reduce the effects of noise on nearby communities. In addition, the office receives and processes complaints 24 hours a day, 7 days a week. Other airports reported having similar activities in place.

Airports' Public Outreach Efforts Often Target Aircraft Noise Issues

Another mechanism employed by officials at some airports to address aircraft noise issues is public outreach and education. For example, the San Francisco International Airport created the San Francisco Airport Roundtable in 1981—a voluntary body that includes representatives from 13 Bay Area jurisdictions, FAA officials, airline advisors, air traffic managers, and the airport director—to discuss and attempt to resolve

primarily noise-related issues. Similarly, Fort Lauderdale International Airport officials told us that an ad hoc committee comprising neighborhood, community, and aviation industry representatives was formalized in 1992 to address residents' concerns about the airport's noise. (See app. I.) Similar airport/community noise groups have been established at other airports, including the Minneapolis/St. Paul International Airport, the Oakland International Airport, and Chicago's O'Hare Internatioanl Airport.

Lack of control over air traffic operations was cited by half of the airport officials surveyed as a major or moderate concern when addressing noise issues. An airport industry representative stressed that U.S. airports cannot control the frequency and type of aircraft that use their facilities and that airports are not able to control the amount of noise that aircraft generate.

FAA and the Department of Transportation have reported that with the recent completion of the Stage 3 phase-in, additional noise mitigation techniques will have to be undertaken locally by airports until more can be done to reduce aircraft noise in the future. Options might include changing the operating characteristics for an airport, such as the landing and take-off corridors and preferential runway use. Airport officials can recommend these changes to FAA on an ad hoc basis or through the agency's noise compatibility program.

FAA also implements a national program for review of airport noise and access restrictions. It is through this process—known as Part 161—that FAA reviews airports' requests for restrictions on certain aircraft operations to help reduce noise. Airport operators often choose to negotiate informal voluntary agreements with airlines, FAA air traffic towers, and other airport users, rather than pursue mandatory restrictions through the demanding Part 161 process.

Community Concerns About Aircraft Noise Persist Despite Airports' Efforts

Despite the mandatory and voluntary measures currently being implemented by many airports, some citizens' groups and local officials do not believe that their concerns about aircraft noise are being adequately addressed. For example, some citizens are concerned that aircraft are not adhering to preferred flight paths to help minimize the impact of aircraft noise on surrounding communities. FAA officials told us that aircraft may deviate from preferred flight paths when necessary to ensure safety. In general, airport representatives stress that much of the aircraft noise is

beyond the control of airports; however, airports are often the focal point of noise complaints.

Two airports that we visited illustrate the concerns of communities about aircraft noise.

Los Angeles International Airport: Citizens' groups and local government officials from several communities surrounding the Los Angeles International Airport said they are dissatisfied with the airport's efforts to address the impact of aircraft noise. In particular, they are dissatisfied because some aircraft—primarily older, noisier aircraft[10]—are making turns early after takeoff and, hence, not following approved flight paths. In addition, these community and local officials, as well as regional air quality officials, are concerned that the airport has "incrementally" increased its capacity by 20 million passengers annually without any type of environmental review. These citizens' groups and regional air quality officials are concerned about these issues because, as aircraft operations increase, noise and emissions levels can also increase. However, an official from the airport authority said that the airport has several measures in place to minimize aircraft noise—a noise-monitoring system to track violations, in-flight procedures (including the preferred use of certain runways and departures over the ocean), the use of quieter Stage 3 aircraft, sound insulation for impacted residences, and a sound wall[11] to mitigate the effect of aircraft noise on residents. However, this official noted that some of the flight procedures intended to minimize the impact of noise on surrounding communities are not always followed for safety reasons. In addition, the airport's noise office sends monthly reports to airlines regarding deviations from approved flight paths by their pilots and investigates to see if the airport tower directed a given pilot to deviate.

[10]These aircraft are particularly noisy because they are among those that weigh less than 75,000 pounds and therefore were not required to be modified or phased out to meet the more stringent standards for Stage 3 aircraft. The federal phaseout regulation for aircraft does not apply to aircraft weighing less than 75,000 pounds. Thus, older subsonic jet aircraft (certified before 1975) that do not comply with Stage 3 standards are still allowed to operate in the United States.

[11]During a tour of Los Angeles International Airport, an airport authority official noted that a wall had been built between the airport and residences in an effort to reduce the impact of aircraft noise on adjacent communities. However, the official told us that these walls are often constructed for political reasons and, in some cases, can actually increase the impact of noise on some residences by creating a tunneling effect. Similarly, officials at Miami International Airport told us that a sound wall built by the airport has been only marginally effective because it buffers only the first several rows of residences closest to the wall.

Furthermore, according to FAA, the airport is implementing an airport roundtable modeled after the San Francisco Airport Roundtable to further address concerns about aircraft noise in the Los Angeles area.

Miami International Airport: During our visit to the airport, an airport official told us that only in the past 5 years has the airport admitted that it has an aircraft noise problem. This official added that complaints about aircraft noise have increased from about 18 to 19 per month in 1993 to 300 to 400 a month in 1999[12] and that communities are beginning to show resistance to the airport's current expansion plans. To help address the communities' concerns, this official told us the airport plans to more than double its aircraft noise and environmental planning staff this year, increase the use of departure routes that avoid residences that are currently affected, and continue to close runways at night. However, this official told us that the airport does not participate in FAA's noise compatibility program and, as a result, does not receive federal grant funds for mitigating the impact of noise on residents in surrounding communities. Such funds could be used, for example, to insulate the 65,000 homes affected by high noise levels—those greater than 65 dB DNL. (See fig. 6.) Local government officials from this community told us that they have created an ad hoc committee of several affected communities to oppose expansion by the airport unless the airport implements a noise compatibility program for residences. A proposed new runway would be 800 feet closer to this community. According to these officials, the most important recommendation from the ad hoc group has been that the county's aviation department develop and implement a noise compatibility program for the airport so that it will be eligible for federal funding for soundproofing residences.

[12]The airport official responsible for addressing aircraft noise told us many of these complaints are from residents living in areas with relatively low noise levels—below the 65 db DNL.

Figure 6: Residential Communities Bordering Miami International Airport

Some airport representatives also stressed that the ability to address noise complaints is often outside their control. For example, one airport official noted that federal law does not authorize the airport to impose fines on airline operators for violating preferential flight paths designated by the airport—nor can the airport force air traffic controllers to follow such procedures. As a result, the authority to direct flights in a manner that reduces the impact of noise on surrounding populations—consistent with safe and efficient use of the nation's airspace—rests with FAA tower operators. FAA officials said that the responsibility for addressing aircraft noise is shared among FAA; airports; airlines; and federal, state, and local governmental entities—reiterating the position FAA has taken since the mid-1970s. However, these officials stressed that the airport is primarily responsible for addressing aircraft noise problems in the areas surrounding the airport.

Water Quality Is a Primary Concern and Challenge for Airports

Runoff from airport activities is a concern for airports because it can have harmful effects on local water quality unless managed correctly. Hence, containing runoff is an ongoing challenge for airports. Officials from 12 of the 50 airports surveyed reported that water quality issues are currently their primary concern—ranking these issues second overall to noise issues. In addition, officials from 18 airports reported that concerns specific to deicing and anti-icing most affect their airports' operations. Many of these airports are in northern states that generally receive large amounts of snowfall. As a result, airports and airlines are challenged to reduce the environmental impact of deicing and anti-icing operations—specifically, those related to the use of glycol products. In addition, officials from 31 airports cited other water quality issues as their primary concern and ranked controlling fuel spills as the chief challenge among these.

To remove and prevent the buildup of ice and snow that would inhibit taxiing, takeoff, and landing, airports may apply deicing and anti-icing chemicals to paved surfaces such as runways and taxiways. Similarly, airlines may apply deicing and anti-icing chemicals to aircraft to help ensure the safety of operations. (See fig. 7.) These chemicals have the

potential to contaminate groundwater and surface water supplies if allowed to flow from airport facilities to storm drains or waterways. Runoff from airports may also contain fuel, fire-fighting retardants, and other pollutants.

Figure 7: Aircraft Deicing/Anti-Icing Trucks at Denver International Airport

According to officials from 18 of the 45 airports where deicing occurs, the use of glycol-based products at their airport is a major water quality concern. While standards governing ethylene- and propylene-glycol-based chemicals are developed by the Society of Automotive Engineers and accepted by FAA, both chemicals cause environmental concerns because they are highly soluble and rapidly biodegrade, threatening aquatic life as they break down in water and consume oxygen. Airports have more options for deicing runways than airlines have for deicing aircraft. Some airports have begun to use alternative, less polluting materials for runways. For example, officials from 26 airports reported using potassium acetate, and officials from 5 airports reported using calcium magnesium acetate. These substances have been approved by FAA on both safety and environmental grounds and, according to EPA, have no significant impact on water quality. However, officials from 17 of the airports surveyed still use urea, which is less expensive and can have a negative impact on water quality.

Airports that intend to discharge pollutants, such as spent deicing fluids, into the nation's waters must obtain a National Pollutant Discharge

Elimination System permit from either EPA or a state authorized by EPA to issue the permit. To obtain such a permit, an airport must provide quantitative analytical data identifying the types of pollutants present in its discharges. The permit will then set conditions and limits on the airport's pollutant discharges, including discharge limits based on federal or state water quality criteria or standards, which were designed to protect surface waters that support aquatic life and/or recreation. Water quality criteria and standards vary from state to state and site to site, depending on the uses of the receiving water body. Airports' permits must also reflect stormwater discharges associated with deicing and airport maintenance activities.

Lack of control over the deicing of aircraft is also a concern for airports. Aircraft deicing is largely outside an airport's control because it is done by a variety of tenants and users, such as the airlines that operate much of the equipment used for deicing. In most cases, airports are considered the "discharger" for regulatory control and permitting purposes, and individual airlines do not hold specific discharge permits for deicing chemical runoff. As a result, the runoff attributable to the airport operator is minimal. However, in some cases, the airport and the airline jointly hold the permit, or contractual agreements between them stipulate shared responsibilities, including legal accountability. Sharing responsibility has fostered more communication and accountability between airlines and airports for reporting and documenting the use of deicing materials because both are held legally accountable for discharge activities.

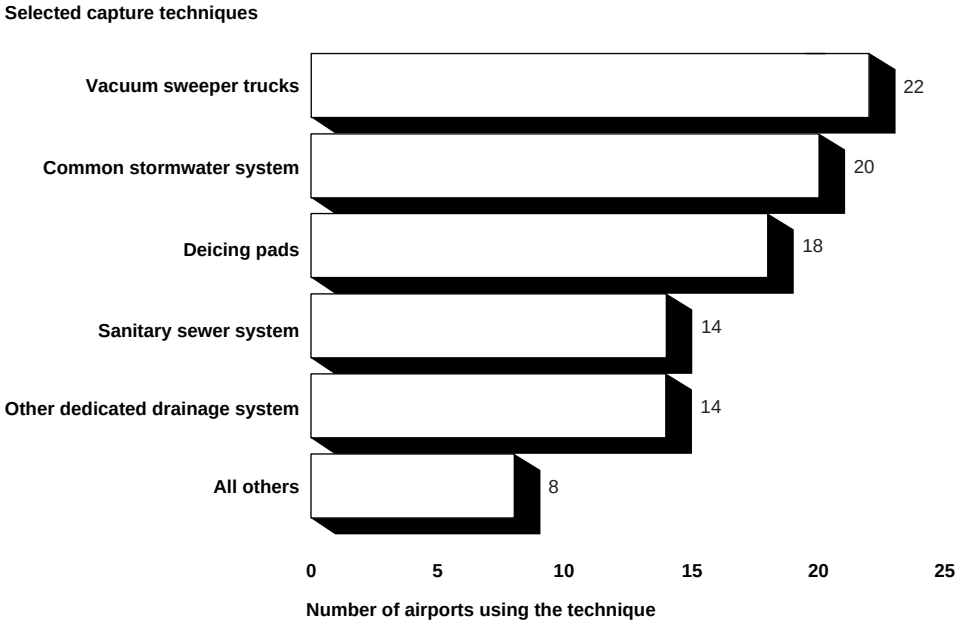
Eleven airports reported fuel spills as their primary concern—the second most prominent water quality concern after deicing. Leaks, improper connections, and improperly monitored storage tanks can lead to fuel spills. If spills are not contained or diverted to an established treatment system, they may contaminate soil and/or groundwater. To help address this concern, the airline and petroleum industries and a number of airports have funded an effort to study and identify remedial and preventative measures to detect and address fuel leakage and spills at airports.

