

GAO

Report to the Committee on Commerce,
Science, and Transportation,
U.S. Senate

September 2012

AIRPORT NOISE GRANTS

FAA Needs to Better Ensure Project Eligibility and Improve Strategic Goal and Performance Measures



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Highlights of [GAO-12-890](#), a report to Committee on Commerce, Science, and Transportation, U.S. Senate

Why GAO Did This Study

The Federal Aviation Administration (FAA) predicts that air traffic in the United States will increase 20 percent by 2024. If not mitigated, the noise associated with these flights could significantly diminish the quality of life for communities surrounding airports and constrain an airport's ability to expand. Over the last 30 years, Congress has provided billions of dollars in grants under the Airport Improvement Program to airports to reduce and mitigate significant noise exposure. FAA's overall strategic noise goal is to reduce the population exposed to significant noise to fewer than 300,000 people nationwide.

At your request, GAO (1) described how airport noise exposure has changed, (2) evaluated noise grant results, and (3) assessed potential future demand for these grants. GAO analyzed FAA data on noise grants, planned projects, and population exposure and reviewed relevant literature. GAO also conducted interviews with relevant airport and FAA officials and industry representatives, as well as visited seven airports that have used noise grants, judgmentally selected based on size, location, and other factors.

What GAO Recommends

GAO recommends that the Department of Transportation align its strategic goal for noise reduction with the results of the noise grant program and establish corresponding performance measures. The department provided technical comments and agreed to consider the recommendations.

View [GAO-12-890](#). For more information, contact Dr. Gerald L. Dillingham at (202) 512-2834 or dillingham@gao.gov.

AIRPORT NOISE GRANTS

FAA Needs to Better Ensure Project Eligibility and Improve Strategic Goal and Performance Measures

What GAO Found

The number of people in the United States exposed to significant airport noise has steadily declined from roughly 7 million people in 1975 to about 309,000 today. This change reflects large decreases in the size of areas that are exposed to significant airport noise and is primarily due to improvements in aircraft technology.

Since 1982, FAA has provided \$5.8 billion in Airport Improvement Program noise grants to 481 airports for residential and public building noise insulation and land acquisition, among other project types. The majority of grants went to airports that voluntarily undertook Noise Compatibility Programs (NCP). While these funds benefitted thousands of people, GAO identified two areas of concern regarding FAA's enforcement of project eligibility criteria that creates a risk that some undetermined amount of grant funds may have gone to projects that do not meet FAA's project eligibility criteria. First, FAA does not always require airports to maintain updated and accurate noise exposure maps to define eligible project areas. For example, half of the noise exposure maps—which show the areas around an airport that are exposed to significant airport noise and are a key element in determining project eligibility—are from the 1990s or earlier. For an airport to receive a noise grant, program criteria generally require that such maps are updated every 5 years, but nine airports received \$87.6 million in grants in fiscal years 2010 to 2011 based on maps that predate 2000. Second, FAA has inconsistently implemented requirements that limit residential noise insulation projects to homes with interior noise levels above an established threshold. In the absence of FAA enforcement, airports have little incentive to update maps and limit residential treatment because doing so might eliminate planned projects expected by the public. Concurrent to GAO's review, FAA issued new guidance that should substantially address this risk if effectively implemented. Further, the results of noise grants are not linked to FAA's strategic noise reduction goal and measurement approach. For example, the goal does not include the results of noise insulation of homes and schools. As a result, there is insufficient performance information about the effects of noise grants and the extent to which noise exposure remains a constraint on airport growth.

There has been an increase in the estimated cost of planned noise mitigation projects in FAA's 2011 National Plan of Integrated Airport Systems report to Congress, but a number of indicators point to a future decline in demand for grants for noise projects. Specifically, the 2011 report, compared to prior reports, includes a smaller portion of projects in the most significantly noise-impacted areas. Further, since the 2001 report, the number of airports planning eligible noise projects is down 16 percent, with about half the number of planned projects. Additionally, fewer airports are developing new noise compatibility programs and many of the 234 airports with such programs may be completed. For example, 102 of 137 airports with an NCP more than 10 years old received no noise grants since 2007, an indication that those airports may have completed all eligible projects in those plans. Finally, about a third of the people living in significantly noise-impacted areas reside near airports that have not completed, and may never complete, an NCP, a necessary step before an airport can use noise grants for residential noise insulation. This population, therefore, may never be reached by FAA's grant program.

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Abbreviations

ACIP	Airports Capital Improvement Plan
ADO	Airports District Offices
AEDT	Aviation Environmental Design Tool
AIP	Airport Improvement Program
CNEL	Community Noise Equivalent Level
dB	decibel(s)
DNL	Day-Night Average Sound Level
FAA	Federal Aviation Administration
FICAN	Federal Interagency Committee on Airport Noise
GIS	Geographic Information System
INM	Integrated Noise Model
MAGENTA	Model for Assessing Global Exposure from Noise of Transport Airplanes
NCP	Noise Compatibility Programs
NEPA	National Environmental Policy Act of 1969
NPIAS	National Plan of Integrated Airport Systems
NextGen	Next Generation Air Transportation System
PFC	Passenger Facility Charge
SOAR	System of Airport Reporting
VALE	Voluntary Airport Low Emission

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G A O

Accountability * Integrity * Reliability

United States Government Accountability Office
Washington, DC 20548

September 12, 2012

The Honorable John D. Rockefeller IV
Chairman
The Honorable Kay Bailey Hutchinson
Ranking Member
Committee on Commerce, Science, and Transportation
United States Senate

The number of commercial and general aviation flights in the United States is estimated to increase 20 percent by 2024, according to the Federal Aviation Administration (FAA). While airports provide access to transportation for millions of people each day, airport noise—by, for example, interfering with speech, sleep, and student learning—can severely diminish quality of life in communities around airports and spur community objections to airport operations and continued growth. Since 1982, to address and mitigate the problems associated with airport noise, Congress has provided a dedicated source of funding within the Airport Improvement Program (AIP) for noise mitigation projects.¹ FAA administers the AIP, which has provided nearly \$5.8 billion in grants since fiscal year 1982 to sound insulate homes and other buildings near airports as well as acquire land in, and relocate residents away from, significantly noise impacted areas, among other noise mitigation activities.² FAA's 2018 strategic goal for noise is to reduce the residential population exposed to significant airport noise in the United States to less than 300,000 people. AIP-funded noise mitigation projects, administered by airports, are FAA's primary tool to achieve this goal.

FAA has an ongoing responsibility to balance the growing demand for aviation capacity against the environmental concerns and effects on communities caused by airport noise. Aircraft technology, the number of aircraft operations, and noise levels have changed markedly since FAA first began providing AIP noise grants. Moreover, the implementation of

¹Tax Equity and Fiscal Responsibility Act of 1982, Pub. L. No. 97-248, § 508 (d) (2), 96 Stat. 324.

²FAA defines significant airport noise as at or above a Day-Night Average Sound Level (DNL) of 65 decibels (dB). DNL is a generally accepted measure of noise exposure.

the Next Generation Air Transportation System (NextGen)³ and the growth in aircraft operations that NextGen investments could spur may lead to new demand for airport noise mitigation or new noise challenges. As a result, it is not clear how well the AIP noise grant program will be able to provide an appropriate and effective tool for addressing changes in future airport noise exposure. In light of these concerns, you requested that we examine FAA's AIP noise grants. Our report addresses the following questions:

1. How has overall airport noise exposure changed since AIP noise grants were first funded?
2. How have AIP noise grants been used by airports to mitigate noise and what have these grants achieved?
3. What is the likely future demand for AIP noise grants?

To describe how airport noise exposure has changed over time, we reviewed available literature; assessed the use of FAA noise models; interviewed industry, FAA, and airport officials; and, for illustrative purposes, performed Geographic Information System (GIS) analysis of changes in the areas exposed to airport noise near several large airports. To assess how AIP grants have been used by airports for noise mitigation projects and planning, we analyzed FAA data in the System of Airport Reporting (SOAR). This database includes detailed information about AIP grantees, Passenger Facility Charge (PFC) approvals, project types, and other information. We performed a data reliability assessment of SOAR that included electronic testing, review of FAA documentation, and interviews with relevant FAA officials. We found the data to be sufficiently reliable for our purposes. To assess the likely future demand for AIP noise grants we compiled and analyzed a range of data from different sources. Sources included planned projects in the National Plan of Integrated Airport Systems (NPIAS),⁴ FAA's main planning tool for identifying future airport capital projects; data on airports' Noise Compatibility Programs (NCPs) and noise exposure maps, both key

³NextGen refers to the transformation of the air transportation system by 2025 from the current radar-based system, to a more automated aircraft-centered, satellite-based system.

⁴The NPIAS may not capture all planned noise mitigation projects that are included in other airport planning documents, such as environmental approvals.

documents for many AIP noise grants; and FAA's estimates of the population exposed to significant airport noise.⁵ FAA calculates these estimates with models that are broadly used and generally considered accurate for the purposes intended. We did not independently assess FAA's models. To illustrate the results of our analysis and better understand the real world implementation and future of airport noise programs, we reviewed noise programs at seven judgmentally selected airports. These airports were selected to represent a range of sizes, geographical locations, and use of noise grants. Information gathered from these reviews is not generalizable to all airports. We conducted this performance audit from October 2011 to September 2012 in accordance with generally accepted government auditing standards. Those standards require that we plan and perform the audit to obtain sufficient, appropriate evidence to provide a reasonable basis for our findings and conclusions based on our audit objectives. We believe that the evidence obtained provides a reasonable basis for our findings and conclusions based on our audit objectives.

Background

Since the late 1950s, noise from aircraft and other airport operations has generated controversy within many surrounding communities and can be a constraint on airport development and aircraft operations. As we have previously reported, noise is one of the top environmental concerns at airports.⁶ Most airports are owned and operated by public authorities, such as cities, counties, or port authorities, which have primary responsibility for addressing community concerns about noise. The federal government has a long history of helping airports address noise concerns by, for example, defining how airport noise is measured; providing a framework for assessing the impact of noise and for airports to plan noise mitigation projects; and funding eligible noise mitigation projects. Within this context, airports may undertake a range of noise mitigation projects. The federal government has also required the use of

⁵For the purposes of this report, we used the currently accepted definition of significant airport noise (e.g., DNL 65+ dB). The results of our analysis of future demand for noise grants would change if the definition of significant airport noise changes in the future.

⁶GAO, *Aviation and the Environment: Impact of Aviation Noise on Communities Presents Challenges for Airport Operations and Future Growth of the National Airspace System*, [GAO-08-216T](#) (Washington, D.C.: October 2007); GAO, *Aviation and the Environment: Systematically Addressing Environmental Impacts and Community Concerns Can Help Airports Reduce Project Delay*, [GAO-10-50](#) (Washington, D.C.: September 2010).

quieter aircraft technologies. The Aviation Noise and Capacity Act of 1990 required that all commercial jets at civilian airports switch to Stage-3 aircraft by the year 2000.⁷ Airlines phased out the loudest aircraft over time, and by 2000, the U.S. commercial fleet was composed of quieter aircraft than in the 1990s.