A representative of a national network of citizens' groups told us that the contamination of groundwater from deicing/anti-icing chemicals and fuels is of concern for citizens living near the nation's airports. According to this representative, several lawsuits are pending at major U.S. airports because of contamination from deicing runoff and leaking underground storage tanks. These lawsuits reflect citizens' concerns about the adverse health effects of such contamination.

Airports Are Attempting to Mitigate the Impact of Deicing/Anti-Icing Operations and Fuel Spills

To manage runoff from deicing/anti-icing and fueling operations, airports reported that they employ a range of techniques. Most frequently, they use vacuum sweeper trucks for capturing deicing or anti-icing chemicals. These trucks are used by almost half of the airports we surveyed where these chemicals are applied. Figure 8 provides a summary of airports' capture techniques.

Figure 8: Airports' Use of Selected Deicing and Anti-Icing Chemical Capture Techniques



Note: Statistics include the 45 airports at which deicing chemicals are used.

Source: GAO's survey of the nation's 50 busiest commercial service airports.

Airports also often use tanks or ponds to store glycol-laden runoff so that it can be released during high flow periods, when mixing of the runoff with higher water volumes minimizes glycol's effects on aquatic systems. In addition, many airport operators filter the runoff through equipment that removes the glycol component for reuse. For example, Denver International Airport has an extensive system for capturing and recycling the runoff from its deicing/anti-icing operations. This system includes a wide range of equipment for collecting the runoff, an extensive drainage system, large holding ponds for storing the runoff, and a plant that is used

for mixing and recycling deicing fluids. Portland International Airport has also undertaken a comprehensive effort to manage the runoff from its deicing/anti-icing operations and the environmental impact of this runoff on local water bodies—primarily the Columbia Slough and the Columbia River. (See app. I.)

Airlines Help Airports Manage Deicing/Anti-Icing Operations

Several airline representatives told us they are aware of the environmental concerns associated with deicing and anti-icing operations and are undertaking a variety of measures with airports to address these concerns. For example, one airline representative told us that over the past several years, the airline has upgraded its stormwater management program nationwide to reduce the impact of its deicing operations on water quality. In addition, the airline is testing a system that uses forced air and a smaller amount of deicing fluid to remove snow and ice—using 50 percent less deicing fluid (glycol) than the former system. Furthermore, the airline uses computers to measure and blend deicing mixtures in accordance with ambient conditions instead of using an equal mixture of glycol and water that can result in the use of more glycol than is needed for safe operations. The airline is also funding research to identify state-of-the-art methodologies to reduce the environmental impact of deicing and anti-icing fluids and plans to share the results with the air transport industry. Additionally, the airline industry is working with other interested parties to further evaluate and address deicing runoff at airports.

Furthermore, an airline industry representative told us that one airline is using a new method of deicing aircraft using infrared technology inside a hangar-like structure instead of applying deicing chemicals. However, the official stressed that this technology is in its early stages.

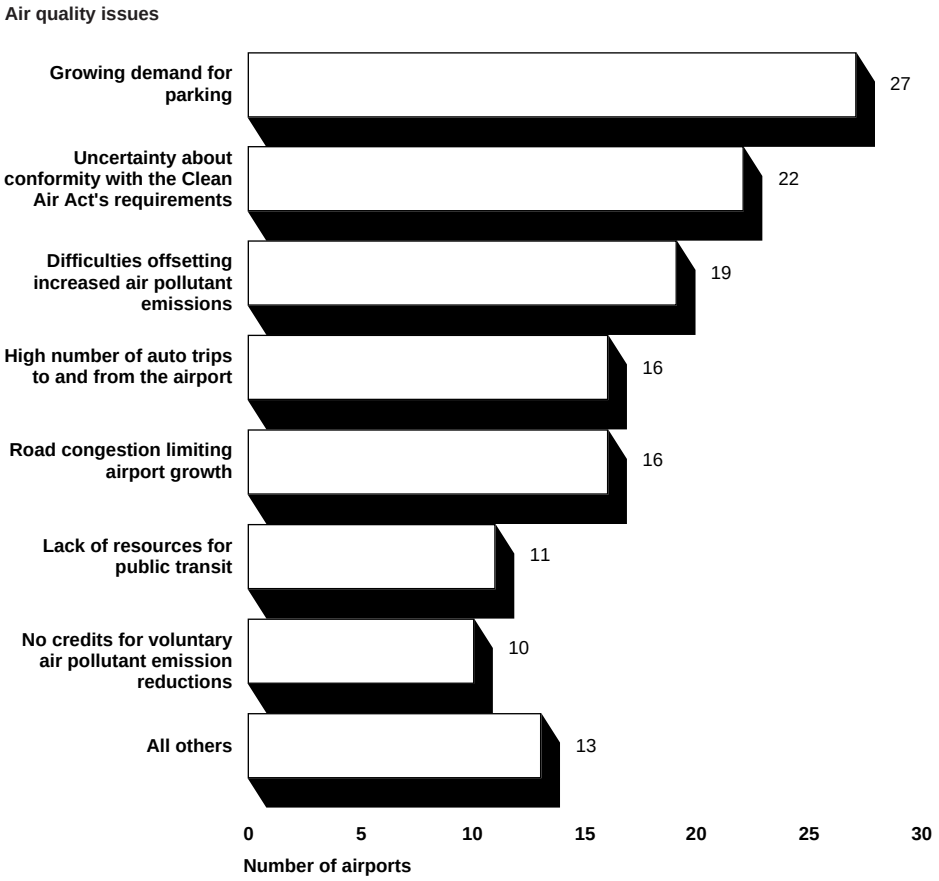
Air Quality Is an Increasing Concern and Challenge for Airports

The major source of air pollutant emissions generated at airports is vehicles that rely on fossil fuels and are used to access and operate the airport facility. These vehicles include (1) aircraft; (2) vehicles such as automobiles, shuttles, and public transit that transport people and goods to and from the airport; and (3) ground support equipment used in the facility, such as aircraft towing, baggage-handling, maintenance/repair, refueling, and food service vehicles. Air quality is a major concern for many of the nation's busiest commercial service airports and is expected to become a more serious issue for them in the future. For current operations, officials from six of the airports we surveyed cited air quality as their primary environmental concern. Specifically, they identified the growing demand for parking—which could lead to increased congestion and emissions around airports—and uncertainties about how to comply with the Clean Air Act as challenges for their airports. For future operations, officials from 16 airports ranked air quality first among their environmental concerns. Many of the airport officials we surveyed have strategies in place to deal with air quality issues. In addition, airlines assist airports with their efforts to reduce air pollutant emissions generated by airport operations.

Airports' Primary Air Quality Concerns Involve Parking Demand and Compliance With the Clean Air Act

Airport officials cited a variety of air quality concerns associated with their current operations. Officials from 27 of the airports surveyed reported that the demand for parking is currently a major concern because of traffic congestion and the effects of increased emissions on air quality. In addition, officials from 22 of the airports surveyed said that uncertainties associated with conforming to the requirements of the Clean Air Act were a major concern for them. Finally, officials from 19 of the airports surveyed noted that offsetting air pollutant emissions, as required in their state implementation plans, is a major concern, while 16 said that the high number of auto trips to and from the airport and the limits on airport growth due to road congestion were major concerns. (See fig. 9.)

Figure 9: Air Quality Issues That Are Major Concerns for Airports



Source: GAO's survey of the nation's 50 busiest commercial service airports.

The air quality concerns cited by airport officials as the most problematic are interrelated. For example, the growing demand for parking is linked to the high number of automobile trips to and from the airport and the amount of road congestion surrounding the airport. All of these traffic indicators are a factor in the amount of emissions produced around an airport and affect the airport's ability to comply with the Clean Air Act and its state's plan to come into compliance with the act. An aviation industry official noted that an airport's difficulties conforming to the Clean Air Act's requirements is the largest direct impediment to an airport's future growth.

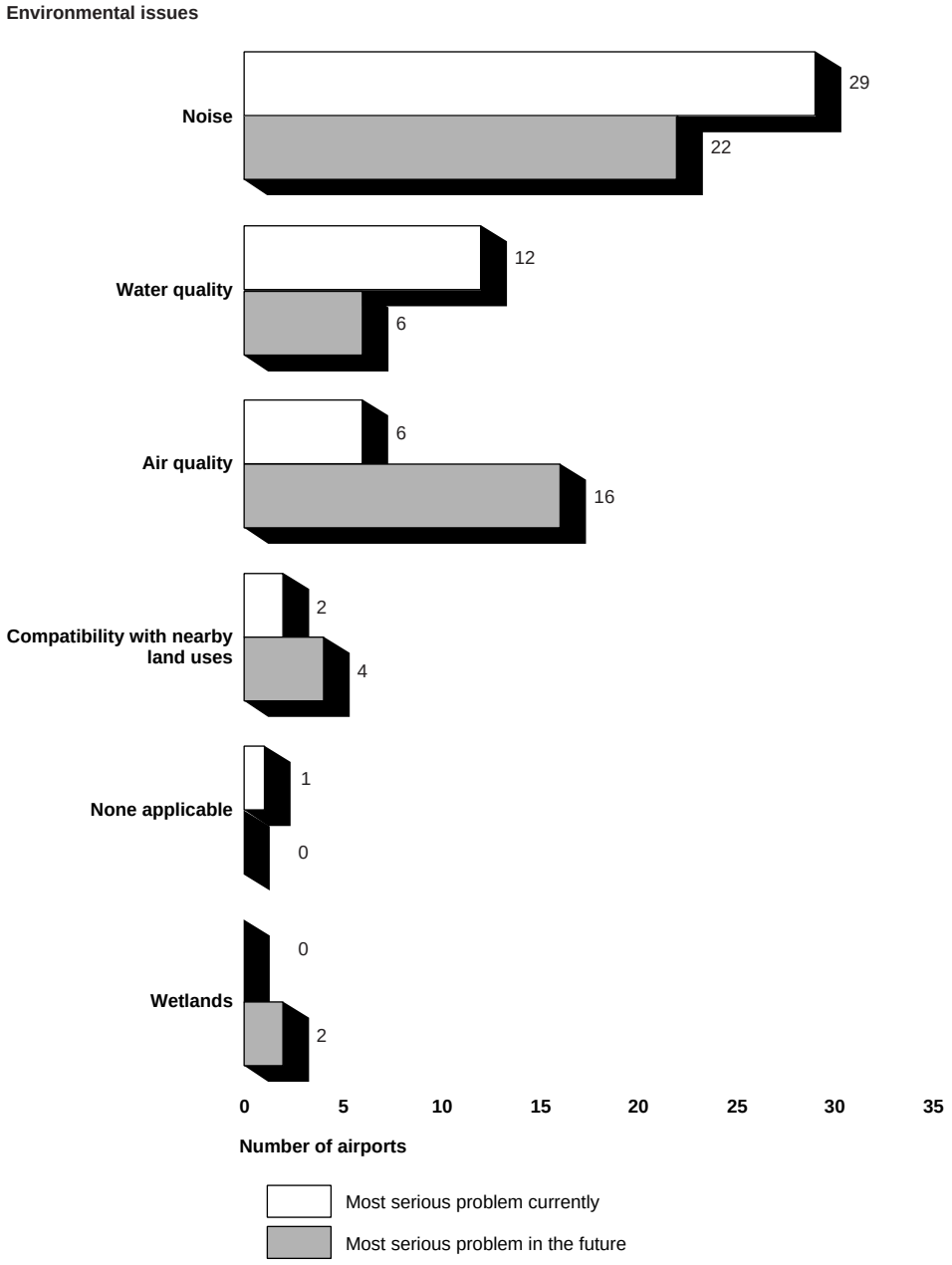
Air Quality Is a Growing Concern for Future Airport Operations

When considering the future, officials from 16 of the nation's 50 busiest commercial service airports cited air quality as their most significant environmental concern. (See fig. 10.) Many of these airports must comply with state implementation plan requirements (e.g., emission limitations), which do not always consider airports' plans to grow. Compliance is of particular concern for 33 airports that are located in areas found in violation of certain Clean Air Act requirements—referred to as air quality nonattainment areas.[1] Another four airports are located in areas that recently achieved compliance, known as maintenance areas.[2] FAA and EPA concur with the airport officials' growing concern about air quality issues, stating that while noise is the greatest current concern affecting aviation capacity, the focus on air pollutant emissions is expected to increase in the future.

[1]A nonattainment area is any geographic area in the United States that is in violation of any National Ambient Air Quality Standard for specified criteria pollutants (ozone, carbon monoxide, particulates, sulfur dioxide, nitrogen dioxide, and lead) under the Clean Air Act, as amended.

[2]Any geographic area of the United States previously designated as a nonattainment area pursuant to the Clean Air Act Amendments of 1990 and subsequently redesignated to attainment.

Figure 10: Environmental Issues That Most Concern Airports Currently and in the Future



Source: GAO's survey of the nation's 50 busiest commercial service airports.

Many Airports Have Begun to Address Concerns About Air Pollutant Emissions

The majority of the nation's 50 busiest commercial service airports are funding strategies to address their concerns about airport air pollutant emissions. These strategies include increasing the use of (1) alternative-fuel vehicles and the infrastructure that supports them; (2) alternative, less-polluting power sources for aircraft operations at airport gates; and (3) shuttle service to the airport from remote locations for passengers and employees.

Currently, some airports are providing incentives to encourage the use of alternative-fuel vehicles. For example, some airports offer discounted fees to commercial operators that transport people to and from the airport if they use alternative-fuel vehicles. In addition, officials from 30 of the 50 airports we surveyed reported that they have alternative fuel-stations to support the use of these vehicles. Another airport that we visited provides free parking to passengers that drive electric vehicles, has 15 recharging stations available, and is planning to expand the number of stations in the future. (See fig. 11.) In addition, most shuttles using this airport can operate on alternative fuels. However, some airport officials we interviewed cautioned that many of these vehicles can also be operated on gasoline, noting that it is difficult to determine when and if alternative fuels are being used.

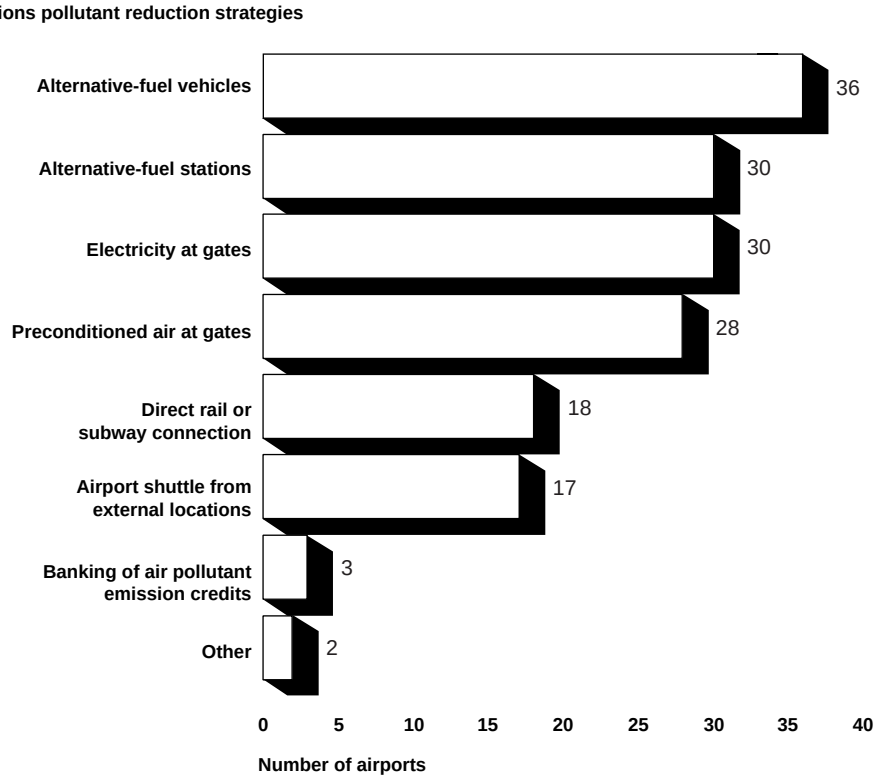
Figure 11: Electric Vehicle Recharging Stations at Los Angeles International Airport

Officials from 30 of the airports surveyed reported they provide electricity and 28 of the airports surveyed said they provide preconditioned air at some gates[3] for airlines' use to reduce or eliminate the need for aircraft to operate separate generators (e.g., ground power and conditioned air units, as well as auxiliary power units onboard aircraft). Allowing aircraft to use airport-provided electricity and air reduces both air pollutant emissions and fuel use. However, regional air quality officials from one state expressed concern that many airlines still rely on generators out of habit, instead of using the less polluting electricity and preconditioned air provided by some airports.

In addition, officials from 18 of the airports surveyed reported that they have a direct rail or subway connection to the airport. For example, at Atlanta's Hartsfield International Airport, passengers can check in for their flight just outside the airport's metropolitan rail station. Officials from 18 of the airports surveyed also operate shuttles from remote locations to reduce the number of individual passengers and employees traveling to the airport, and, in turn, air pollutant emissions. (See fig. 12.)

[3]Gates are wired to provide aircraft with air and electricity during gate operations.

Figure 12: Strategies for Reducing Air Pollutant Emissions Funded by Airports



Source: GAO's survey of the nation's 50 busiest commercial service airports.

Currently, a small percentage of the ground service equipment (e.g., airplane tugs and baggage carts operated by airlines) and ground access vehicles (e.g., cars, taxis, and buses operated by passengers, airports, and/or commercial operators) at airports are using alternative fuels. Approximately 2 percent of the ground service vehicles and less than 1 percent of the ground access vehicles currently operate on alternative fuels at the 50 busiest commercial service airports. However, airport officials expect those levels to more than quadruple in the next 5 years.

To address air quality concerns, some airports are increasing the use of a wide range of emissions reduction strategies to limit the impact of airport operations on local air quality. Two of the airports we visited—Boston's Logan International and Los Angeles International airports—have implemented such strategies. Massport[4] officials told us that Boston's Logan International Airport has numerous air pollutant emissions reduction efforts under way and has successfully leveraged private-sector funds to support them, including maximizing the number of alternative-fuel vehicles used at the airport. Remote park-and-ride facilities also make less expensive parking available for passengers and airport employees and improve air quality at the airport by reducing the number of vehicle trips into the airport core. In addition, through the establishment of public/private partnerships, the airport has helped private operators of buses, shuttles, and taxis defray the up-front costs of purchasing these vehicles. The airport also discounts the cost of access permits for operators of alternative-fuel vehicles and is encouraging rental car facilities to collocate their facilities and consolidate their passenger shuttle operations to reduce air pollutant emissions.

According to officials from Los Angeles World Airports,[5] Los Angeles International Airport has undertaken a variety of air emission reduction efforts that support aircraft operations and access to the airport. These activities include hosting a conference for airport tenants to promote the use of alternative-fuel vehicles for ground service equipment, providing airlines with electricity and preconditioned air at many gates to reduce the need for them to use higher-polluting onboard or auxiliary generators, operating employee van pools, establishing remote pickup sites for passengers and employees, operating alternative fuel shuttle vehicles (see fig. 13), and providing free parking and the use of electric recharging stations for electric vehicles users. (See app. I.)

[4]Massport is an independent public authority, which develops, promotes, and manages airports—including Logan International Airport, the seaport, and transportation infrastructure.

[5]Los Angeles World Airports is the aviation authority that maintains and operates the Los Angeles International Airport, Ontario International Airport, Van Nuys Airport, and Palmdale Regional Airport.

Figure 13: Use of Alternative-Fuel Shuttles at Los Angeles International Airport

Airlines Work With Airports to Reduce Air Pollutant Emissions

Airlines work independently and with airports to reduce the emissions generated by their operations. One airline representative stressed that the industry has every incentive to improve its operations to reduce fuel consumption and, hence, emissions, because fuel costs are the airlines' second largest expenditure after personnel costs. This representative said that when airlines choose not to take actions that are viewed as beneficial to the environment, safety considerations are often the driving factor.

Airlines have a range of efforts under way to reduce the emissions associated with their operations. For example, one airline has pioneered the use of single engines—instead of multiple engines—for taxiing to reduce the impact on local air quality when operationally feasible. This airline estimates that it has reduced its fleet's fuel consumption by 40 million gallons per year and, in turn, reduced the impact of air pollutant emissions. However, a representative of this airline cautioned that some aircraft engine manufacturers do not recommend this practice, and in other instances, ramp and taxi conditions may warrant the use of more than one engine. In addition, FAA officials said that the agency works with airports and airlines to develop operational procedures to reduce delays that go a long way toward reducing aircraft emissions. However, these officials also said that there are trade-offs associated with many efforts to reduce air

pollutant emissions and aircraft noise. Specifically, there may be trade-offs between nitrogen oxide and nitrogen dioxide (collectively termed NOx) and carbon dioxide emissions—when engines are modified to decrease one, the other is often increased. According to representatives of the airline industry, modifications to aircraft to reduce noise may add to the weight of an aircraft, and, in turn, cause it to burn more fuel—resulting in higher air pollutant emissions.

An official from a major cargo carrier told us it is also pursuing a range of initiatives to reduce the environmental impact of its operations, including efforts to reduce air pollutant emissions. However, this official cautioned that many of the alternative-fuel vehicles currently available to replace the carrier's ground support equipment do not meet the performance requirements for cargo carriers. For example, the tractors used to pull cargo freight must be capable of pulling much heavier loads than the tractors used to pull passengers' baggage. This official maintained that, as a result, cargo carriers cannot easily adopt the ground support equipment designed for use by passenger airlines.

The Federal Government Has Coordinated Some Efforts, but Challenges Remain

The federal government has coordinated some efforts to assist airport officials with balancing airport operations and growth with the impact on the environment. Such efforts include coordination across the federal government on aviation noise—including reaffirming the use of a common metric for measuring aircraft noise—and an ongoing effort led by EPA and FAA with the aviation industry and other interested parties to address air pollutant emissions from airport operations. In addition, FAA, EPA, and NASA have efforts in place to help airports manage the environmental effects of airport operations and growth. However, our review identified several areas in which the federal effort could be improved. Specifically, (1) federal environmental reviews are not well understood by many airport officials and the results of some of these reviews (i.e., categorical exclusions) are not systematically documented or communicated to them by FAA; (2) many airports are uncertain about how to meet their responsibilities under the Clean Air Act; (3) difficulties remain in coordinating some federal, state, and local environmental processes for airports; and (4) a federal law[1] may be limiting the effectiveness of the federal environmental approach for some airports and communities.

Federal Coordination Efforts Have Been Undertaken

Coordination has occurred across federal agencies to help balance airports' impact on the environment with their operations and growth. In addition, airport officials said that FAA assists them effectively in a number of environmental areas and coordinates its activities among its offices. The federal environmental review process itself received mixed reviews from airport officials—two of the three levels of environmental review were found satisfactory by officials from a majority of the airports.

The Federal Government Has Coordinated Its Efforts on Some Environmental Issues Related to Airport Operations

The federal government has undertaken two major efforts to coordinate and communicate on the environmental impact of airport operations, including aircraft noise and airport air quality issues.

[1] 49 U.S.C. 47504.

- In 1992, the Federal Interagency Committee on Noise published a report entitled *Federal Agency Review of Selected Airport Noise Analysis Issues*, finding that, among other things, research on the basic elements of aircraft noise assessment methodology was needed. In addition, this committee reconfirmed the use of the day-night sound level (DNL) as the common federal standard for measuring aircraft noise, concluding that there were no other measurement methods with sufficient scientific understanding to replace this method. To foster research in this area, the committee recommended that a new federal interagency committee be formed to assess future research needs and to encourage new developments in the reduction of aircraft noise. The result was the Federal Interagency Committee on Aviation Noise,[2] convened in 1993, which is continuing to foster aircraft noise and assessment research.