FAA is charged with implementing and enforcing noise regulations for airports' noise mitigation efforts, including setting the eligibility standards to receive federal funding. In 1979, the Aviation Safety and Noise Abatement Act charged FAA with establishing regulations for noise compatibility planning.⁸ In 1984, FAA promulgated regulations, commonly referred to as the "Part 150" program, that guide airports' Noise Compatibility Programs (NCP).⁹ Under these Part 150 regulations, FAA has adopted Day-Night Average Sound Level (DNL) as the measure used for assessing noise.¹⁰ Generally FAA applies DNL 65 dB as the minimum level for residential properties to be eligible for federally funded noise mitigation.¹¹ Airport operators must submit noise exposure maps to the FAA for review and acceptance before submitting an NCP. These maps show, among other things, the airport property, runway location(s), flight paths, DNL noise contours at the 65, 70, and 75 dB levels (and the

⁷Pub. L. No. 101-508, §9308, 104 Stat. 1388-382 (1990). Federal noise regulations define aircraft according to 4 classes: Stage-1, Stage-2, Stage-3, and Stage 4. Stage 1 are the loudest, and Stage 4 are the quietest. All Stage 1 aircraft have been phased out of commercial operation, and all unmodified Stage 2 aircraft over 75,000 pounds were phased out at the end of 1999. The FAA Modernization and Reform Act of 2012 (Pub. L. No. 112-95, §506(a), 126 Stat. 11, 105 (2012)) requires the phase out of Stage 2 aircraft under 75,000 pounds (general aviation aircraft) by the end of 2015.

⁸Pub. L. No. 96-193, §104, 94 Stat. 51 (1980).

⁹14 C.F.R. Part 150. 49 Fed. Reg. 49269, December 18, 1984.

¹⁰In 1972, the Environmental Protection Agency (EPA) was required to study exposure to airport noise (49 U.S.C. § 44715(a)(2)). EPA's study identified Day-Night Average Sound Level (DNL) as the appropriate measure for assessing cumulative noise in the airport environment. DNL is a cumulative sound level in decibels (dB), for the period from midnight to midnight, obtained after the addition of ten decibels to sound levels for the periods between 10:00 p.m. and 7:00 a.m.

¹¹According to FAA, a lower local standard (e.g., DNL 60 dB) may be used if the standard is formally adopted by the local jurisdiction for land-use compatibility and the airport sponsor has incorporated it. See, 49 U.S.C. §47504(c)(2)(B)). Where a compatible land use plan is adopted outside of the Part 150 process, the land use compatibility plan must be developed cooperatively by the airport sponsor and local jurisdiction. 49 U.S.C. § 47141.

incompatible land uses and estimates of the population residing within those contours), and the location of noise sensitive public buildings, such as schools, as defined by FAA regulations.¹² For example, residential development within the DNL 65+ dB contour is deemed incompatible, whereas commercial and manufacturing development is not because of the different impacts of noise on people. The NCP documents the noise mitigation projects the airport proposes to implement and is submitted to FAA for review and approval. The airport may offer mitigation measures within incompatible land use areas that meet other eligibility criteria. For example, a residence located within a DNL 65+ dB area that also has interior noise levels above DNL 45 dB may receive noise insulation. Airport participation in the Part 150 process is voluntary. The typical level of noise in a suburban residential neighborhood that is not near an airport is about DNL 50 dB and an urban residential area is about DNL 60 dB.¹³

FAA administers two programs that fund airports' capital development projects, including noise-related projects. With the creation of the AIP in 1982, FAA had a source of funds to provide grants to airports for noise mitigation projects. Congress reserved a set-aside specifically for noise projects that is currently funded at no more than \$300 million per year, but has also expanded over time to include other types of environmental projects including water projects at airports undertaken as a result of an environmental record of decision for an airport development project and

¹²Noise Exposure Maps show noise contours surrounding an airport that depict specified levels of noise and look similar to a land elevation map. The number of operations, runway orientation and use, the type of aircraft, and time of day (because night operations have a higher multiple/weight in calculating DNL) are the fundamental drivers of the size and shape of an airport's noise contour.

¹³DNL is a noise descriptor or metric that takes into account the magnitude of the sound levels of all individual events that occur during a 24-hour period, the number of events, and an increased sensitivity to noise during typical sleeping hours (between 10:00 p.m. and 7:00 a.m.) Although FAA requires the use of DNL for airport analyses, it also promotes the use of supplemental metrics, which according to the Federal Interagency Committee on Aviation Noise, are also useful in addressing various public noise concerns and helping the public to further understand airport-related noise impacts.

certain types of air quality projects.¹⁴ Capital projects in approved NCPs that meet AIP criteria are eligible for AIP grants. Further, airports can be awarded AIP noise grants for some types of noise mitigation projects without an NCP. First, in 2003, AIP noise grant eligibility was temporarily expanded by permitting FAA to provide grants to state and local governments for land use compatibility planning and noise mitigation projects around large and medium hub airports if the airport had not submitted a Part 150 study or had not updated its NCP for more than 10 years.¹⁵ Second, the National Environmental Policy Act of 1969 (NEPA), as amended, requires federal agencies to examine the potential impacts associated with a proposed federal action, including potential noise impacts. As a result, airport development proposals, such as adding new runways or otherwise expanding capacity, must be reviewed for the potential environmental effects as fully as technical, economic and other considerations. Likewise, operational changes, such as changes in flight paths, may trigger a similar review process, depending on the extent of the likely noise impact. These reviews may require airports to prepare an environmental assessment or may require the FAA to prepare an environmental impact statement which could, in turn, lead to a noise mitigation project that is eligible for AIP funding. Airports must match AIP

¹⁴Pub. L. No. 97-248, §505, 96 Stat. 676 (1982). The AIP is funded by congressional appropriation from the Airport and Airway Trust Fund which is principally funded by a variety of excise taxes paid by users of the national airspace system. Under FAA's current authorization, 35 percent of the annual AIP discretionary budget, up to \$300 million, is reserved for airport noise mitigation projects, including noise compatibility planning and implementation of noise compatibility programs, and other approved environmental projects. The upper limit is a new statutory provision enacted as part of the FAA Modernization and Reform Act of 2012 49 U.S.C. § 47117(e)(1)(A). Airports that accept AIP grants for airport development commit to several assurances, include taking steps, to the extent practicable, to restrict use of land adjacent to airports to activities and purposes compatible with normal airport operations. 49 U.S.C. 47107.

¹⁵In such cases, the airport sponsor must agree and provide necessary documentation. Vision 100: Century of Aviation Reauthorization Act, Pub. L. No. 108-176, § 160(a), 117 Stat. 2511 (2003). This provision was later extended by the FAA Modernization and Reform Act of 2012 to September 30, 2015. Pub. L. No. 112-95, § 153.

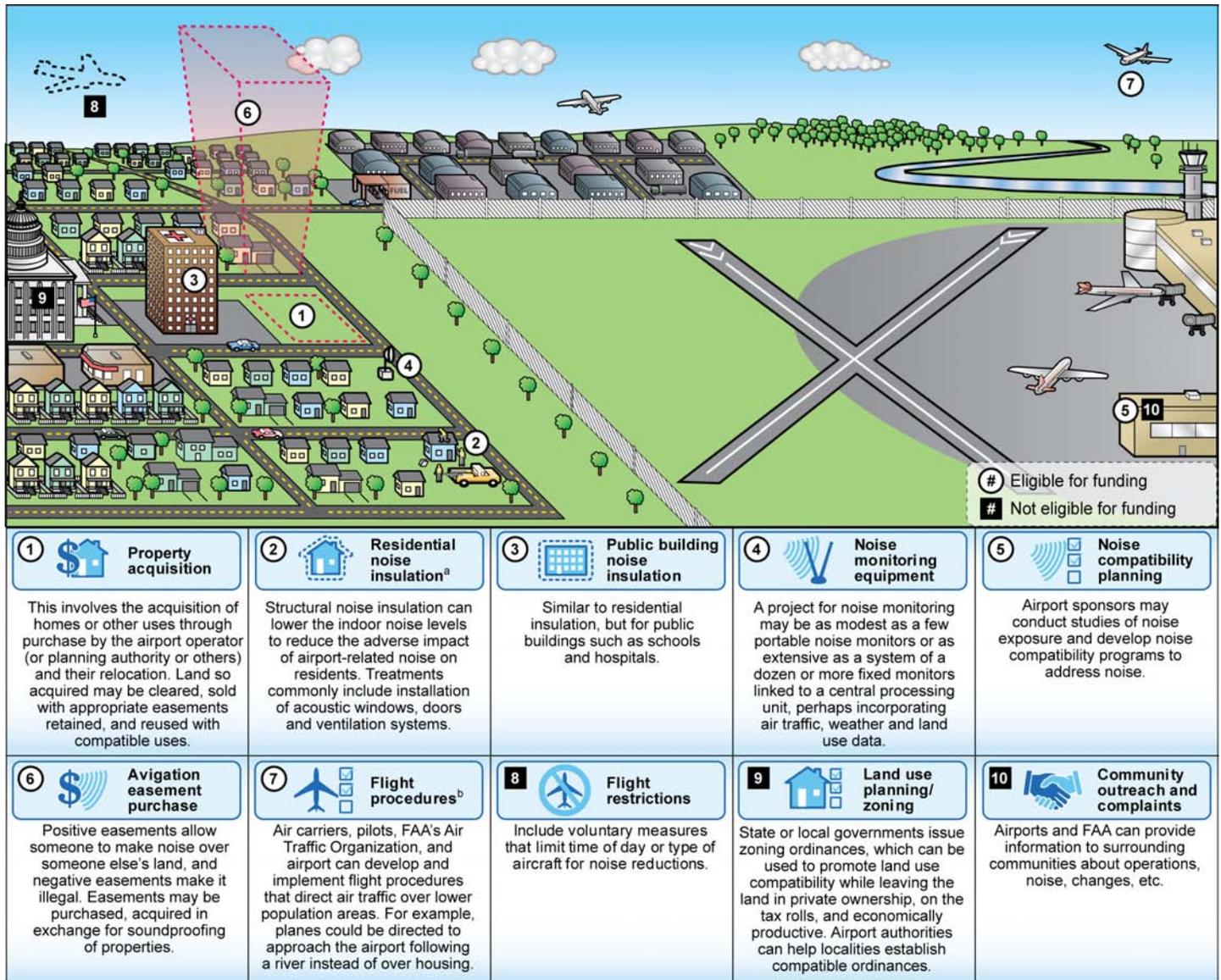
grants to varying degrees, depending on an airport's size.¹⁶ The second FAA funding program for noise mitigation projects is the Passenger Facility Charge (PFC) program.¹⁷ This program allows publicly operated airports to charge passengers a fee and retain these fees for their use on FAA-approved projects, including those that reduce noise. Project eligibility criteria for the PFC and AIP programs are largely the same, although an NCP is not required to use PFC funds for noise mitigation projects. PFC funds can be used to match AIP grants.

There are a variety of projects and actions to mitigate and reduce airport noise that airports may use, some of which are eligible for AIP grants. See figure 1.

¹⁶FAA's authorizing statute categorizes the nation's primary airports into four main groups based on the number of passenger enplanements—large hubs, medium hubs, small hubs, and nonhubs. The categories are based on the number of passengers boarding an aircraft (enplaned) within the United States. A large hub enplanes at least 1 percent of all systemwide passengers, a medium hub at least 0.25 but less than 1 percent, a small hub at least 0.05, but less than 0.25, and a nonhub less than 0.05 percent. See 49 U.S.C. § 47102 (10), (12), and (23) respectively. Historically, noise mitigation projects were eligible for 80 percent funding under AIP for large- and medium-hub airports, and 90 percent funding at small, non-hub, general aviation, and reliever airports 49 U.S.C. § 47109. Between 2004 and 2011, the federal share for smaller airports was temporarily increased to 95 percent under Vision 100-Century of Aviation Reauthorization Act (Pub.L. No. 108-176), but that increased level expired with the passage of the FAA Modernization and Reform Act of 2012.

¹⁷49 U.S.C. §40117.

Figure 1: Selected Tools Available to Address Airport Noise



Source: GAO analysis.

^aBeginning October 1, 1998, FAA only approves noise mitigation measures for incompatible development existing as of that date.

^bFAA Modernization and Reform Act of 2012 allows FAA to provide noise grants for airports to complete environmental reviews and assessment activities for proposals to implement flight procedures as part of an airport noise compatibility program (Pub. L. No. 112-95, § 504).

Populations Exposed to Significant Airport Noise Have Declined Because of Improvements in Aircraft Technology

Model for Assessing Global Exposure from Noise of Transport Airplanes (MAGENTA)

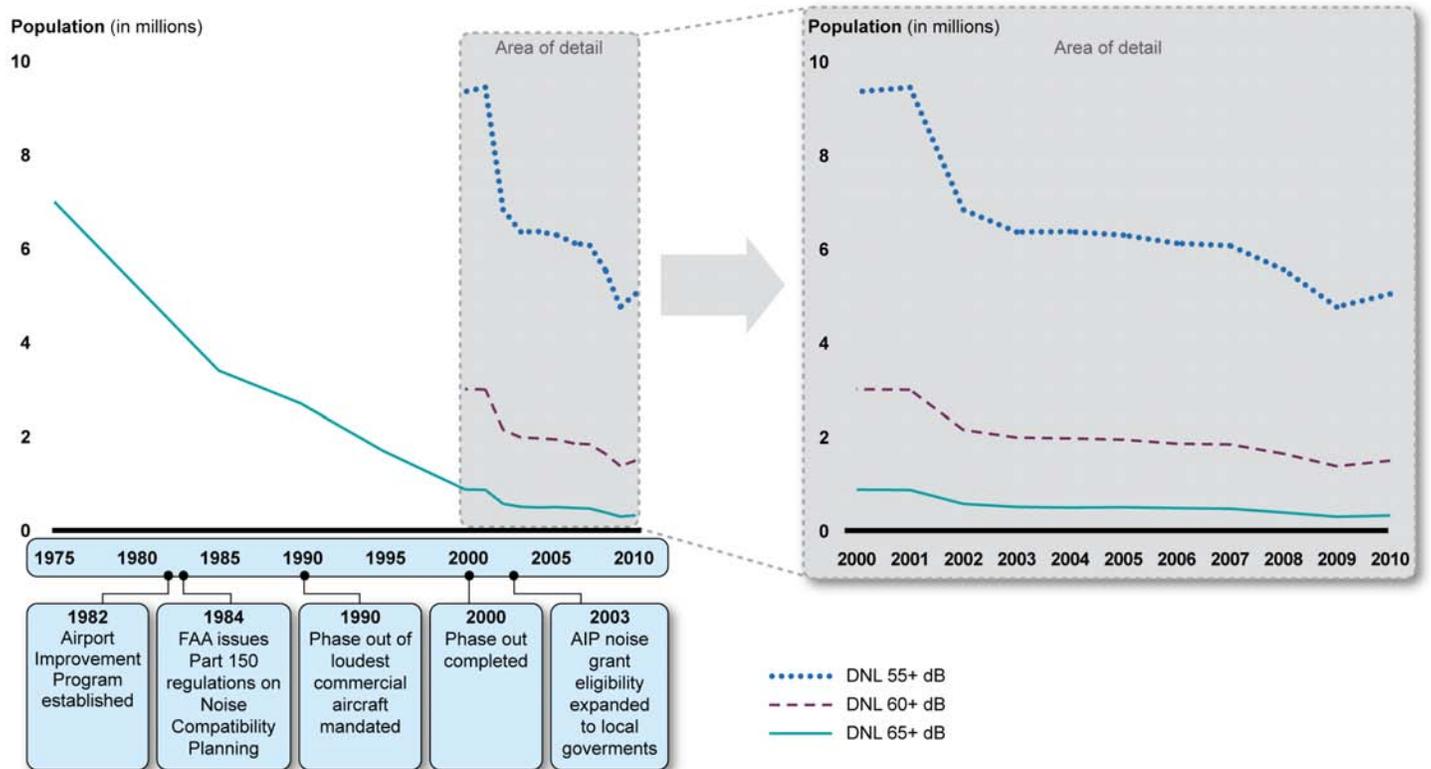
Each year, FAA's estimates of the number of people exposed to airport noise are obtained by computer modeling. This model provides specific estimates of the population exposed to airport noise; this estimate is not a census. The principal model used by FAA in recent years—called the Model for Assessing Global Exposure from Noise of Transport Airplanes (MAGENTA)—relies on

- detailed airport-level information on the numbers and times of aircraft operations
- types of aircraft, flight paths
- census population figures for 94 of the largest airports in the United States.

Using less detailed information, FAA also generates airport-level estimates for an additional 626 airports. FAA calculates an overall estimate of the population exposed to airport noise by adding these individual airport estimates. Using traffic forecast data, FAA can predict future exposure. In 2011, FAA began using a new model—called the Aviation Environmental Design Tool (AEDT)—which can model changes in noise exposure and emissions. Though AEDT provides enhancements to the methodologies, the core noise component of MAGENTA and AEDT remains FAA's Integrated Noise Model (INM). INM is commonly used by airport authorities and consultants in performing Part 150 studies and developing noise exposure maps.

The number of people exposed to airport noise has been steadily declining for several decades, according to FAA. FAA uses a model, called Model for Assessing Global Exposure from Noise of Transport Airplanes (MAGENTA), to calculate a high-level national estimate of the population exposed to different levels of airport noise. MAGENTA uses, among other factors, airport-level information about the number of aircraft operations, types of aircraft, flight paths, and census data for communities near airports (see sidebar). Individual airports may have, through Part 150 studies or through studies undertaken for NEPA compliance, for example, more precise estimates. FAA estimates that approximately 7 million people lived in areas exposed to significant airport noise—DNL 65 dB or higher—in 1975. Through the 1980s and 1990s, this exposure declined to less than a million by the year 2000. FAA estimates that about 309,000 people currently live in areas at or above DNL 65 dB. FAA estimates also show declines in the populations exposed to non-significant airport noise (i.e., below DNL 65 dB). For example, FAA estimates that between 2000 and 2010 the number of people residing in areas with DNL 60 to 65 dB decreased from about 3 million to 1.5 million (see fig. 2). The downward trend in noise exposure has held relatively steady despite overall increases in air traffic. For example, total U.S. operations—including arrivals and departures—went up from approximately 17.4 million in 2000 to 20.8 million in 2011, though some locations have seen declines.

Figure 2: Estimated Population Exposed to Various Airport Noise Levels, 1975 to 2010



Source: GAO analysis of FAA data.

Note: Population exposure estimates include residents that have and have not received noise insulation treatment. Data on DNL 55 dB+ and DNL 60 dB+ were not available for years prior to 2000.

FAA's model is intended to determine the population living within geographic areas exposed to airport noise, regardless of whether the houses or apartments have been sound insulated using AIP, PFC, or other funds. Consequently, some percentage of the population that FAA estimates is exposed to DNL 65 dB or higher lives in structures that have benefited from noise insulation. There are no readily available data to determine this percentage. Thus, FAA's model cannot be used to specifically assess the results of AIP grants.

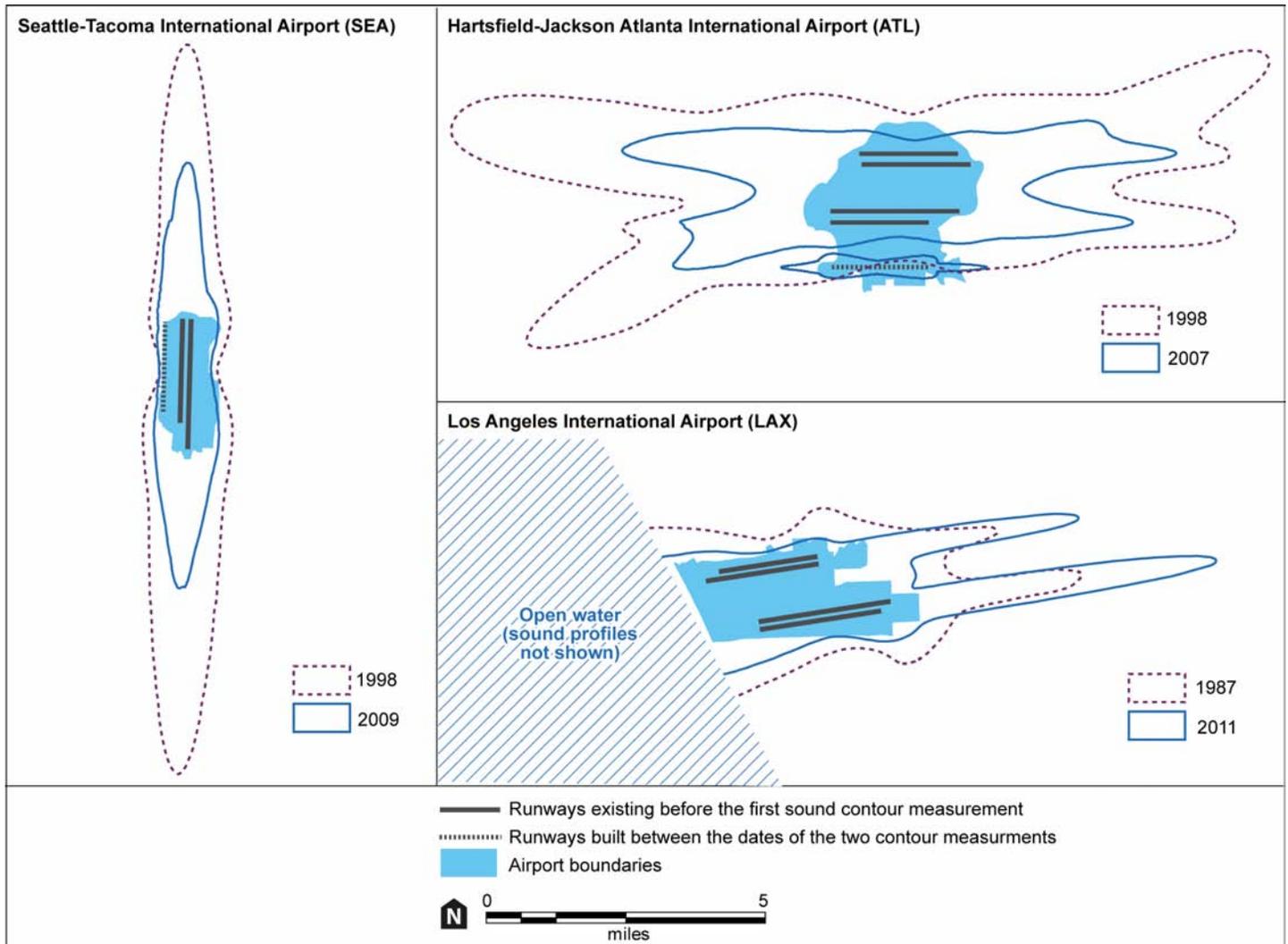
As with the shrinkage in the populations living in noise-exposed areas, the geographic areas exposed to significant noise around airports have

also generally been shrinking based on multiple recent assessments of DNL 65 dB noise contours that we, FAA officials, and others have conducted.¹⁸ Likewise, FAA and airport officials, as well as industry representatives with whom we spoke generally agreed that the DNL 65 dB noise contours around airports have been shrinking. We did not perform an overall assessment of the extent of this change because noise exposure maps are updated at different times at the discretion of individual airports. At all seven of the airports we examined—including two airports that have recently added runways—noise contours have shrunk overall, according to airport officials or our assessments of noise exposure maps for these airports.¹⁹ For example, at Atlanta-Hartsfield airport, the DNL 65 dB contour has become smaller since the 1980s despite a tripling of airport operations. Likewise, at Seattle-Tacoma International airport, noise contours are substantially smaller today than in the past. Specifically, the DNL 65 dB contour decreased in area almost 60 percent, from approximately 14 to 6 square miles, from 1998 to 2009. However, while noise exposed areas have generally become smaller overall, the shapes of some contours may have changed or shifted over time, decreasing significant noise exposure in some areas, but also exposing new areas to significant noise. For example, while the DNL 65 dB area around Los Angeles International airport decreased from approximately 13 to 11 square miles in total area from 1987 to 2011, the shape of the contour changed and now includes different communities (see fig. 3).