- In 1998, EPA and FAA, in cooperation with the Air Transport Association, created a stakeholder group on the local air quality issues associated with airport operations. The group's goal is to find voluntary ways to track and reduce the emission of air pollutants around airports. This effort has brought together many groups to work on the issue of air quality, including airlines, engine manufacturers, airports, state and local environmental regulators, and nonprofit interest groups. Several participants told us that the group began by focusing on retrofitting certain older commercial aircraft engines for emission reductions, but the debate was later opened to other potential opportunities for reducing emissions from airport operations. While participants we interviewed agree that the group's progress is often slow and frustrating, many are encouraged by the group's efforts. To date, this group has worked to establish a baseline of emissions from airports and explore options for reducing these emissions. Reports on these issues are due to be completed in fall 2000, and officials with the Air Transport Association said that the group's goal is to have the aviation industry voluntarily enter into an agreement by the end of 2000 to achieve reduction goals for air pollutant emissions.

[2]The committee was established to provide forums for debate over future research needs to better understand, predict, and control the effects of aviation noise and to encourage new developments in technology. Members include the Department of Defense, the Department of Transportation (FAA), the Department of the Interior, EPA, and the National Aeronautics and Space Administration.

FAA Has Efforts Under Way to Address the Environmental Impact of Airport Operations and Growth

FAA is working with other federal agencies and the aviation community to address the environmental impact of airports through several initiatives. It also has specific programs to address the noise, air, and water quality issues associated with airport operations and growth.

FAA Coordination to Resolve Airport Environmental Issues

FAA coordinates with other federal agencies with jurisdiction and expertise to resolve specific airport environmental issues. For example, FAA has coordinated with the U.S. Fish and Wildlife Service on an acceptable mitigation strategy for the Minnesota Valley National Wildlife Refuge—a critical component for approval of a new runway at Minneapolis-St. Paul International Airport. FAA also works with industry through forums and working groups to address environmental issues at airports.

FAA has also established design review groups associated with the development and use of the modeling systems FAA uses in assessing the potential for noise and air pollutant emissions from proposed airport development. These groups are made up of representatives of FAA, the aviation/airline industry, consultants, other users, and academia. They generally meet on an annual basis to provide input and direction to FAA on needed enhancements to these predictive models. In addition, FAA actively participates in the International Civil Aviation Organization—responsible for setting international civil aviation standards, including those for aircraft noise and emissions, through its Committee on Aviation Environmental Protection. An FAA official serves as the U.S. representative to this organization.

FAA's Specific Efforts to Address Noise, Water, and Air Quality

FAA works with aviation industry groups and targets its resources toward addressing major airport environmental issues.

Noise: Because of FAA's and the aviation community's cooperative efforts, aircraft noise levels around airports have been reduced. FAA has developed and continues to improve computer models to more accurately assess the impact of noise and to assist state and local governments and planning agencies in establishing compatible land use plans. FAA is also examining recent noise concerns from a technical and public policy perspective.

Water: FAA participates in a Society of Automotive Engineers group, which develops standards for aircraft and airport deicing. FAA and this

group have independently funded research and development on new technology for reducing and remediating the impact of glycol runoff, including the use of forced air and infrared technology to reduce the amount of deicing chemicals used. FAA also published advisory circulars on handling deicing/anti-icing agents and designing deicing facilities and worked cooperatively with EPA and industry to address stormwater discharges from airports. In addition, FAA entered into a cooperative research and development agreement that resulted in an infrared technology that is being used to deice aircraft. Furthermore, FAA officials noted that the agency administers airport grant-in-aid funds and passenger facility charges that can be used to mitigate the impact of airport expansion projects on water quality.

Air: FAA officials told us that they coordinate with EPA on national air quality issues that are applicable to airports and have developed and continue to enhance the modeling system, which is used to assess the impact of proposed airport development on air quality. In addition, the agency also administers the airport grant-in-aid funds and approves passenger facility charges that airports can use to mitigate the impact of airport expansion projects on air quality. Finally, FAA has updated its environmental guidance to include air quality, such as procedures and methodologies for assessing the impact on air quality of FAA's and the Air Force's actions at airports and air bases.[3]

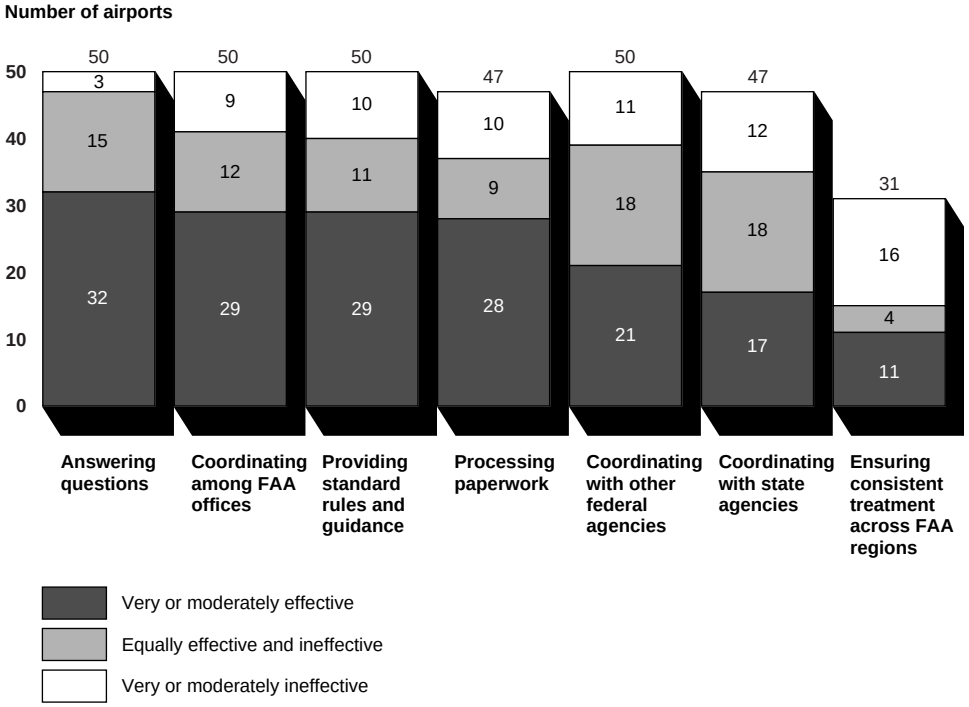
FAA Assistance to Airports Received Generally Positive Reviews

According to our survey, airport officials generally believe that FAA effectively assists them with their environmental activities. (See fig. 14.) For example, officials from 32 airports reported that they were satisfied with the way FAA answered their questions and addressed their concerns about environmental issues. In addition, officials from over half of the airports reported that FAA was effective in coordinating activities among its offices, providing standard rules and guidance, and processing paperwork. However, airport officials reported that FAA was less effective in ensuring consistent treatment across its regional offices. This could be due, in part, to FAA's decentralized structure for addressing environmental issues. For example, officials from one airport told us that FAA refused to allow them to use airport funds for off-site environmental work to mitigate the airport's impact on wetlands, but approved the same action at another airport in the same region. FAA officials told us that this apparently

[3] *Air Quality Procedures for Civilian Airports and Air Force Bases*, FAA and U.S. Air Force (Apr. 1997).

inconsistent treatment could have arisen from situational differences due to ongoing changes in wetland rules. In addition, airport officials expressed somewhat less satisfaction with FAA's coordination with state agencies than with its coordination with federal agencies—an issue some told us reflected duplication in state and federal environmental requirements.

Figure 14: Airports' Opinions of FAA's Effectiveness in Selected Environmental Areas



Note: The responses of officials reporting that they were unsure about FAA's effectiveness or that the issue did not apply to them were not included in this figure. In addition, officials from five airports identified additional issues in the "other" category.

Source: GAO's survey of the nation's 50 busiest commercial service airports.

EPA Has Undertaken Efforts to Address the Environmental Impact of Airport Operations and Growth

In addition to issuing regulations, EPA has several efforts under way to address the environmental impacts of airport operations and growth related primarily to water and air quality. For example, EPA, FAA, and the Society of Automotive Engineers undertook a 2-year study of airport deicing operations to provide information needed to decide whether additional regulation was required to address water-related environmental issues at airports. On the basis of the study, EPA decided not to develop regulations for airport deicing operations in 2000; however, the agency may decide to do so in the future.[4]

In the area of air quality, EPA participates in a forum focused on development of "green airports" through the voluntary adoption and implementation of environmentally friendly equipment, processes, and services. The agency has also developed the general conformity rule applicable to airports, published guidance on compliance with air quality requirements, and briefed FAA and other interested parties, including airport managers, on the general conformity requirements. In addition, a 1999 EPA study found that aircraft emissions are a potentially significant, increasing source of pollution in 10 cities with local air quality problems.[5] Moreover, the agency has initiated efforts to update and improve general conformity rules for complying with the Clean Air Act. EPA also reviews environmental impact statements prepared by FAA for airport development projects. Furthermore, EPA has developed evaluation tools and models for communities, airport planners, and local regulators to encourage innovative actions to improve air quality. For example, EPA has created a model for helping airports estimate the impact of different strategies for reducing the emission of air pollutants from ground support equipment.

NASA Is Involved in Efforts to Work With Industry to Address Aviation's Environmental Impact

NASA, in cooperation with FAA and the aviation industry, is continuing to develop new technologies, including airframe improvements and new engine combustor technologies, to reduce the impact of aircraft noise and air pollutants.

[4] *EPA Preliminary Data Summary—Airport Deicing Operations* (EPA, Jan. 2000).

[5] *Evaluation of Air Pollutant Emissions from Subsonic Commercial Jet Aircraft* (EPA, Apr. 1999).

According to a NASA environmental manager, FAA is NASA's principal partner in aviation noise reduction research, and FAA uses NASA's scientific and technological knowledge to regulate noise from aircraft.[6] The NASA official said that EPA, the Department of Energy, and FAA depend on NASA's research on aircraft noise, such as that on making quieter engines, because they do not do any such research. For example, NASA—in cooperation with the aviation industry—developed new, quieter engines that led to the phaseout of older, noisier Stage 1 and Stage 2 aircraft. In addition, the agency currently has technology in the pipeline that will allow noise reductions well beyond Stage 4 standards. Pending adequate funding, NASA's goal is to develop technology that, if incorporated, would reduce aircraft noise by 10 decibels between 1997 and 2007 and by a total of 20 decibels by 2022. However, FAA officials noted that technologies developed by NASA are passed off to industry and that many years can pass before these technologies are available on new aircraft.[7]

In the past, NASA also made significant contributions toward reducing aircraft emissions through the development of new technologies. These improvements—in combination with those of the aviation industry—have helped aircraft burn fuel more efficiently and, hence, reduce emissions.

[6]According to an FAA official, the agency contributes about $1 for every $20 NASA spends on relevant environmental research.

[7]There is no assurance that industry will complete the development of any technology developed in NASA's programs. Such development will occur in response to the marketplace or regulatory standards.

NASA has a new program—Ultra-Efficient Engine Technology—that will fund engine technology research and development to further reduce aircraft emissions. NASA believes that this program (running from fiscal year 2000 through fiscal year 2005) will continue efforts to reduce NOx emissions to 70 percent below the International Civil Aviation Organization's 1996 standard. Through this program, NASA plans to develop technology to further reduce carbon dioxide emissions by 15 percent below today's emissions. While an industry official questioned whether NASA could achieve this goal—noting that current aircraft engine technologies generally require a trade-off between NOx and carbon dioxide emissions (when engines are designed to minimize NOx emissions, they generally emit more carbon dioxide, and vice versa)—EPA and NASA consider the goal feasible in principle. According to EPA, a potential trade-off exists between carbon dioxide and NOx emissions; however, engine technology can reduce NOx emissions from aircraft without increasing carbon dioxide emission levels. NASA is performing in-depth studies with propulsion and airframe manufacturers to assess the trade-off of these various technologies toward meeting the goal of reducing NOx and carbon dioxide simultaneously. Furthermore, an EPA official noted that one engine manufacturer makes an engine that reduces NOx emissions by 20 percent without increasing carbon dioxide emissions.[8] In addition, a NASA official told us that in 1999, the agency completed a full-scale demonstration of a new combustor technology on an aircraft engine that reduced NOx levels 50 percent below the International Civil Aviation Organization's 1996 standard, while holding carbon dioxide emission levels constant. NASA is fairly confident, given the data and testing thus far, that these reductions can be achieved when the new technology is ultimately used on new production aircraft.

NASA also expects to make aerodynamic improvements, such as using lighter and stronger materials, to reduce the amount of fuel burned by aircraft. In addition, improvements in aircraft engines—anticipated through reductions in weight and applications of new engine technologies—are expected to significantly improve fuel efficiency. However, an aviation industry official pointed out that there are trade-offs between applying these new engine technologies and ensuring safety and performance. EPA agrees with FAA that safety is the highest priority for

[8]According to the Intergovernmental Panel on Climate Change, there is no single relationship between NOx and CO_2 that holds for all engine types. See *Aviation and the Global Atmosphere*, IPCC (1999).

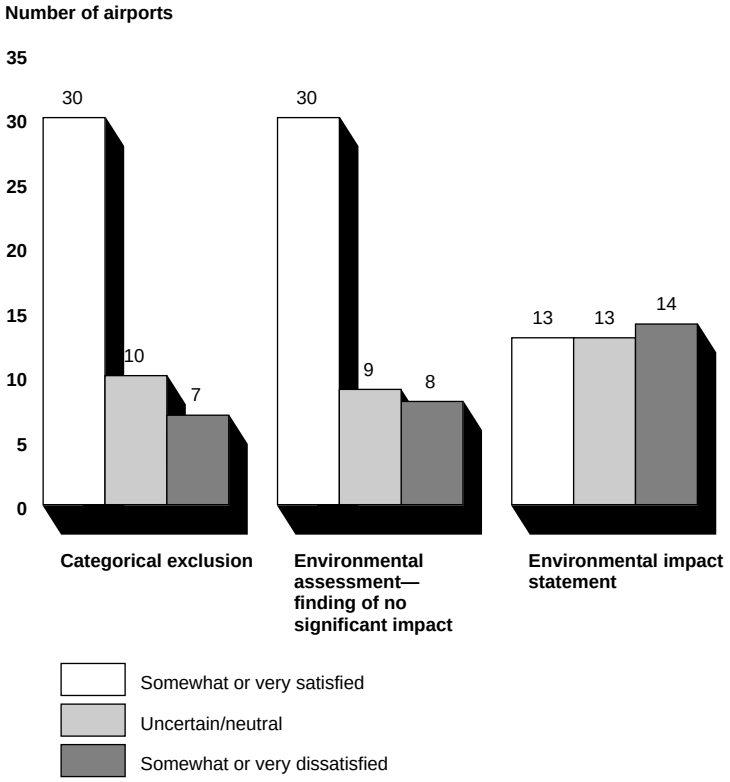
aviation but maintains that using less-polluting technologies does not necessarily compromise safety. Also, NASA officials told us that the agency has developed a type of propylene glycol for deicing aircraft that is environmentally benign (nontoxic and food grade); however, this product is not yet commercially available.

Federal Environmental Review Processes Received Mixed Reviews From Airports

Airport officials reported various levels of satisfaction with the federal environmental review process required under NEPA. Specifically, officials from 30 of the airports that have had recent experience with completing various federal environmental review requirements under NEPA reported that they were generally satisfied with the process used to determine if a project will be categorically excluded from further review, but officials from only 13 were satisfied with the review process required for a full-scale environmental impact statement.

Officials were also generally satisfied with the environmental assessment process that is used to determine whether a more in-depth environmental review (environmental impact statement) or a finding of no significant impact is warranted. (See fig. 15.)

Figure 15: Airports' Satisfaction With the NEPA Review Process



Note: The figure shows the statistics for those officials with experience with these levels of NEPA review. Officials from three airports did not have experience with the categorical exclusion process. Officials from two airports did not have experience with the environmental assessment process resulting in findings of no significant impact, and an official from an additional airport did not answer this part of the question. Officials from 10 airports did not have experience with the environmental impact statement process.

Source: GAO's survey of the nation's 50 busiest commercial service airports.

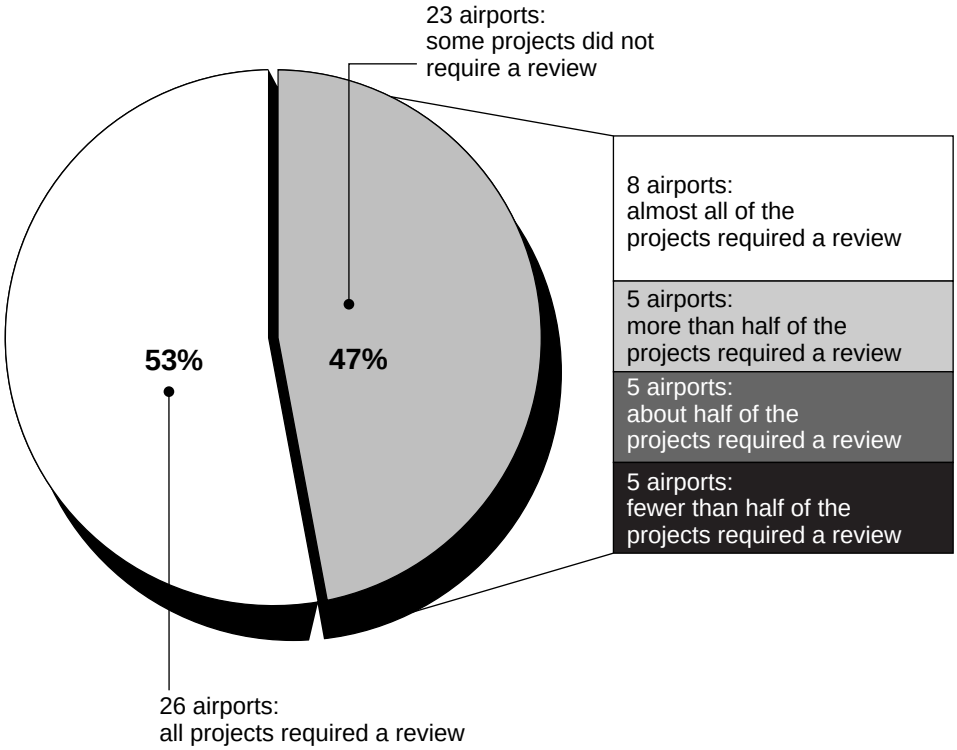
The Federal Environmental Review Process Is Not Well Understood by Many Airport Officials, and Some Reviews Are Not Systematically Documented or Communicated to Them by FAA

Officials from 23 airports reported that at least some of their capacity expansion projects (defined in the survey as including taxiways and terminals) did not require an environmental impact statement, environmental assessment, or categorical exclusion. (See fig. 16.) However, NEPA regulations require that all "major federal actions" receive one of these types of reviews, and FAA's policy[9] implementing NEPA also requires that airport projects that FAA approves receive such reviews. FAA headquarters officials confirmed that FAA's policy requires that all airport capacity expansion projects receive an environmental review and maintain that all such reviews are taking place. The responses from airport officials suggest, however, that there is a lack of understanding about when environmental reviews are required.

[9]FAA Order 5050.4A, *Airport Environmental Handbook*.

Figure 16: Share of Airports With Expansion Projects Whose Projects Required Environmental Review

Figure includes the 49 airports with expansion projects in the last 10 years



Source: GAO's survey of the nation's 50 busiest commercial service airports.

While NEPA regulations issued by the Council on Environmental Quality and FAA's policy require environmental assessments and environmental impact statements to be documented for airport development projects, documentation is not required for categorical exclusions. However, when airports request federal funding or authority to collect and use passenger facility charges,[10] FAA requires that funding records include specific categorical exclusion determinations, while projects that are categorically excluded and do not use federal funding do not require specific documentation on airport layout plan approvals.[11] This leaves FAA without systematic documentation that all categorical exclusion reviews are occurring. Documentation of all categorical exclusions by FAA is important because these determinations account for the vast majority of environmental reviews conducted by the agency. Without documentation, a reliable determination cannot be made about whether categorical exclusion reviews are taking place when no FAA funding is involved. FAA officials also told us that they do not have a systematic process for communicating to airport officials the results of categorically excluded projects.

FAA headquarters officials acknowledged that based on the survey results, there appears to be a lack of understanding on the part of some airport officials about when environmental reviews are required and have occurred. The FAA officials agreed that improved communication with airports is warranted. In addition, FAA officials said that such reviews could have taken place without airport officials' being aware of the results, in part, because (1) NEPA is a federal rather than an airport responsibility, (2) airport officials are not necessarily trained in NEPA requirements and rely heavily on consultants for the airport portion of NEPA work, and (3) categorical exclusion determinations are not as visible or documented as environmental impact statements or environmental assessments that result in findings of no significant impact and may have been overlooked by a number of airport officials.

[10]A boarding fee charged to passengers to help airports pay for capital development projects.

[11]On airport layout plan approvals, FAA documents specific airport development projects that require an environmental assessment or environmental impact statement prior to FAA's unconditional approval of the airport layout plan and prior to construction. However, FAA does not necessarily document projects on the plan that FAA has categorically excluded from further environmental review.

Many Airports Are Uncertain About How to Meet Clean Air Act Requirements

Airports reported two key problems—inadequate guidance and/or a lack of experience on the part of some EPA and FAA regional officials in applying the Clean Air Act to airports. Airport officials also identified confusion in three other areas: (1) which agency is in charge of ensuring that airports conform to the act, (2) what their region's air quality status is, and (3) what their airports should do to receive credit for voluntary efforts to reduce air pollution.

Federal Guidance and Experience With Complying With the Clean Air Act Could Be Improved

Inadequate federal guidance and/or a lack of experience among some FAA and EPA regional officials with applying the Clean Air Act to airport expansion projects has left a number of airport officials uncertain of their responsibilities. When establishing regulations for implementing the Clean Air Act, EPA grouped airports and all other sectors—except for highways and transit—into the general compliance rules and guidelines, known as general conformity. Because many of these sectors, such as airports, ski resorts, and coal mines, have little in common with each other, EPA developed broad general conformity rules for federal actions—such as airport expansion projects—to direct compliance with the act.

Guidance

Many airport and government officials said that the Clean Air Act guidance applicable to airport projects is inadequate. As a result, airports may be unsure of their responsibilities and at risk of not doing the level of analysis required or not conforming to the act's requirements. In addition, state air quality officials said that the Clean Air Act's general conformity guidance—that covers airports—was inadequate compared with the guidance for highway and transit projects, which have a more structured process for complying with the act. FAA headquarters officials have said that while guidance is available, it can always be improved on and that air quality is a complex area—one in which airports and FAA staff are not nearly as well versed as, for example, aircraft noise. Furthermore, these officials stated that all entities involved are accountable for understanding their individual responsibilities and effectively communicating with each other to ensure that environmental requirements are met.

Some airport, FAA, and EPA officials told us that they are confused about the types of airport expansion projects that trigger air quality analyses, even though federal guidance on this topic is available.[12] As a result, these officials are unsure how to conduct these analyses when they are required. For example, an FAA regional official said airports in that region were unsure of whether projects that did not receive federal funds required air quality analyses under the Clean Air Act. As for projects requiring analysis, EPA and FAA officials said that individual agencies, such as FAA, could create their own lists of excluded projects by setting precedents and applying them to other similar projects, but the officials also said that the process is so difficult that no agency has attempted to create such a list. Because there is no list of excluded airport projects, an FAA official in the region said that officials there interpreted the requirement to mean that airports must prove that all projects, no matter how small, conform to the Clean Air Act. FAA regional and airport district office environmental staff members said that they need more guidance on the types of projects that need to be analyzed.