¹⁸GAO, *Aviation and the Environment: Impact of Aviation Noise on Communities Presents Challenges for Airport Operations and Future Growth of the National Airspace System*, [GAO-08-216T](#) (Washington, D.C.: October 2007). Airport Cooperative Research Program, *Aircraft Noise: A Toolkit for Managing Community Expectations*, ACRP Report 15 (Washington, D.C.: 2009).

¹⁹We examined Atlanta-Hartsfield (ATL), Birmingham-Shuttlesworth (BHM), Burbank (BUR), King County International – Boeing Field (BFI), Los Angeles International (LAX), Ontario International (ONT), and Seattle-Tacoma International (SEA). To some extent, comparing noise contour maps over time is a judgmental process because the methods and assumptions used in producing maps at different points in time change. For example, newer maps maybe generated, in part, with data from noise monitors that were not in place when older maps were made. However, to illustrate a broad trend, we compared the DNL 65 dB (Community Noise Equivalent Level, or CNEL, in California) contours of available maps, using Geographic Information System (GIS) analysis when possible. CNEL, like DNL, is used to characterize average noise levels, but uses a somewhat different methodology.

Figure 3: Examples of Decrease in Size of Areas Exposed to Significant Airport Noise (DNL 65 dB)



Source: GAO analysis of airport provided data.

Improvements in aircraft technology, spurred by federal mandates and industry actions to reduce aircraft noise levels, have been the largest contributor to the shrinkage in airport-noise-exposed populations and

noise contours.²⁰ FAA and airport officials we spoke with generally agreed that the phase out of the loudest aircraft—specifically, stage 1 and stage 2 aircraft weighing over 75,000 pounds—by 2000 and improved aircraft and engine technology are the most significant factors causing noise contours to shrink. For example, reduced air velocity moving through improved engines has reduced engine noise. Likewise, acoustical liners and improved air flap designs have reduced airframe noise.²¹ Other factors that may have contributed to decreased airport noise exposure include the implementation of flight procedures that can, for example, direct air traffic over less populated areas during arrivals and departures.

FAA Is Taking Steps to Ensure that Projects Meet Eligibility Criteria, and FAA’s Strategic Noise Goal Is Not Linked to the Noise Grant Program

AIP noise grants have been widely used by airports and have provided noise mitigation to thousands of people. However, in recent years, the program has benefited fewer people and FAA has not met its program goals. In light of the shrinking airport noise contours discussed above, FAA’s enforcement of grant eligibility criteria—related to noise exposure maps and the assessment of interior residential noise—creates a risk that some noise grants may not have met eligibility criteria, especially in the edges of the noise contour where noise may be below DNL 65 dB. FAA has recently issued guidance to address these areas of grant eligibility criteria, which if followed should reduce the risk of making ineligible grants. In addition, FAA’s overall strategic goal for its noise-related activities is not linked to the results of noise grant investments.

Grants Are Widely Used for Noise Insulation Projects and Land Acquisition

Since fiscal year 1982, FAA has provided about \$5.8 billion in AIP noise grants to 481 commercial and general aviation airports, reflecting broad participation in the program by airports through the program’s history. Specifically, most primary airports have been awarded at least one noise grant. General aviation airports have received \$75 million in grants since fiscal year 1982. Airports that have completed voluntary Part 150 studies and have had an NCP approved by FAA have received the majority of

²⁰49 U.S.C. § 47528. The importance of technological advancement in reducing airport noise exposure has been comprehensively addressed by the National Academies of Sciences. National Research Council, *For Greener Skies: Reducing Environmental Impacts of Aviation* (Washington, D.C.: 2002).

²¹FAA seeks to achieve source noise reduction through programs such as the Continuous Lower Energy, Emissions and Noise (CLEEN) program as well as through operational and procedure changes.

AIP noise grant funding.²² As of May 2012, 234 airports had an approved NCP and received grants totaling about \$5 billion.²³ Primary commercial airports account for 168 of the 234 approved plans. Of the remaining 66, 62 are larger general aviation or reliever airports.²⁴ Additionally, grants have been awarded to airports and communities outside the Part 150 framework following statutory changes in 2003 that allow for such grants.²⁵ During fiscal years 2005 through 2011, grants totaling \$336 million have been awarded to 24 airports or communities that do not have NCPs. These grants went to some of the largest airports in the country. For example, the Port Authority of New York and New Jersey secured \$134 million in grants for noise insulation of public buildings—mostly schools—near Teterboro, Newark, LaGuardia, and Kennedy airports.

AIP noise grants have funded a range of different types of projects, reflecting FAA and airport priorities, with noise insulation and land acquisitions receiving the most support. From fiscal year 2000 through 2011, out of approximately \$3.2 billion total, residential and public building noise insulation projects received approximately \$1.7 billion and \$456 million, respectively; property acquisition projects received \$780 million (see fig. 4). In addition, since fiscal year 2000, FAA has approved PFC applications from 73 airports to collect nearly \$2 billion for noise mitigation projects.

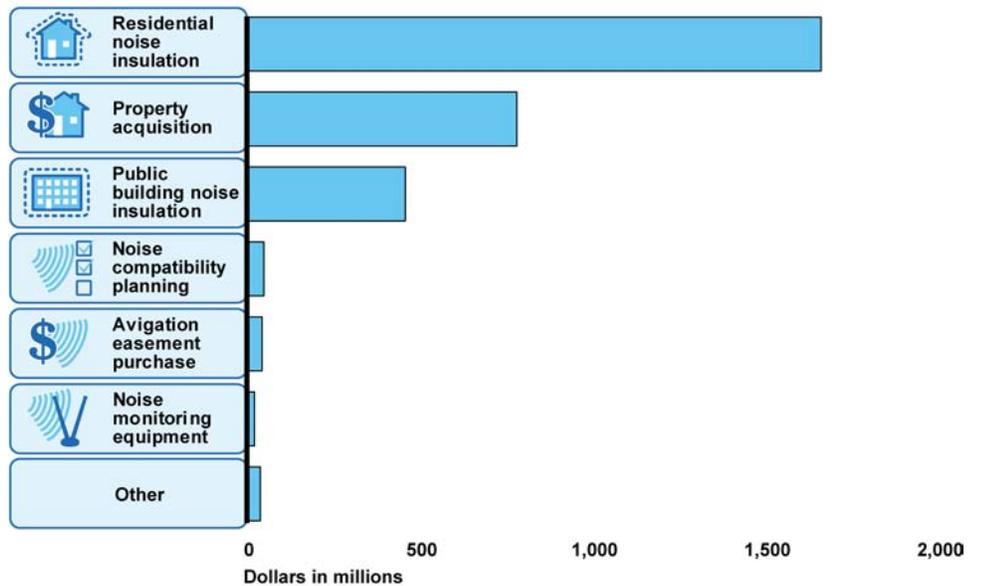
²²As previously discussed, noise grants can be awarded following FAA approval of a Part 150 NCP, agreements that are made pursuant to certain environmental review studies, or via other statutory provisions that allow certain projects to be funded without Part 150 approvals. FAA's Office of Airport's System of Airports Reporting (SOAR), a central data system, does not track the underlying justification for each grant and airports may have performed both Part 150 and environmental reviews.

²³101 airports have been awarded AIP noise grants for planning purposes, but have not subsequently been awarded grants for capital projects, such as noise insulation or land acquisition.

²⁴A primary airport is a commercial airport with more than 10,000 passenger boardings each year. 49 U.S.C. § 47102(15). A reliever airport is an airport designated by the Secretary of Transportation to relieve congestion at a commercial airport and provide general aviation access to the overall community. 49 U.S.C. § 47102(22). A reliever airport may be publicly or privately-owned.

²⁵Vision 100: Century of Aviation Reauthorization Act, Pub. L. No. 108-176, § 160(a), 117 Stat. 2511 (2003)

Figure 4: Airport Improvement Program Projects by Funding Category, Fiscal Years 2000 through 2011



Source: GAO analysis of FAA data.

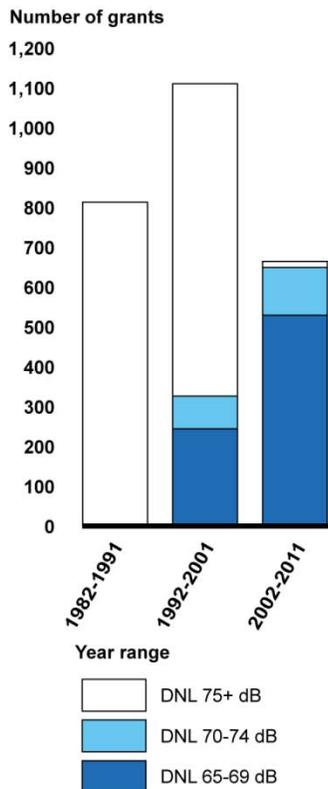
Note: Other includes various project categories listed above, but FAA data do not specify project-type funding levels.

The distribution of funds reflects airport priorities and FAA’s project assessments based on AIP grant-scoring formulas as well as judgmental considerations. FAA’s grant scoring formula ranks proposed projects in higher DNL areas above lower DNL areas and at larger airports above smaller airports. For example, a proposed residential noise insulation project in the DNL 70-74 dB range would score higher than a project in the DNL 65-69 dB range, regardless of airport hub size. In addition to formula scores, FAA made grant award decisions based on judgmental factors such as input from regional FAA officials—such as FAA’s Airports division regional offices or Airports District Offices (ADO)—about an individual airport’s capacity to execute its proposals and consideration of FAA regional priorities, as well as to meet national priorities. In recent years, FAA has also considered information on the number of expected beneficiaries—whether residents, students, or other groups—and attempted to fund a mix of grants that will meet an annual beneficiary goal. These beneficiary goals, discussed later in this report, are measured in the number of people expected to benefit from awarded grants. The fiscal year 2012 goal was 15,000 people.

In the first decades of the program, noise grants largely went to projects in areas most significantly impacted by airport noise—generally areas closest to airports—while grants in more recent years have gone to projects in areas that are less significantly impacted, but still deemed to be exposed to DNL 65 dB or higher noise levels (see fig. 5). For example, based on FAA data, all 385 acquisition and noise insulation grants from fiscal year 1982 through 1991 went to projects in DNL 75 dB or higher areas. In the last 12 years, as areas of higher noise exposure were increasingly already addressed, a large majority of grants went to projects in DNL 65-69 dB areas, the lowest significant noise-level eligible for grants under the program.²⁶ Also, most of the grants for planning activities were awarded in the first half of the program’s history. Specifically, through fiscal year 2000, FAA awarded 332 planning grants for approximately \$50.3 million. As of 2000, 195 airports had approved NCPs. Since fiscal year 2000, FAA has awarded 117 grants totaling approximately \$45.5 million for planning. Since 2001, thirty-nine airports had new NCPs approved by FAA. In some cases, instead of conducting a Part 150 noise study, airports completed environmental impact statements for major proposed development that included developing noise exposure maps that could be used to identify mitigation projects eligible for AIP noise grants.

²⁶The DNL of these projects refers to the noise level stipulated for the project by the airport sponsor based on, for example, the noise exposure map and additional documentation required closer to the date of the grant award.

Figure 5: FAA Noise Grants by DNL Range, since Fiscal Year 1982



Source: GAO analysis of FAA data.

Note: 124 grants totaling \$124.6 million did not specify the DNL level of the projects (“noise mitigation measures”) and are excluded from this analysis.