Recognizing this confusion, EPA recently undertook an effort to help make the guidance on complying with the Clean Air Act more understandable. In addition, FAA asked EPA to streamline the process as part of its revisions of the general conformity rules to provide relief in understanding air quality analytical requirements and other areas of the regulations. An EPA official told us that as part of this effort to review and revise its general conformity rules, the agency is evaluating how to improve the communication with and among stakeholders. EPA acknowledges the need to clarify the guidance, but its efforts have been delayed because of resource constraints.

EPA officials told us that shortly after the original general conformity rules were promulgated, the agency held a training workshop for state and other federal agencies. However, these officials speculated that because so few determinations are done in each area, the expertise was probably lost before it could be used. In addition, these officials said that EPA regional staff members are available to discuss the regulations with airport authorities. FAA headquarters officials also said that FAA staff are available to assist others in understanding the air quality requirements.

[12]Current guidance that airport projects or actions are subject to includes FAA Orders 1050.1D and 5050.4A, the FAA air quality procedures handbook, and EPA regulations on general conformity provisions of the Clean Air Act.

Experience

Several EPA and FAA officials attributed problems in implementing the Clean Air Act's conformity requirements to a lack of experience, noting that detailed conformity analyses of air quality impacts are seldom required for airports to demonstrate compliance with the act. Specifically, FAA and EPA officials told us that each airport, FAA airport district office, and EPA region may perform only one or two airport conformity determinations over a period of decades. The infrequency of such analyses makes it difficult to build and retain experience in any agency or airport. For example, an EPA official said that none of the four general conformity determinations in 1999 involved airports—two involved coal mines, one involved a ski resort, and one involved a Native American reservation. However, determinations involving airport projects may become more common in the near future. An EPA official said that an informal survey of the agency's regional offices showed that airports represent 13 of the 18 general conformity determinations that have been identified for the near future.

FAA headquarters officials said that the aviation industry also lacks experience and knowledge when it comes to air quality analyses. Limited expertise, both in the aviation industry and the government, on the application of those rules to airport projects could have contributed to the uncertainty about general conformity that was reported as a major or moderate concern by officials from 35 of the nation's 50 busiest commercial service airports.

Confusion among responsible officials and the general nature of the guidance on air quality can also cause regional variation in the application of requirements. An airport industry representative said that some FAA regional officials are overly cautious about air quality analysis—in turn, requiring more assessment—while others are more flexible in their approach. The representative said this has caused the air quality models used by airports to estimate the emissions from expansion projects to be routinely accepted in some regions and questioned in others.

Confusion Exists in Three Other Areas of the Clean Air Act as It Applies to Airports

Our review identified three other areas of confusion for airports under the Clean Air Act.

- **Lines of authority and responsibility**. Some airport and federal officials are confused about the most basic issue—which agency is in charge. For both FAA and EPA, this confusion stems, in part, from a lack of experience and guidance at the regional level on airports' compliance

with the Clean Air Act, as amended. The act places responsibility on owners and operators—these can be the airport, tenants, and FAA to the degree that they own facilities at airports that need permits under the act. One exception is aircraft engines, for which manufacturers are the responsible party and FAA takes the lead. However, a lack of leadership on air quality guidance was particularly clear in one region we visited, where an airport official told us that FAA and EPA could not decide which agency was in charge.

- **Air quality status**. Some airports are uncertain of the status of their region's compliance with the Clean Air Act—information that is critical to determining the feasibility of airport expansion projects. In our survey, 6 of the 50 airports incorrectly categorized their status in meeting Clean Air Act requirements. In addition, we visited numerous airports where officials were uncertain if their airport's region had reached "attainment status" with the act's requirements. We asked officials of EPA and four airports that we visited what their region's attainment status was, and only one airport provided the same information as EPA. For example, officials at two of these airports listed by EPA as being in full attainment told us that they were in nonattainment. These differences are important because each of these airports is currently planning major expansions that would require a different level of air quality analyses based on their attainment status. EPA officials said that the agency has an established process to ensure that the designation of a region's air quality status is appropriate. These officials speculated that airport officials' confusion over their regions' air quality status could be attributed to some EPA regions that have attained the air quality standards but may not have met all the necessary requirements for EPA to formally redesignate them as having reached attainment status. According to EPA officials, the air quality agency of any state, as well as EPA's regional offices, could provide full details on the attainment status of any area in its jurisdiction. In addition, the official said that the attainment status of areas is available on EPA's Web site.

- **How the government accounts for voluntary reductions of emissions**. Although EPA has published guidance on providing states with credits for promoting voluntary reductions of air pollutants, EPA has not set up a process for passing the credits on to airports. As a result, some FAA officials, airports, airlines, and aviation experts believe that airports can be penalized if they reduce emissions voluntarily as part of a project that is not associated with a major airport expansion.

Instead of receiving credit for such voluntary efforts, airport and airline officials said, the emissions reductions become the new baseline for determining compliance with the Clean Air Act. Aviation experts said that this practice creates a disincentive for airports to undertake voluntary efforts to reduce emissions. The EPA/FAA group currently assessing airport air quality issues is addressing this concern.

Difficulties Remain in Coordinating Federal, State, and Local Environmental Processes for Airports

FAA and airport officials said that federal environmental requirements for airports overlap with some state and local processes and that poor coordination in these areas frustrates airport officials and can result in rework and additional negotiations and renegotiations. While officials from 17 of the nation's 50 busiest commercial service airports reported that FAA's coordination with state environmental agencies was effective, officials from 12 of these airports ranked FAA as moderately ineffective or very ineffective in coordinating with state environmental agencies. In addition, airport officials from one airport we visited told us that because environmental issues are not well coordinated across state and federal agencies, the airport must retain more environmental staff than would otherwise be necessary to complete required work. Airport and FAA officials said that if not properly coordinated, overlapping environmental review and wetlands permitting processes can delay airport projects without adding commensurate environmental benefits.

- **Some NEPA and state processes can overlap and delay airport projects**. In addition to the federal environmental review process, several states have passed laws incorporating consideration of environmental effects into state processes. However, this process does not always work as intended and can lead to duplication of effort by airport officials in meeting their environmental responsibilities. According to airport officials, despite FAA's efforts, airport projects in these states may have to undergo two completely independent, redundant environmental reviews that do not provide any incremental environmental benefits. For instance, the officials from one airport said that the consensus developed under the federal NEPA process for an expansion project reduced the number of feasible runway options from 17 to 4, which meant that the airport would only need to perform an environmental review of the 4 options, but the state process forced the airport to reconsider all 17 options. FAA officials acknowledged that overlapping federal, state, and local requirements can cause difficulties.

- **Destruction of wetlands can require duplicative negotiations**. According to airport and FAA officials, when airport projects require the destruction of wetlands—lowland areas saturated with moisture—duplicative negotiations may be required even though they do not add environmental value. In those instances, airports must negotiate with multiple governmental entities to replace the wetlands they destroy. Airport and FAA officials told us that the federal wetland permitting process through the Army Corps of Engineers is not well coordinated with several state and local permitting processes. A headquarters official from the Corps said that overlapping federal, state, and local permitting requirements for wetlands is a problem in some states. For instance, a state might value the quality (e.g., ecological value) of the wetlands replaced, while the local Corps office might value the quantity.

  An airport official from Florida said that airport officials have had to negotiate wetland permits with three different agencies. The representative said that efforts to coordinate the three processes were time-consuming and that the process would be more efficient if state, local, and federal officials could coordinate and designate one level to negotiate agreements and make commitments on behalf of the other levels. In addition, FAA regional officials told us that airports in the New England region must repeatedly negotiate wetland destruction agreements with different levels of government. An official of the New England District of the Army Corps of Engineers said that coordinating federal, state, and local wetland permitting processes works better in some states than in others. For example, some states in the New England District refuse to start the state permitting process until after the NEPA process is completed.

Provisions in a Federal Law Limit the Eligibility of Some Airports and Communities to Receive Federal Noise Funds and Create Somewhat Duplicative Air Quality Requirements

Limitations and duplications in the federal law governing airport noise programs and air quality requirements may hinder the ability of some airports and communities to effectively and efficiently address noise and air quality. First, the law does not allow FAA to provide funding set aside for noise mitigation to communities affected by aircraft noise if the airport chooses not to participate in FAA's noise compatibility program under Part 150. Second, the law and the Clean Air Act include somewhat duplicative air quality requirements that may unnecessarily delay some airports' expansion projects.

Federal Law Limits FAA in Assisting Some People Affected by Aircraft Noise

FAA's voluntary Part 150 noise compatibility program provides noise mitigation funds to assist local communities through grants to airports that participate in the program. However, the law allows FAA to provide noise set aside funding—from the Airport Improvement Program—through the Part 150 program to a community only if the neighboring airport participates in the program.[13] The program has provided billions of dollars to mitigate the effect of noise around many airports; nevertheless, some people affected by noise lack access to the program's benefits because some of the busiest commercial service airports do not participate in FAA's Part 150 noise compatibility program. Changing the law could allow communities to access these funds directly from FAA under rules and restrictions similar to those placed on airports, even if the communities' airports do not participate in the program.

[13]Although most projects designed to mitigate the impact of aircraft noise on surrounding communities are funded through the Airport Improvement Program noise set aside, airports can choose to finance these projects in other ways, such as using passenger facility charges, airport revenue or other Airport Improvement Program funding for which the airport is eligible. In addition, some soundproofing of schools and health care facilities is eligible for funding even if an airport does not participate in this program. 49 U.S.C. 47504(c)(2)(D).

FAA's Part 150 noise compatibility program provides guidance to airports on the types of land uses that are incompatible with certain levels of airport-related noise and encourages them to develop a noise compatibility program to reduce and/or prevent such uses. Under this program, airports can use federal grants to, among other things, soundproof buildings and acquire homes. As part of this process, airports map the area affected by noise and estimate the affected population. FAA encourages airport operators to participate in this program. Over 240 airports participate in the program, through which FAA has distributed $2.7 billion from 1982 through 1999 for noise mitigation. However, 14 of the 50 busiest commercial service airports choose not to participate in the Part 150 noise compatibility program.[14] Consequently, more than 320,000 people who live near these 14 airports cannot receive these federal funds for mitigating noise. These airports represented about one quarter of all air carrier operations in 1998 and account for more than half of the population affected by aircraft noise at the 65 dB DNL and above. FAA has twice proposed a legislative change on compatible land uses around airports that would have had the side benefit of extending Part 150 funding to some of these affected communities; however, its proposals were not adopted. Some airport officials told us that their facilities do not join the noise compatibility program because the process is too complicated and difficult to implement and they do not want to raise false expectations in their communities about reductions in aircraft noise. For example, at one of these airports, airport and FAA officials said that the airport does not participate because of the cost of providing benefits to such a large population, estimating, for instance, that the airport would need to soundproof about 65,000 affected residences. Officials from one affected community told us that they are negotiating with the neighboring airport to encourage it to establish an FAA Part 150 noise compatibility program as a condition for accepting a new runway project, but the airport is resisting. These officials consider their options for encouraging the airport's participation in the program to be very limited.

[14]Boston's Logan International Airport also chose not to participate in FAA's Part 150 noise compatibility program, but it was not included in this statistic because the airport receives federal noise mitigation funds through a grandfathering provision under the Part 150 legislation.

Federal Laws Include Duplicative Air Quality Processes That Burden Some Airports

Two sets of air quality requirements under federal law can be duplicative and can cause delays in completing NEPA documents, as well as place unnecessary burdens on some airports in a number of states. Federal law requires the governor of each state to certify that federally funded airport runway additions or major expansions conform to local air quality standards. The process—referred to as the state certification requirement—is termed and applied differently in each state because there is no standard approach to handling the certification process.[15] Similarly, the Clean Air Act, as amended, requires the federal agency—in this case, FAA—to determine that the emissions from airport projects conform to a state's plan to implement national air quality standards. The act also stipulates that local air quality standards must meet the national standards but can be more stringent. These requirements for airports are somewhat duplicative and, in some cases, require airport officials to demonstrate compliance with air quality requirements twice.[16]

FAA and representatives of a working group of airports told us that they have recommended the elimination of the state air quality certification requirement because of the overlap with the Clean Air Act's requirement. States would retain the right to set their own more stringent standards under the Clean Air Act even without the state air quality certification process. However, FAA headquarters officials maintained that the requirement seldom delays projects and is more often an annoyance than a substantive problem.