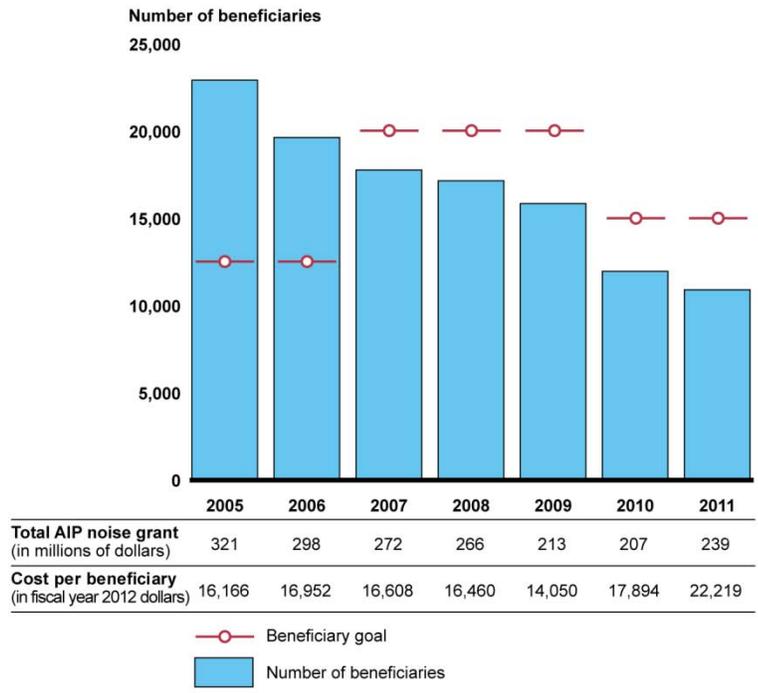
Consistent with the grant trends discussed above, according to FAA and airport officials with whom we spoke, planned projects within individual airport noise programs were prioritized to first address the most noise impacted areas or specific project types. At all of the seven airports we visited, officials indicated that they began mitigation efforts with properties in the noisiest areas that are typically closest to the airport or with schools. For example, Burbank (Bob Hope) Airport in California first insulated most of the schools inside the DNL 65 dB contour before beginning residential noise insulation. At Boeing Field in Seattle, residences in areas above DNL 70 dB were generally insulated first. However, airport officials also noted that project selection can also depend on practical program considerations, not simply noise exposure. For example, before starting a residential insulation project, the airport sponsor must identify and sign up homeowners and complete other

planning steps—all of which take time—and could lead to noise insulation of homes in areas with lower noise before homes in higher noise areas simply because they cleared these steps more quickly.

As part of managing the grant program, FAA sets beneficiary goals for AIP noise grants and tracks progress towards those goals. Beneficiary data, assessed annually, are used as part of FAA's annual budget justification to Congress. These data aggregate the number of people who have been—or are expected to be—relocated following acquisitions, as well as residential and student population soundproofing beneficiaries as a result of the grants awarded that year. Based on this information, noise grants have helped reduce or mitigate airport noise exposure for thousands of people.²⁷ However, as shown in figure 6, in recent years, fewer beneficiaries have been reached by these grants, FAA has fallen short of its beneficiary goals, and results have come at a higher per beneficiary cost. For example, in fiscal year 2011, the awarded noise grants benefited 10,913 people, short of the goal of 15,000, at nearly 40 percent higher per beneficiary costs than in fiscal year 2005. FAA officials explained that these trends are partly attributable to increasing construction costs due to inflation and more projects in higher cost areas, such as San Diego and Los Angeles. Finally, as discussed more below, these results are not reflected in FAA's overall reporting on the population exposed to significant airport noise.

²⁷FAA does not collect information on the results of noise mitigation projects that are funded exclusively with PFC or other local sources of funds. The results FAA reports for AIP grants include accomplishments that came, in part, because of local matching funds, such as PFCs.

Figure 6: FAA Noise Grant Beneficiary Goals, Results and Costs, Fiscal Years 2005 through 2011



Source: GAO analysis of FAA data.

Note: Beneficiaries include both residential and student populations that received noise insulation, relocation, or other benefits. Total Airport Improvement Program noise grants excludes Voluntary Airport Low Emissions grants that do not provide noise beneficiaries.

AIP noise grants have been the most important source of funding for noise mitigation projects, but other funding sources have also been used. Officials representing all seven of the airports we reviewed agreed that AIP funds were of great importance to their noise mitigation programs and most stated that, in the absence of these funds, much less, if anything, would likely have been spent on such projects. For example, Boeing Field does not collect PFCs, and according to airport officials, its noise mitigation program is highly dependent on AIP funds. However, many airports do have other funding sources—primarily PFC funds—that can be used for noise mitigation projects. According to FAA and airport officials, PFC funds are most commonly used to provide the local matching funds required of AIP grantees. For example, officials at five of the six airports that we reviewed that collect PFCs indicated that PFCs were used for noise mitigation projects as a match to AIP grants. PFCs also have been used to supplement AIP funds. FAA officials indicated that PFC funds may be used to speed up the completion of planned noise

mitigation projects in light of limited availability of AIP grants. However, most officials agreed that projects essential to the continued operations of the airport, such as runway rehabilitation and maintenance, were typically a higher priority for PFCs than noise mitigation projects. FAA's existing data system does not distinguish between projects that are fully funded using PFCs from those where PFCs are used to match AIP grants or provide supplemental funding.

Outdated Noise Exposure Maps and Inconsistent Application of Interior Noise Standards Increase Risks for Noise Grant Funds

We found that many of the FAA-accepted maps used to determine project eligibility for noise grants are outdated and could overstate the actual size of the DNL 65+ dB areas around airports, putting some federal grant investments at risk of funding projects that do not meet the eligibility criteria. Following the passage of the Vision 100 Act in 2003,²⁸ airports have been required to update noise exposure maps when a change in airport operations would indicate that the maps on file with FAA no longer accurately show the size or shape of the airport's DNL 65 dB noise contours and relationship to land uses. Federal regulation defines a significant change as a 1.5 decibel increase or decrease in the DNL for a substantial land area exposed to airport noise. Additionally, if the maps on file with FAA are older than 5 years, then the airport must certify that the maps continue to accurately reflect current conditions.²⁹ FAA officials explained that maps over 5 years old should be periodically reviewed for potential inaccuracies or changed conditions. In light of the general shrinkage in DNL 65 dB contours, some of the FAA-accepted maps are outdated and therefore could be inaccurate:

- Most maps that could be used for noise grant eligibility are more than 5 years old. According to FAA data, of the 252 airports that have developed noise exposure maps accepted by FAA, 189 maps are

²⁸Previously airports had been required to update maps only when there was an increase in the contours that would create a substantial new incompatible land use.

²⁹Prior to 2003, program criteria indicated that maps should accurately reflect conditions and be revised when changes occurred, but did not require a revised map when changes resulted in decreases in noise exposure. Part 150 requires preparation of "current" and "forecast" condition maps. The current condition map reflects conditions—operations, fleets, etc.—at the time of the study while the forecast condition map uses estimates of conditions at least 5 years in the future. Either map can be used for AIP grant eligibility provided it accurately reflects conditions.

more than 5 years old.³⁰ Further, we found 126 airports with maps from 1999 or before, predating the phase-out of stage 2 commercial aircraft by the year 2000. To the extent that the contours depicted by these maps reflect conditions from when these louder aircraft operated, the actual noise exposed area today is likely smaller.

- Many airports with old maps continue to be awarded noise grants for residential noise insulation in DNL 65-69 dB designated areas—the area that would first drop out of grant eligibility because of shrinking noise contours. Of the 28 airports that were awarded noise grants for this purpose in 2010 or 2011, 10 have maps from 2000 to 2005. In addition, nine of the 126 airports with maps from 1999 or before received a total of \$87.6 million in grants in fiscal years 2010 and 2011 for residential insulation projects in the DNL 65-69 dB area of the official map.
- Some airports have produced separate noise maps for reasons unrelated to Part 150 noise compatibility planning, such as to meet state requirements or for environmental reviews.³¹ In some cases, these maps indicate that noise-exposed areas have decreased, but FAA has not required the airport to update the map used for AIP eligibility. For example, Ontario International’s noise mitigation program area is currently defined by a map from 1990, but to meet state noise requirements, the airport produces quarterly noise exposure maps. While the technical details of the FAA-accepted map and these quarterly maps differ, preventing exact comparisons, the area exposed to significant noise in the more recent maps covers very little residential land across a much smaller area than in the 1990 map.³² The program has received \$25.8 million in grants since fiscal year 2007 and has identified \$58.4 million in planned AIP-funded noise mitigation projects for fiscal years 2013 through 2017.

³⁰18 of the airports that developed noise exposure maps have not developed an NCP, and as will be discussed later in this report, an airport that no longer intends to request noise grants may not update its NCP and therefore, its noise maps.

³¹Noise exposure maps developed as part of environmental reviews can be used for AIP grant eligibility.

³²While the methodologies used to develop noise maps for California’s requirement and for FAA grant eligibility may differ, both types of maps were developed using FAA’s Integrated Noise Model. Therefore, each methodology may produce somewhat different noise contours, but the overall trend in the size of the contour should be similar.

These indicators suggest that some risk of funding projects that do not meet eligibility criteria exists. Without current and accurate noise maps, or documentation of an alternative project justification, such as environmental agreements, there is no readily available way to determine how many, if any, FAA-funded projects did not meet the requirement of being inside the DNL 65 dB contour at the time of funding, though FAA officials believe that few, if any, grants have funded projects to date that do not meet the eligibility criteria.³³

Because an airport has little incentive to update a map that might overstate noise exposure, as it might disqualify projects planned by the airport from future grants, it is important that FAA enforce the requirement that airports maintain appropriately updated or certified noise exposure maps. As illustrated by the examples above, FAA has not always done so. For oversight purposes, FAA's 24 regional and district airports offices are primarily responsible for assessing the continued accuracy of noise exposure maps. In our site visits, we found that FAA district officials were generally informed about noise conditions at airports, potentially obviating the risk of funding ineligible projects, although we also found examples of lax enforcement as well.³⁴ Some local FAA officials we met with said they had reviewed additional information, such as other noise maps from environmental reviews, and determined that the requested grants targeted projects that remained in significantly noise affected areas. Officials explained during our site visits that these assessments are partially a judgmental process based on their knowledge of an airport's unique circumstances. For example, district officials determined that Seattle-Tacoma airport did not need to update its noise exposure map until after the addition of a third runway, a project that involved a comprehensive environmental review that included developing noise exposure maps. In this case, as in others we identified during our site visits, the maps developed as part of this review were used to meet AIP grant eligibility requirements. However, in our site visits, we found that each district office made different judgments about when to require an updated map. In one case, a district office allowed noise maps that were

³³The annual data FAA collects on beneficiaries includes DNL designations for the areas in which individuals reside and, to the extent that some grants went to projects that did not meet eligibility criteria as discussed previously, beneficiary results would be overstated.

³⁴We did not assess the extent that FAA officials in other districts consulted additional information in similar circumstances nor did we evaluate FAA's review of individual grant requests.

known to be inaccurate to be used in an effort to continue funding an existing airport's noise mitigation program. Several airport officials acknowledged that the maps used in their AIP funded noise program could overstate current exposure. Some airport officials we spoke with explained that they were reluctant to update maps when doing so could limit AIP eligibility for planned projects that the airport has already promised residents. Airport and FAA officials explained that planned project areas, as reflected in noise maps, need to be somewhat stable. They emphasized that while noise exposure is constantly evolving, it takes time to define a program, receive a grant, enroll people, and then design and execute projects. According to these officials, planned projects represent promises to communities, making program stability important. Changing or canceling planned projects because of decreasing noise can create public relations problems for airports, especially since gradual decreases in DNL may be difficult for residents to perceive. In light of these considerations, airport sponsors are unlikely to limit projects to only those that clearly meet program criteria without FAA's insistence. FAA, however, is responsible as the steward of the program for insuring that AIP noise mitigation funds only support projects that meet the program's eligibility criteria. Because the program has limited funding, paying for noise mitigation that is no longer needed takes money away from eligible projects that did not receive funding or from other aviation priorities.