An aviation expert said that some states, such as California, conduct very vigorous certification processes, while others consider state certification perfunctory once the Clean Air Act's requirements are met. The expert, who has experience with helping airports fulfill the state air quality certification process, said that the requirement can delay airport projects in two ways. First, states can set the requirements for state air quality certification higher than the federal Clean Air Act requirements, which may require additional time and analysis. Officials at the California Air Resources Board—the body responsible for the state air quality

[15]The state certification requirement also requires that federally funded airport runway additions or major expansions conform to local water quality standards. However, this requirement was not raised during our review as problematic for airports.

[16]While state air quality certification applies to all airports, Clean Air Act requirements vary depending on the attainment status of a given region.

certification process—told us that their standards have been higher than those of the Clean Air Act, as is allowed by law. The board is also responsible for preparing California's state implementation plan for the Clean Air Act. Board officials told us about an airport that recently had to renegotiate its air pollution reduction commitments with the state after a project had already demonstrated its compliance with the Clean Air Act.

Second, the expert said that many states are not aware of the state air quality certification requirement and the staff may not know how to handle it. Because new or upgraded runways are rare, many states have not had to grant this certification since the early 1980s, and staff turnover has left them without the necessary institutional experience. Many states must go through the time-consuming process of redeveloping expertise and a process for certifying new or expanded runways each time a runway project occurs. The relearning costs money and causes delays and frustration. Additionally, the expert said state officials understand "permitting" but worry that "certification" is somehow different. Moreover, reliable sources of information may not exist. The association of state environmental officials does not provide guidance on the state air quality certification requirement. A state air quality official we visited said that he would be responsible for this state certification requirement, but he was not aware of the requirement and questioned whether such a requirement existed. In addition, EPA may not have the knowledge or experience to provide assistance. For example, EPA air quality officials in headquarters and the California regional office said they had no knowledge or experience with the state air quality certification process.

Conclusions

Some federal efforts to help airports manage both their operations and growth and their environmental responsibilities have been undertaken. Among these are ongoing cooperative and independent endeavors by FAA, EPA, and NASA, such as EPA's and FAA's work with the aviation industry and other interested parties to address air quality issues in the airport environment. Furthermore, the high level of satisfaction reported by most of the nation's 50 busiest commercial service airports attests to the effectiveness of FAA's efforts to answer airports' questions, address their concerns on environmental issues, and coordinate environmental activities among its offices. Nonetheless, we identified several limitations to the federal effort.

First, the inconsistency between FAA's policy requiring environmental reviews for all airport capacity expansion projects and the reports of many

airport officials we surveyed who maintained that their projects did not always require such reviews by FAA points, at a minimum, to a lack of communication between FAA and airport officials over when environmental reviews are required and have taken place. In addition, because FAA does not require documentation of the results of environmental reviews that result in categorical exclusions when no FAA funding approval is involved, the agency is not in a position to consistently demonstrate that these reviews have occurred.

Second, despite available federal guidance and technical assistance, a wide range of officials from airports and federal and state agencies remain confused about the requirements for airports to conform to local air quality standards when undertaking capacity expansion projects and obtaining credit for voluntarily projects that reduce air pollutant emissions. EPA's regulations for general conformity under the act are very broad because they are designed to accommodate a diverse group of facilities—leaving airports without the specificity they need to fully understand and meet their responsibilities. As a result, some airport officials may undertake analyses that are more complex and costly than necessary, while others may not fully meet their responsibilities under the act. Furthermore, because EPA has not set up a process for providing credits to airports for voluntary efforts to reduce the emission of air pollutants, there are disincentives to voluntarily reducing air pollution.

Third, although efforts to coordinate federal, state, and local environmental review processes for airports exist, difficulties persist—frustrating airport officials and, in some cases, resulting in duplication of effort to meet environmental requirements. In addition, such duplication can delay airport projects without adding commensurate environmental benefits.

Finally, limitations and duplications in the federal law governing airport noise programs and air quality requirements can result in somewhat duplicative air quality requirements and may hinder the ability of some airports and communities surrounding them to effectively and efficiently address noise and air quality issues. First, under FAA's Part 150 noise compatibility program, the requirement that airports must participate for neighboring communities to receive funds for mitigating the impact of aircraft noise does not allow over 320,000 people around nonparticipating airports to be eligible for mitigation projects. Second, the federal requirement for state air quality certification is somewhat duplicative. Airports are already required to determine that an airport project conforms to its state clean air implementation plan, which could include standards

that are more stringent than the national standards. In addition, the certification process may unnecessarily increase the number of steps required for some airports to obtain approval to build or extend a runway.

Recommendations

To provide assurance that environmental reviews for all airport development projects are broadly understood and systematically documented and that airport officials are aware of such reviews, we recommend that the Secretary of Transportation direct the Administrator, FAA to

- communicate to airport officials the requirement that all airport expansion projects are subject to environmental reviews,
- document the results of all categorical exclusions, and
- inform airport officials of the results of all environmental reviews.

To help airports meet their responsibilities under the Clean Air Act, we recommend that the Administrator, EPA, in coordination with FAA and airport officials, (1) clarify guidance in areas such as general conformity determinations and guidelines for states to provide airports with credits for voluntary emission reduction efforts and (2) provide more effective technical support for regional and airport officials to meet air quality requirements.

Matters for Congressional Consideration

Since 14 of the 50 busiest commercial service airports do not participate in FAA's Part 150 noise compatibility program and, thus, the people who live in communities surrounding these airports that are affected by aircraft noise are not eligible to receive funds from this program (under 49 U.S.C. 47104 and 48103), the Congress may wish to consider the impact this restriction imposes on the affected communities. In addition, because the state air quality certification requirement (49 U.S.C. 47106 (c)(1)(B)) is somewhat duplicative and may impede some airports as they attempt to grow and implement their environmental responsibilities, the Congress may wish to consider eliminating this requirement.

Agency Comments

We provided the Department of Transportation; the Department of Defense; NASA; EPA; and an advisory panel that included the Air Transport

Association of America, Inc., Airports Council International-North America, Frederic R. Harris, Inc., and the Natural Resources Defense Council with copies of the draft report for their review and comment.

We met with officials from the Department of Transportation, including FAA's Director, Office of Airport Planning and Programming. These officials generally agreed with the facts in the report and provided clarifying comments, which were incorporated as appropriate.

The Department of Defense and NASA concurred with the report. NASA offered clarifying comments that were incorporated as appropriate. NASA's and the Department of Defense's written comments are included as appendixes IV and V.

We met with senior officials from EPA's Office of Enforcement and Compliance Assurance and the Office of Air and Radiation, including the Senior Scientist/Policy Adviser for the Office of Air and Radiation. Although EPA officials generally agreed with the facts in the report, they suggested that we further emphasize airports' shared responsibility for managing their impact on the environment, noting that airports must take a more active role in working with local, state, and federal officials. They also provided technical and clarifying comments. We added language to the report to further emphasize airports' shared responsibility and incorporated other comments as appropriate.

The advisory panel of experts that included the Air Transport Association of America, Inc., Airports Council International-North America, and Frederic R. Harris, Inc., generally agreed with the contents of the report and provided technical and clarifying comments, which were incorporated, as appropriate. The Natural Resources Defense Council provided no comments.

Selected Airports' Activities to Balance Operations and Growth With Environmental Impacts

Airport Noise

San Francisco: To better address aircraft noise issues, the San Francisco International Airport created the San Francisco Airport Roundtable in 1981. This voluntary body includes representatives from 13 Bay Area jurisdictions, FAA officials, airline advisers, air traffic managers, and the airport director. The Roundtable meets monthly, mainly to discuss noise-related issues. A representative of the group told us that the airport is funding this effort to address a citizen group's concerns about noise at the airport. This official stated that excellent cooperation exists among officials as they try to solve problems involving community, airport, FAA, and elected officials.

In addition, the area's Metropolitan Transportation Commission is funding a series of forums to educate the public on airport noise outside the Roundtable's boundaries. Since all of the region's airports are receiving extensive publicity about their growth, the Commission thought it would be wise to provide information for the entire Bay Area on noise abatement procedures and flight patterns. A representative of the Roundtable stated that these informational meetings are on a fast track and will offer to other parts of the Bay Area what the Roundtable has provided to communities surrounding San Francisco for more than 15 years. A Roundtable representative said that this effort should help the community better understand why airplanes must follow certain flight patterns. This official hopes that the education effort will help the Bay Area get past the issue of noise so it can address how it will accommodate increasing air traffic.

A representative of a national nongovernmental organization on aviation noise cited the San Francisco Airport Roundtable as a model for community involvement in the decision-making process for airport development, including the identification of environmental effects and concerns.

Fort Lauderdale: Fort Lauderdale Airport officials told us that an ad hoc committee was formalized in 1992 to address the airport's noise concerns. Currently, the committee meets on a quarterly basis and consists of neighborhood, community, and aviation industry representatives, all of whom are voting members. The chair of the committee is a neutral resident of the Miami area. According to the airport's noise abatement officer, residents are becoming more educated about the airport's operations, and meetings no longer focus on noise complaints. Instead, meetings consist of updates and reports on the Stage 3 phaseout, runway closures, proposed changes to flight paths, and other ongoing noise mitigation efforts.

According to an airport official, the noise committee has been a tremendous help in gaining respect and credibility with the community. Similar airport community noise groups have been established at other airports, including those in Louisville, Oakland, and Chicago (O'Hare).

Water Quality

Denver: Denver International Airport has an extensive system for capturing and recycling the runoff from its deicing operations. According to an airport official, Denver's most serious ongoing environmental issue is the impact of deicing/anti-icing runoff on water quality. An EPA official cited the Denver International Airport as having "best practices" for deicing/anti-icing, perhaps because the airport is so new. Whereas most airports apply one or two progressive techniques for capturing runoff from deicing/anti-icing, this official said that Denver applies all of them. Our tour of the airport's facilities and discussions with the airport official responsible for water quality confirmed that the airport does have a number of progressive practices in place to address water quality issues associated with deicing and anti-icing operations. For example, the airport has a wide range of equipment for collecting runoff, an extensive drainage system, large holding ponds for storing runoff, and a plant that is used for mixing and recycling deicing fluids. After being recycled, the fluid is sold.

However, an airport official told us that some improvements are needed. For example, the retention basins used for runoff have deteriorated much more quickly than anticipated, in part because the airport is located at a high altitude, resulting in increased exposure to ultraviolet light. (See fig. 17.) The official said, in retrospect, the airport should have purchased enclosed holding tanks even at several times the cost of the open tanks because these tanks would have been much more durable—with a life span of about 20 years and lower maintenance costs. In addition, although the airport has dedicated facilities, known as deicing pads, available for deicing, they are not popular among some carriers because the location of the deicing pads is inconvenient for them. For example, one carrier with an entire terminal refuses to use the deicing pads—instead it deices its aircraft at its gates. Because deicing is the responsibility of the airport tenants, the airport cannot force them to use the deicing pads. This official also noted that the airport must currently use trucks to take spent deicing/anti-icing fluids from one part of the airport to the recycling plant and that a pipeline is needed to improve the efficiency of this operation.

Figure 17: Two Deicing/Anti-Icing Runoff Capture Basins at Denver International Airport

An Adams County commissioner told us that the $200 million runoff disposal system for deicing built at Denver International Airport does not work as intended to contain harmful chemicals. After receiving an anonymous tip and complaints from a farmer, the commissioner tested the water bodies in adjacent communities and found traces of glycol that had seeped into two creeks that flow from Denver International Airport into Barr Lake—a recreational lake in Adams County. The county health department verified these findings. The airport added more permanent berms on the runways and fixed the drains. The commissioner said the problem with the runoff seems to have improved, but he is frustrated by the lack of standards on glycol contamination, and the county health department cannot tell him what levels are safe. An airport official noted that although the airport's extensive disposal systems capture 80 percent of the spent deicing fluids, the remaining 20 percent escape.

Portland, Oregon: Portland International Airport has had difficulty managing the runoff from its deicing/anti-icing operations and the environmental impact of this runoff on local water bodies. The airport is built on a floodplain behind a dike along the Columbia River—located north of the airport. The Columbia Slough, located south of the airport, has been the receiving water body for the airport's deicing runoff. The slough was originally designed to assist in draining the industrial area that surrounds the airport. However, in the 1980s and 1990s, it was transformed into an "urban stream" that supports a species of fish listed as endangered. In addition, industries along the slough have been replaced by office parks, golf courses, and housing. The Northwest Environmental Defense Center filed complaints with the state charging that the airport's National Pollutant Discharge Elimination System permit must require immediate implementation, but the issue has not been resolved. With the help of the airlines, Portland International Airport has developed a system for managing deicing runoff from the entire airport to address concerns about discharges into local water bodies—primarily the Columbia Slough and the Columbia River.

Air Quality

Boston's Logan International Airport: Airport officials told us that the airport has a wide range of air pollutant emissions reduction efforts under way and has successfully leveraged private-sector funds to support them. In addition, when the airport began experiencing operational problems in the early 1980s—because of a lack of parking and ground transportation gridlock—it initiated efforts to reduce congestion and air pollutant emissions, including maximizing the number of alternative-fuel vehicles used at the airport. Using such vehicles to reduce emissions has allowed the airport to accumulate "credits" that can be banked or sold. Massport[1] officials told us that the following are some of the efforts under way at Logan:

- To help alleviate congestion, the airport entered into a partnership with the airlines, which agreed to pay half the cost of three remote park-and-ride facilities that made less expensive parking available for passengers and airport employees. Within 3 to 4 years, this partnership, known as Logan Express, began to see a profit. Currently, Logan Express serves over 1 million passengers per year, approximately 87 percent of whom are repeat customers. Employees are the fastest-growing users of this service and currently account for 10 to 20 percent of the riders. This solution has also improved air quality at the airport because trips into the airport core are not keeping pace with operations. Currently, Logan Express operates 32 natural gas buses and 2 electric buses, which not only alleviate congestion but also produce less pollution than conventional vehicles.

- Through the establishment of public/private partnerships—supported, in part, by grants and federal funding from EPA Region 1—Logan has promoted the use of alternative-fuel vehicles. For example, such partnerships allow the airport to help private operators of buses, shuttles, and taxis defray the up-front costs of purchasing these vehicles. The use of alternative-fuel vehicles also allows private operators to reduce their operating expenses because natural gas costs less than unleaded fuel. As a further incentive, the airport offers the operators of alternative-fuel vehicles a 25-percent discount on their

[1]Massport is an independent public authority, which develops, promotes, and manages airports, including Logan International Airport, the seaport, and transportation infrastructure.

access permits.

- Interest in procuring and using alternative-fuel vehicles is driven by the Energy Policy Act of 1992, which was enacted to reduce the United States' dependence on foreign oil. Because the state runs the airport, it must comply with the act. By 1999, the law required 50 percent of the vehicles purchased by the state to use alternative fuels. By 2000, 75 percent of the state's purchased vehicles must use alternative fuels. If the state/airport purchases more than the allotted percentage, the state receives air emission credits. State agencies, utilities, and industries can then buy the credits. One of these officials noted that the credits are selling for about $4,200 apiece. The airport has approximately 65 to 70 credits that can be banked or sold.

- Currently, one-quarter of the airport's fleet of ground vehicles consists of alternative-fuel vehicles—40 natural gas and 20 electric vehicles. In addition, the airport has provided an adequate number of refueling stations to support the use of these alternative-fuel vehicles.

- Consolidating Boston's Logan International Airport rental car facilities would be the most significant access improvement the airport could make to reduce air pollutant emissions. Instead of being spread out around the airport, these facilities would be collocated. Further reductions in emissions could then be obtained if the agencies consolidated their passenger shuttle operations. Currently, the airport is renegotiating its contracts with six rental car agencies, each of which now operates six to nine gasoline-fueled buses—running every 2 to 3 minutes—which are operated well below passenger capacity. To help reduce the emissions generated by these operations, the airport is hoping to compel the rental car agencies to purchase alternative-fuel vehicles or consolidate their rental car facilities, as the Dallas/Fort Worth and Denver airports have done. However, Massport officials observed that consolidation is very complicated. One official noted that rental car companies are reluctant to consolidate their operations because they are fearful of losing market shares.

Los Angeles International Airport: According to officials at this airport, Los Angeles World Airports—which includes the Los Angeles International Airport—has won four awards from the Clean Air Coalition for its efforts to reduce air pollutant emissions.[2] These efforts can be broken into two categories—activities that support aircraft operations (airside) and activities that support access to the airport (landside).

Airport authority officials told us that Los Angeles International Airport has undertaken efforts to reduce air pollutant emissions for activities supporting aircraft operations. For instance, the airport recently hosted a conference for airport tenants to promote the use of alternative-fuel vehicles for ground service equipment. In addition, alternative-fuel vehicles currently make up half of the ground service fleet at the airport.

Airport officials also cited several efforts currently used to reduce the impact on air quality of its ground access (landside) operations, including the following:

- **Van pools:** Van pools are currently used by more than half of the airport's 2,000 employees.

- **Remote pickup sites:** The airport supports several remote passenger pickup sites and shuttles passengers to the airport.
- **Electric gates:** Gate-based electrical power and preconditioned air are provided to aircraft to reduce the use of onboard and auxiliary, stand-alone power systems that are more polluting. Preconditioned air is available at approximately 50 percent of the airport's gates.

- **Shuttle vehicles:** Many shuttle vehicles use alternative fuels. Currently, the airport is encouraging hotel shuttle services to switch to alternative-fuel vehicles. In addition, to reduce the number of shuttle vehicles traveling in and around the airport, the airport is encouraging hotel and rental car companies to consolidate their shuttle services.

- **Airport-owned vehicles:** Half of the airport fleet now consists of alternative-fuel vehicles.

[2]Los Angeles World Airports is the aviation authority that maintains and operates the Los Angeles International Airport, Ontario International Airport, Van Nuys Airport, and Palmdale Regional Airport.

- **Flex schedules:** By encouraging the use of flexible work schedules, the airport has reduced the traffic congestion generated by employees by 10 percent.

- **Public transit:** There is a city bus terminal at the airport, and a free bus provides service to the nearby light rail system.

- **Circulation of shuttles:** Short-range shuttles are limited to making three rounds before going to their destination in order to cut back on the amount of traffic circulating around the airport. Long-range shuttles are limited to four rounds.

- **Cogeneration plant:** This plant creates hot and cold water from waste heat from the airport. Excess power generated from the plant is then sold back to the power company. An airport official said that a cogeneration plant is more fuel efficient and less costly than traditional methods of generating power.

- **Free electric recharging stations:** These stations provide free parking and recharging for electric vehicle users. Currently there are approximately 15 recharging stations, and the airport is planning to expand this service.

Europe Is Addressing the Environmental Impacts of Airports

Europe is taking steps to help limit the impacts of airports on the environment—focusing primarily on noise. A November 1999 report from the European Commission entitled *Air Transport and the Environment: Towards Meeting the Challenges of Sustainable Development* discusses Europe's position and planned approach for the future. Europe is developing a common noise classification scheme in an attempt to avoid further proliferation of different local systems and is looking at better land-use planning to reduce the problem. The goal is to establish an objective, common basis for computing the level of noise exposure. In addition, the European Commission will, in cooperation with member states, consider the possibility of establishing recommended practices for making land-use decisions in the vicinity of airports and will propose that proper land-use rules be considered as a criterion for financial support to airport construction and expansion projects under the European Community's various financial instruments. Finally, the Commission will examine the feasibility and possible scope of a Community system to identify particularly noise-sensitive airports with a view to applying more stringent regulations at these airports.

Europe is also addressing aircraft emissions, including working closely with the International Civil Aviation Organization to develop new parameters for assessing aircraft emissions for landing and takeoff and to establish parameters for climbing and cruising altitudes. In addition, the Commission is continuing to study innovative concepts, such as emissions trading. Finally, the European Commission noted the importance of ensuring that its research and development programs aim at breakthrough achievements in the environmental performance of aircraft and their engines, as well as in understanding and assessing the atmospheric effects of aircraft gas emissions. Such achievements, according to the Commission, will have the benefit of safeguarding the competitiveness of the European Commission's aeronautical industry.

List of the 50 Busiest U.S. Commercial Service Airports Based on 1998 Data From FAA

Anchorage International
Atlanta International
Austin/Bergstrom International
Baltimore-Washington International
Boston/Logan International
Charlotte/Douglas International
Chicago/Midway
Chicago/O'Hare International
Cleveland Hopkins International
Covington/Cincinnati International
Dallas/Fort Worth International
Dallas Love Field
Denver International
Detroit Metro Wayne County
Fort Lauderdale/Hollywood
Honolulu International
Houston/George Bush Intercontinental
Houston Hobby
Indianapolis International
John F. Kennedy International
Kansas City International
La Guardia
Lambert/St. Louis International
Las Vegas/McCarran International
Los Angeles International
Memphis International
Metropolitan Oakland International
Miami International
Milwaukee/General Mitchell International
Minneapolis/St. Paul International
Nashville International
New Orleans International/Moisant
Newark International
Ontario International
Orlando International
Philadelphia International
Phoenix Sky Harbor International
Pittsburgh International
Port Columbus International
Portland International
Raleigh-Durham International
Reno/Tahoe International

Ronald Reagan Washington National
Salt Lake City International
San Diego International/Lindbergh
San Francisco International
San Jose International
Seattle Tacoma International
Tampa International
Washington Dulles International

Comments From the National Aeronautics and Space Administration

Note: GAO's comments supplementing those in the report appear at the end of this appendix.

National Aeronautics and
Space Administration
Office of the Administrator
Washington, DC 20546-0001

Mr. Allen Li
Associate Director
Defense Acquisitions Issues
United States General Accounting Office
Washington, DC 20548

AUG 10 2000

Dear Mr. Li:

Thank you for the opportunity to review this GAO report entitled, "Airport Operations and Future Growth Present Environmental Challenges." Shown below are NASA's comments.

Now on p. 67.
See comment 1.

On page 67, prior to the second to the last sentence starting with "For example, an EPA official…"; we believe an insertion of the following comment would be beneficial: "NASA is performing in-depth system studies with propulsion and airframe manufacturers to assess the implications of developing these various technologies towards meeting the goal of reducing NOx and CO_2 simultaneously."

Now on p. 68.
See comment 2.

On page 68 of the report, the last sentence of the second paragraph should be replaced with the following: "NASA officials also told us that the Agency has developed a type of propylene glycol for deicing aircraft that is environmentally benign (nontoxic and food grade)."

If we can be of further assistance, please do not hesitate to call Robert Pearce on (202) 358-4595 or Neal Nijhawan on (202) 358-4637.

Sincerely,

Daniel R. Mulville
Associate Deputy Administrator

cc:
R/S. Venneri

GAO Comments

1. We added information to the report in response to NASA's comment.

2. We added information to the report in response to NASA's comment.

Comments From the Department of Defense

OFFICE OF THE UNDER SECRETARY OF DEFENSE

3000 DEFENSE PENTAGON
WASHINGTON DC 20301-3000

ACQUISITION AND TECHNOLOGY

AUG 11 2000

Mr. Louis J. Rodrigues
Director, Defense Acquisitions Issues
National Security and International
Affairs Division
U.S. General Accounting Office
Washington, D.C. 20548

Dear Mr. Rodrigues:

This is the Department of Defense (DoD) response to the General Accounting Office (GAO) draft report, "AVIATION AND THE ENVIRONMENT: Airport Operations and Future Growth Present Environmental Challenges," dated July 19, 2000 (GAO Code 348176/OSD Case 2053).

The DoD has reviewed the draft report and concurs without further comment.

The Department appreciates the opportunity to comment on the draft report.

Very truly yours,

Sherri W. Goodman
Deputy Under Secretary of Defense
(Environmental Security)

Environmental Security *Defending Our Future*

GAO Contacts and Staff Acknowledgments

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Staff Acknowledgments

In addition to those named above, Danielle Bartoni, Sandra Cantler, Keith Cunningham, Beverly Dulaney, Bess Eisenstadt, Fran Featherston, and David Hooper made key contributions to this report.

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