Furthermore, program criteria—including regulations and FAA guidance—require that only homes located in DNL 65 dB areas with interior noise levels above DNL 45 dB can be approved for noise treatment, with limited exceptions, such as neighborhood equity. For example, FAA's principal guidance on AIP implementation explains that the design goal of residential noise insulation should be to achieve a noise level of 45 decibels in all habitable rooms; homes with interior noise levels already below this level should not generally receive noise insulation.³⁵ This guidance does not explain the method by which a project sponsor needs to assess interior noise levels. FAA district officials told us that the only practical way to determine interior noise levels is with testing. FAA

³⁵Homes that are below DNL 45 dB can be treated with some insulation to assure conformity of improvements and perceived equity of application in the project neighborhood. Additionally, within the airport industry, there is some disagreement and confusion about whether the 45 DNL noise level is a design goal or a grant eligibility requirement.

officials indicated that airport sponsors generally conduct interior noise testing on a sample of homes to determine eligibility based on the 45 dB criterion and to assist in designing acoustical treatments, but acknowledged that not all airports and consultants were consistently applying these rules. We found that interior noise assessments to determine project eligibility had been conducted at only three of the six airports we visited with residential noise insulation programs. Two of the three airports tested samples of homes, and officials at one of these airports noted that, to date, no homes have been excluded based on testing results because all had tested above DNL 45 dB. The third airport's program included interior noise assessment for all homes in the DNL 65-69 dB contour to determine eligibility prior to including a home in the insulation program. In that program's current phase—focused on homes in the DNL 65-69 dB contour in the airport's noise exposure map—less than half of the homes qualified for insulation following testing. We also found that testing protocols differed at these three airports. For example, some tests used artificial noise to simulate aircraft noise while other test procedures relied on actual flyovers. The other three airports we visited did not conduct interior noise assessments for eligibility, but did do some testing for project design purposes. However, without information on testing practices at all airports performing residential noise insulation, we cannot determine the extent of the risk to federal investments or how much, if any, AIP noise grant funding has gone to projects that did not meet the eligibility criteria.

Residential noise insulation projects may not have been limited to residences that have interior noise levels above DNL 45 dB because FAA has not consistently and routinely implemented criteria on interior noise level assessment. These criteria do not delineate requirements and protocols in detail. FAA officials explained that implementation has been inconsistent because airport officials, airport consultants, and FAA district officials have different interpretations of existing program criteria. FAA guidance did not, for example, specify testing protocols fully. Further, as with updating noise maps, there are disincentives for airports to rigorously implement existing criteria. For example, as a result of assessments some residents may not receive expected benefits, such as acoustical doors, windows, and ventilation systems. Airport officials often have to deal with community discontent when they explain why some residents are eligible for noise insulation and others are not.

At the time of our review, FAA, recognizing concerns about the age of noise exposure maps and the inconsistent implementation of interior testing criteria, issued program guidance in August 2012 to clarify existing

requirements regarding noise mitigation.³⁶ According to FAA officials, the guidance reinforces existing criteria on grant eligibility regarding the age and accuracy of noise exposure maps and clarifies the DNL 45 dB interior noise eligibility criteria. The guidance also addresses how interior noise should be measured and will provide for a 3-year transition period that will allow airports to continue with promised noise mitigation projects while better aligning projects slated for 2014 and beyond with the eligibility criteria. It is unclear whether FAA will fund projects during the transition period that do not demonstrably meet program eligibility criteria. FAA previously identified similar concerns about fund use and issued clarifying guidance. Namely, the problems we found regarding potentially inaccurate and old noise exposure maps were also identified in a 2002 internal FAA study.³⁷ Specifically, the study found that in fiscal years 2000 and 2001, grants were provided to airports based on potentially inaccurate maps from the 1980s and early 1990s that pre-dated the stage-2 aircraft phase-out. The study indicated that, because of shrinking contours, some grants may have funded projects in moderately noise impacted areas (DNL 55 to 64 dB) that should not have been funded. To address this issue, in 2003, and again in 2005, FAA issued program guidance requiring that all grant decisions be based on noise exposure maps that are less than 5 years old or otherwise certified as a reasonable representation of conditions at the airport. Therefore, it will be important that FAA enforce and its district offices adhere to the new guidance to ensure that noise grants are both eligible and targeted to the highest needs.

FAA's Strategic Goal for Noise Reduction Is Not Linked to Noise Grant Program

FAA has established an overall agency goal for addressing airport noise—which covers all noise-related agency efforts, not just the AIP noise grant program—to reduce the population living in significantly noise impacted areas to below 300,000 people nationwide by 2018.³⁸ This goal

³⁶Program Guidance Letter 12-09, AIP Eligibility and Justification Requirements for Noise Insulation Projects (Aug. 17, 2012)

³⁷Federal Aviation Administration, "Evaluation of Noise Set Aside Portion of the Airport Improvement Program," (Oct. 1, 2002).

³⁸This agency goal is defined as residential populations living in DNL 65+ dB areas. As discussed earlier, the declining trend in the population exposed to significant airport noise are largely attributable to quieter aircraft that result in smaller noise exposure contours. Current exposure is estimated at about 309,000.

is articulated in the Department of Transportation's fiscal year 2013 performance plan, FAA's long-range strategic plan—Destination 2025—and other FAA performance documentation. The intended outcome of reaching this goal is to ameliorate community noise concerns such that they are not a constraint on airport growth. To achieve this goal and outcome, the department and FAA have indicated that people still exposed to significant airport noise levels shall be addressed by AIP noise grants, FAA's largest program to address airport noise, primarily through airport-specific Noise Compatibility Programs.

However, the overall strategic goal is not linked to the results of the AIP noise grants. We have previously reported that linking program performance to overall goals can provide a clear, direct understanding of how program results will lead to the achievement of goals. We have also reported that to determine whether goals are met, an agency should establish performance measures that gauge progress toward desired outcomes and can be used as a basis for decision making.³⁹ However, with the exception of AIP-funded land acquisition and relocation projects, the types of projects funded by AIP noise grants are not intended to lower the number of people living in significantly noise-impacted areas, but rather mitigate the negative impacts of airport noise exposure.⁴⁰ In other words, noise grant results will not help the agency achieve its goal, as articulated. Further, by articulating its goal strictly in terms of the residential population exposed to significant airport noise, FAA has established a strategic goal that does not account for the results of its largest noise program. Specifically, neither the goal nor FAA's use of the MAGENTA tool to measure progress toward that goal by estimating the population exposed to different levels of airport noise reflects AIP noise grant results:

³⁹GAO, *Executive Guide: Effectively Implementing the Government Performance and Results Act*, [GAO/GGD-96-118](#) (Washington, D.C.: June 1996).

⁴⁰Through 2005, FAA monitoring of progress towards its strategic goal—namely, annual estimates of the population exposed to significant airport noise using the MAGENTA model—did include population decreases because of noise grant funded acquisition and relocation projects, but these results have not been included in estimates since 2005 because of an administrative error. FAA is currently taking steps to account for relocated populations into estimates again, but expects doing so will lower the overall population estimate only slightly.

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- The residential population goal and associated annual estimates of population exposure do not take into account the number of residents benefiting from AIP-funded acoustically treated homes. While these residents continue to live in a noise impacted area, they do so in a quieter home that has benefited from AIP-funded mitigation.
 - The goal and measure also do not account for student or other populations using public buildings that may be affected by airport noise and could benefit from the AIP grant program in the future.

As a result of establishing a strategic goal and a corresponding measure of progress that do not account for AIP noise grants results, there is insufficient performance information about the nature and extent of remaining airport noise exposure and the contribution of noise grants in mitigating the impact of that exposure. Specifically, FAA does not know how many residences, schools, or other public buildings are in significantly noise exposed areas or which of those have yet to benefit from noise insulation projects. Without this information, Congress and FAA program managers cannot make fully informed decisions about what the noise grant program can reasonably be expected to address in the future and the extent to which noise exposure remains a constraint on growth. FAA officials acknowledged that the current approach could cause confusion and that there may be some benefit to better distinguishing between the agency's overall noise goal and the purpose of noise grants.

Airports Continue to Plan Noise Mitigation Projects, but of a Changing Nature

The 2011 National Plan of Integrated Airport Systems (NPIAS) report, which includes airport projects from fiscal years 2011 through 2015, shows continued plans for noise mitigation projects, but a drop in the number of projects and the number of airports planning them. Additionally, since the 2001 NPIAS report, the nature of included projects has changed, reflecting airports' progress in implementing their noise compatibility programs, and a corresponding drop in the residential population living in areas around airports deemed significantly affected by noise. The change in the nature and extent of noise mitigation projects in the NPIAS combined with other indicators—such as the age of NCPs, shrinking noise contours, and other factors—points to the possibility of a future decline in the demand for noise project funding. Concurrently, the scope of projects eligible for the set-aside has expanded to include water and emissions projects, whose cost may grow in the future.

Planned Noise Mitigation Project Demand

The NPIAS, which inventories airport projects planned over the next 5 years, is one indicator of future noise grant demand.⁴¹ The most recent NPIAS, issued in 2011, illustrates that, as compared to previous years, fewer airports are planning fewer noise mitigation projects, albeit at a higher total cost. The 2011 NPIAS report to Congress includes planned AIP-eligible projects. The number of airports with planned AIP noise mitigation projects has declined 16 percent since the 2001 report, which covered fiscal years 2001 through 2005, and the number of planned noise projects included in the 2011 NPIAS is nearly half what it was in 2001 NPIAS.⁴² Despite the decreased number of planned projects, the anticipated costs for those projects rose to \$2.1 billion, or roughly \$425 million per year.⁴³ Table 1 shows the number and estimated costs of planned projects at airports as reported through the NPIAS since 2001.

Table 1: Planned Airport Noise Projects Identified in the National Plan of Integrated Airport Systems since 2001

NPIAS report	Airports with (and number of) noise projects	Planned noise projects estimated cost (in millions)
2001-2005	104 (369)	\$ 1,400
2005-2009	88 (283)	1,426
2007-2011	91 (178)	1,581
2009-2013	93 (187)	2,007
2011-2015	87 (188)	2,124

Source: GAO analysis of FAA data.

The nature of the projects in the most recent NPIAS has changed to focus more on projects designated to be in DNL 65-69 dB contours; the total

⁴¹As a planning document, the NPIAS does not reflect the agency's investment priorities. FAA prioritizes projects through its Airports Capital Improvement Plan (ACIP) which is compiled based on information prepared by regional offices. The project priority ranking included in the ACIP incorporates an airport's size, the purpose of a project (such as insulating homes) and the specific types of efforts (such as insulating homes in the DNL 65 dB contour).

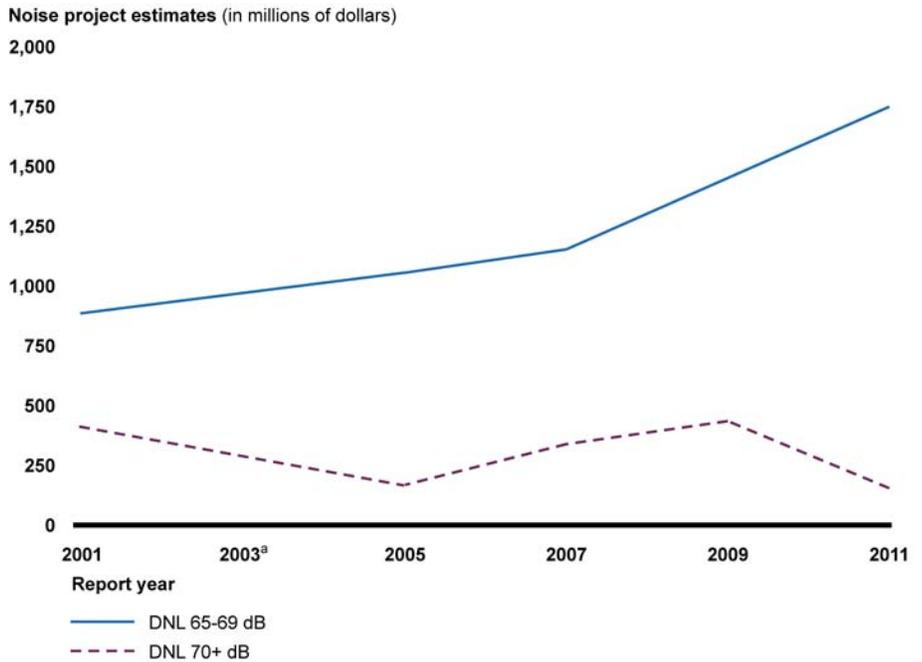
⁴²Since the 2007 NPIAS report, individual projects have been grouped together as part of a bigger multi-phased project that had previously been counted individually. The change may have contributed to apparent decreases in the number of projects.

⁴³These cost estimates are obtained from airport master plans and state system plans, and includes only AIP-eligible projects to be undertaken by airport sponsors. Cost estimates also don't include contingency costs or normal price escalation.

estimated planned costs for mitigation inside DNL 70-74 dB contours has dropped, and there are no projects for land acquisition or noise insulation inside the DNL 75 dB contour. As discussed earlier, airports generally began with projects in the loudest contour, and the changes reflected in the NPIAS suggest that some airports have completed projects in those contours and are now focusing on projects in areas further away from the airport. In fact, the vast majority of noise-related projects identified in the 2011 plan are focused on the further away DNL 65-69 dB contour—the contour with the lowest noise exposure that is considered significant under federal guidelines and still meets eligibility criteria.⁴⁴ This shift of focus may partly explain why the most recent NPIAS has a higher total cost because contours further away from an airport tend to cover larger geographic areas and more homes, though increases in construction costs and other factors likely contribute as well. Figure 7 below shows the change in planned noise mitigation projects as reflected in the NPIAS.

⁴⁴Future demand for noise grants would change if the definition of significant airport noise were to change in the future. FAA, in collaboration with the Federal Interagency Committee on Airport Noise (FICAN) is currently researching whether DNL 65 dB remains the most appropriate measure for assessing airport noise exposure and, as a result of this research, may adopt a different definition of significant airport noise. If this criterion were lowered, then the number of projects eligible for AIP noise grants would likely increase. Our analysis did not assess possible future demand scenarios should this definition change.

Figure 7: Planned Noise Project Estimates by Noise Contour as Reported in the National Plan of Integrated Airport Systems, 2001 through 2011



Source: GAO analysis of FAA data.

^aNo NPIAS was prepared for 2003-2007 because of delays associated with September 11th terrorist attacks and other factors. FAA continued to make AIP noise grants during these years as usual.

Noise Compatibility Programs

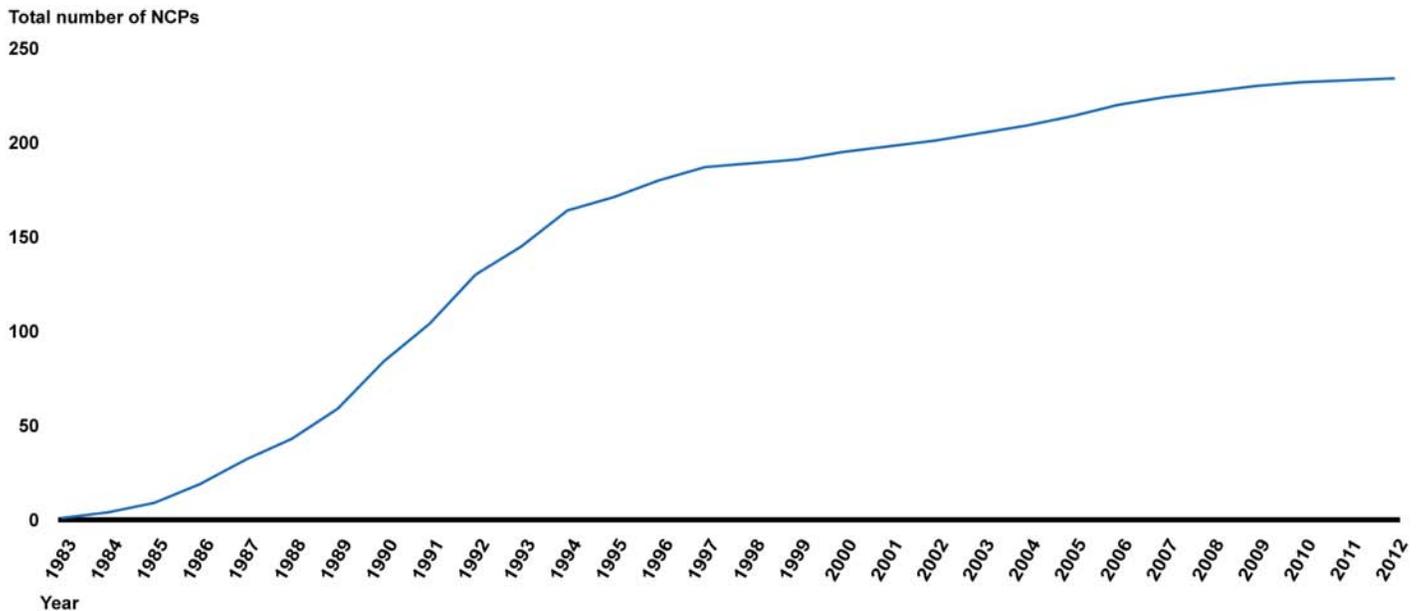
The status of projects in existing NCPs is also an indicator of future noise grant demand and shows potentially lower future demand. Our analysis determined that 102 of 137 airports with NCPs more than 10 years old received no noise grants since fiscal year 2007 and that only 22 of these 137 airports have noise mitigation projects in the 2011 NPIAS, an indication that some of these airports may have completed all of their AIP eligible noise mitigation projects. For several reasons, we could not fully assess the number of outstanding noise mitigation projects that are included in airports' NCPs and that airports intend to seek noise grants for

in the future.⁴⁵ However, some airports are nearing the end of their programs. For example, we were told by officials at 4 of the 7 airports that we reviewed that they anticipate completing their noise compatibility programs within about 3 years. At those airports without NCPs, some anticipate completing their public building insulation efforts in the near future. For example, officials from the Port Authority of New York and New Jersey indicated that they expect to complete the school insulation program around their airports within about 3 years.

Furthermore, airports have developed fewer new or updated NCPs in recent years, suggesting that future demand for noise grants may be waning as existing programs mature. As noted previously, since AIP noise grants were established in the early 1980s, FAA has approved NCPs for 234 airports and inclusion in an NCP is a prerequisite for AIP funding, with limited exceptions. About 85 percent (198 of 234) of the airports' NCPs were approved more than a decade ago, and since 2007, only 14 new ones have been approved (see fig. 8).

⁴⁵Although the NCP sets forth an airport's plan to address noise, FAA does not centrally track the funding or completion status of those projects. In addition, because of the program's voluntary nature, airports are not compelled to complete all projects listed in its NCP. An airport's needs or priorities, for example, may change, which could result in some items being excluded from or added to its noise program. And even if an airport still intends to seek noise grants to fund listed projects, FAA is not obligated to fund projects via AIP.

Figure 8: FAA Approval of Noise Compatibility Programs, 1983 to 2011



Source: GAO analysis of FAA data.

Some communities around airports that are exposed to significant airport noise are not likely to receive residential noise insulation. Airports are free to choose not to perform residential noise insulation projects because developing an NCP—a necessary step for the airport to take to receive AIP funds for such projects—is voluntary. According to FAA and as would be expected, 30 years into a voluntary program, airports that are likely to pursue AIP-funded residential noise insulation programs have likely already at least begun to do so. Some of the busiest airports in highly populated areas have chosen not to complete an NCP. For example, officials from the Port Authority of New York and New Jersey indicated that they have not conducted Part 150 studies for any of the five airports under their jurisdiction because a residential noise insulation program would not alleviate noise exposure when people are outside their homes—they noted that noise complaints peak in the summer—and AIP’s grant-matching requirements would be financially prohibitive. To the extent that airports without NCPs continue not to participate in the Part 150 program, the people living in areas significantly impacted by airport

noise may never receive the benefits of noise mitigation.⁴⁶ This population is about a third of the remaining population that FAA's MAGENTA model estimated is exposed to significant airport noise. Specifically, in 2010, the model estimated 113,000 people (out of 323,000) lived near airports that had not developed an NCP, though this population is not monitored as part of FAA's strategic goal and measurement approach discussed above.

Given the shrinkage of noise contours previously discussed, it is possible that if airports updated older NCPs and noise exposure maps, some noise projects in the current NPIAS—which reflects projects in NCPs—would no longer meet grant eligibility criteria. These smaller noise contours would also reflect that the residential population within areas significantly impacted by noise has fallen dramatically. While there is no way to determine how many planned projects—and the costs of those projects—would no longer meet the grant eligibility criteria, the 2011 NPIAS includes planned projects in areas designated as DNL 65-69 dB at 61 airports. Eighteen of these 61 airports have over \$770 million in projects even though their noise exposure maps are more than 10 years old; as noted previously, these maps are likely to overstate current noise exposure and funding to these projects could put federal investments at risk.⁴⁷ Together, smaller contours and fewer noise impacted populations, if sustained, suggest that projects approved under updated NCPs could tend to be smaller in scale and scope.

Technology and NextGen

Future changes in aircraft noise and the ongoing implementation of NextGen, could factor into future demand levels for AIP noise grants. FAA and the aviation industry expect aircraft noise levels to continue to fall with ongoing technological and operational advancements. Manufacturers continue to work to provide quieter engines for aircraft and to address noise produced by airframes. In addition, as NextGen is implemented, FAA is making an effort to incorporate changes that will not only improve the efficiency of the system, but also provide for quieter operations. FAA

⁴⁶FAA can provide grants directly to communities around medium and large hub airports where airports have not established an NCP, or where an NCP has not been updated in 10 years. 49 USC § 47141.

⁴⁷Some of these 18 airports may have other noise exposure maps that are more recent because of, for example, an environmental assessment. FAA data would not include these maps.

anticipates that there will be noise exposure reduction benefits resulting from the implementation of some operational changes, such as flight procedures. For example, new arrival procedures will involve less engine thrust, and thus result in quieter approaches. But even with these benefits, changes in flight paths will affect populations that had previously been subjected to less aircraft noise or less concentrated flight paths. This impact, however, would generally remain outside the DNL 65 dB contour and, unless the minimum eligible DNL were lowered, would not affect grant demand. FAA has not yet determined the extent of the impact of such operational changes on airport noise, and whether or how they might change noise contours or lower noise exposure around an airport. In contrast, the increases in air traffic predicted in the next decade, particularly at airports near large, densely populated urban areas, could result in recently contracted noise contours growing larger, which could offset, to some unknown degree, advancements in technology and operations. However, if noise contours reverse course and begin to expand, some of that expansion could be into areas that already have been remediated through previous noise mitigation efforts. In such cases, newly eligible noise mitigation projects would not result. Conversely, new incompatible land uses created by subsequent airport development or operational changes may be eligible for funding consideration.

Noise Mitigation Projects Will Compete with Other Projects for Noise Grants

In the future, more types of environmental projects will be competing for the same amount of AIP noise grant funds. The amount of funding available for noise grants is established by Congress. Recently, Congress has expanded the eligibility for noise set-aside funding to projects not directly related to noise, a change that has effectively decreased the funding available for noise programs in recent years. In addition, the Voluntary Airport Low Emission (VALE) program, which was designed to reduce ground sources of emissions at commercial service airports located in areas failing to meet or maintain EPA ambient air quality standards, became eligible for noise grant funding in fiscal year 2005.⁴⁸ Under the VALE program, FAA made 51 grants during fiscal years 2005 to 2011 totaling \$108.5 million at 30 airports. The 2011 NPIAS identifies plans for \$87.9 million in VALE projects at 11 airports through fiscal year 2015 (about 4 percent of the estimated cost of all AIP eligible noise

⁴⁸GAO, *Aviation and the Environment: Initial Voluntary Airport Low Emissions Program Projects Reduce Emissions and FAA Plans to Assess the Program's Overall Performance as Participation Increases*, [GAO-09-37](#) (Washington, D.C.: Nov. 7, 2008).

mitigation projects listed in the report). FAA airport district office officials, as well as airport officials we interviewed, indicated that VALE projects will continue to be pursued in the future. In addition to VALE, the 2012 FAA reauthorization expanded eligibility for certain water projects at airports undertaken as a result of an environmental record of decision for an airport development project, such as a runway extension.⁴⁹ FAA has not estimated future demand for VALE. And because the water project eligibility is new, no such projects appeared in the 2011 NPIAS report and FAA has yet to determine how these projects would be ranked against VALE and noise mitigation projects. Therefore, it is not clear how expanded eligibility for these other kinds of projects for AIP noise set-aside grant funds may affect FAA's ability to meet future noise grant demand.

Conclusions

Today, the number of people in the United States who are exposed to significant airport noise is considerably reduced from when FAA began providing AIP noise grants in the early 1980s. Overall, the program has benefited thousands of people over the years by mitigating airport noise—one of the top environmental concern of airports. However, in the decades since the AIP noise grant program began, airports have completed numerous noise mitigation projects and technology has produced quieter aircraft and better operating procedures. Our review shows that, now and going forward, the need for noise grants may be lower than it was in the past. It is up to FAA to ensure that

- future noise grants are directed to the remaining projects that meet the grant eligibility criteria,
- the agency's goal for addressing airport noise aligns with the current airport noise problem, and
- the measures used to assess progress accurately reflect FAA's programmatic results.

As implemented, there is a risk that some federal investments in noise mitigation went to projects that may not have met existing eligibility criteria, and if not effectively addressed, this risk will continue in the

⁴⁹Pub. L. No. 112-95, §145, 126 Stat. 11, 30 (2012).

future. FAA has not uniformly enforced the accuracy of noise exposure maps and has inconsistently applied program criteria for interior noise assessments. This diminishes Congress's and the public's assurance that federal funding has been or will be spent appropriately and, to the extent that some misapplication of AIP grants to projects has occurred, creates the risk that more meritorious projects at other airports may not have been funded. It is encouraging that FAA issued guidance to more clearly articulate the program's eligibility criteria and has called upon airports to review their noise programs to better ensure the eligibility of planned projects. If properly implemented and followed, this guidance should reduce the risk of federal investment in ineligible projects. However, since some of these problems have persisted despite previous FAA guidance, it is too soon to tell if FAA's current actions will be successful.

Currently, FAA's overall goal for its noise efforts is to reduce the population exposed to airport noise above DNL 65 dB to less than 300,000 people by 2018 and FAA measures progress by estimating the residential population exposed to this noise level. However, there are shortcomings to this approach. First, FAA's overall goal is disconnected from FAA's primary tool to address noise—the AIP noise grants—because it does not reflect the results of these grants. Beneficiaries of noise insulation projects continue to reside or attend school in DNL 65 dB or louder areas even though the noise exposure has been mitigated for them. Second, approximately one-third of the estimated remaining population exposed to significant airport noise resides near airports that have yet to and may never establish an NCP. After 30 years, it appears unlikely that this population will ever be reached by the current program. FAA's strategic goal and measures do not account for this population. To more effectively manage the program and target federal funds, goals and metrics should align with the nature and extent of the remaining airport noise problem. At present, however, the nature and extent of the remaining airport noise problem are ill-defined. Key steps to effectively address airport noise include

- understanding the nature and extent of the current problem,
- determining appropriate goals to address the problem,
- establishing metrics to measure progress, and
- using this information for decision making.

Effective program management should increase the effectiveness of the current grant program and provide a more complete picture of noise grant results. Though a number of airports continue to have planned noise mitigation projects, after 30 years of funding noise grants, it is reasonable to question whether the program may remain relevant for only a limited period in the future or need to be reformed to better target emerging needs. Increased knowledge about the problem and the use of noise grants as a solution should help Congress and FAA chart the most appropriate course for the future of the AIP noise program.

Recommendation for Executive Action

To better ensure that federal investments effectively address the remaining airport noise problem and to more fully demonstrate the results of AIP noise grants, the Secretary of Transportation should direct FAA to take the following two actions:

- Establish a strategic noise reduction goal that aligns with the nature and extent of airport noise and targets the agency's noise grant program.
- Establish performance measures to assess progress toward this goal that better demonstrate the results of the program and provide Congress and FAA's program managers with information to gauge progress and make programmatic decisions.

Agency Comments and Our Evaluation

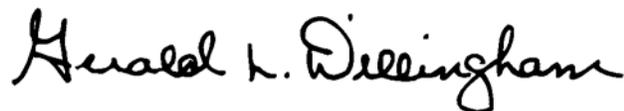
We provided a draft of this report to the Department of Transportation (DOT) for its review and comment. DOT and FAA officials provided technical comments that we incorporated as appropriate. In addition, in emailed comments to us, DOT offered several observations on our report. First, DOT highlighted that the noise grant program is not the only means by which airport noise has been reduced, noting that other FAA initiatives and industry actions, especially those that led to improvements in aircraft engine technology are primarily responsible for airport noise reductions. We concur with this position but, as indicated in the report, the noise grant program is the largest FAA expenditure to address noise. Second, DOT officials stated their belief that noise grants only go to projects that meet eligibility criteria unless otherwise justified. However, as noted in our report, in light of the overall decline in airport noise, the age and potential inaccuracy of some noise exposure maps, and FAA's inconsistent implementation of eligibility standards, we believe there is an increased risk for noise grants and have noted the limited circumstances under

which grants can be made to projects that don't meet these criteria. FAA's recent issuance of guidance clarifying eligibility criteria is commendable and needed because, if properly implemented, it will address this risk. Finally, DOT noted that FAA sets annual beneficiary targets for noise grants, tracks progress toward these targets, and reports these results to Congress. We acknowledged these actions in our report, but these targets, results, and reporting are not linked to FAA's strategic noise goal and measurement approach nor are they included in FAA's reporting on progress toward that strategic goal. Without a linkage between the results of FAA's most costly program to address noise and FAA's strategic goal for addressing noise, Congress, FAA, and the taxpayers do not have sufficient information on the value of these continued investments.

FAA reviewed our recommendations and agreed to consider them for action.

We are sending copies of this report to the Secretary of the Department of Transportation, the Administrator of the Federal Aviation Administration, and appropriate congressional committees. This report is also available at no charge on the GAO website at <http://www.gao.gov>.

If you or your staff have any questions about this report, please contact me at (202) 512-2834 or dillingham@gao.gov. Contact points for our Offices of Congressional Relations and Public Affairs may be found on the last page of this report. GAO staff who made major contributions to this report are listed in appendix II.



Gerald L. Dillingham, Ph.D.
Director, Physical Infrastructure Issues

Appendix I: Objectives, Scope, and Methodology

This report addresses the following objectives: (1) how airports' noise exposure has changed since federal noise grants were first funded, (2) how Airport Improvement Program (AIP) grants have been used by airports to mitigate noise and what have these grants achieved, and (3) the likely future demand for AIP noise set-aside grants.

To describe how airport noise exposure has changed over time, we reviewed available literature and met with industry organizations. For the purposes of this report, we used the currently accepted definition of significant airport noise (e.g., DNL 65+ dB). We interviewed officials from the Federal Aviation Administration's (FAA) Office of Airports and the Office of Policy, International Affairs and Environment at FAA Headquarters, and at 4 Airport District Offices in 3 of 7 FAA regions. We also performed a Geographic Information Systems (GIS) analysis of noise contours at selected airports to illustrate the changes to areas exposed to airport noise over time. To assess how the population exposed to noise has changed over time, we obtained information from FAA's MAGENTA noise model. We did not independently assess the MAGENTA model itself. FAA uses this model to estimate the population exposed to significant airport noise. The MAGENTA estimates for noise exposure are broadly used and generally considered accurate for the purposes intended.

To assess how AIP grants have been used for noise project planning and implementation, we obtained and analyzed data in FAA's System of Airport Reporting (SOAR). This database includes detailed information about AIP grants, Passenger Facility Change (PFC) approvals, project types, and other airport information. We assessed the reliability of SOAR data by (1) performing electronic testing of required data elements, (2) reviewing existing information about the data and the systems that produced them, and (3) interviewing agency officials knowledgeable about the data. We determined that the data were sufficiently reliable for the purposes of this report. We met with sponsors of 7 airports in three regions to discuss the development and implementation of their noise compatibility programs. These airports were judgmentally selected to provide information from airports of different sizes, different parts of the country, and at different points in implementing their noise projects. Information obtained from these airports is for illustrative purposes only, and cannot be generalized for all airports. To understand how the results of AIP noise grants have contributed to FAA's progress towards achieving

its strategic noise goal, we assessed FAA's use of its MAGENTA noise model compared to GAO criteria.¹

To assess future demand for AIP noise grants, we reviewed planned projects in the National Plan for Integrated Airport Systems (NPIAS), FAA's primary tool for identifying potential airport capital projects. The NPIAS data is part of FAA's SOAR reporting system. We also obtained information about the dates of airports' Noise Compatibility Programs (NCPs) and noise exposure maps from the Office of Airports at FAA Headquarters. For the purposes of this report, we used the currently accepted definition of significant airport noise (e.g., DNL 65+ dB)—as does the NPIAS—to identify potential future noise projects. The results of our analysis of future demand for noise grants would change if the definition of significant airport noise changes in the future. To understand the implementation and future of airport noise programs, we reviewed noise programs at the 7 airports indicated above and discussed them with the 4 Airports District Offices which oversee those airports.

We conducted this performance audit from October 2011 through September 2012 in accordance with generally accepted government auditing standards. Those standards require that we plan and perform the audit to obtain sufficient, appropriate evidence to provide a reasonable basis for our findings and conclusions based on our audit objectives. We believe that the evidence obtained provides a reasonable basis for our findings and conclusions based on our audit objectives.

¹GAO, *Executive Guide: Effectively Implementing the Government Performance and Results Act*, [GAO/GGD-96-118](#) (Washington, D.C.: June 1996).

Appendix II: GAO Contact and Staff Acknowledgments

GAO Contact

Gerald L. Dillingham, Ph.D. (202) 512-2834 or dillinghamg@gao.gov

Staff Acknowledgments

In addition to the individual named above Paul Aussendorf (Assistant Director), Amy Abramowitz, Hiwotte Amare, Elizabeth Curda, Jeff Heit, Dave Hooper, Christopher Jones, Delwen Jones, John Mingus, SaraAnn Moessbauer, Josh Ormond, and John Stambaugh made significant contributions to this report.

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