

July 2008

FAA AIRSPACE REDESIGN

An Analysis of the New York/New Jersey/Philadelphia Project





Highlights of [GAO-08-786](#), a report to congressional requesters

Why GAO Did This Study

In September 2007, after 9 years of evaluation and a cost of over \$53 million, the Federal Aviation Administration (FAA) announced it would begin implementing a new airspace structure for the New York/New Jersey/Philadelphia metropolitan area. According to FAA, this redesign of routes leading to and from commercial airports will fully integrate the airspace in the region, produce \$300 million annual savings, and reduce delay by 20 percent once fully implemented. Critics disagree and cite potential increases in aircraft noise and other adverse environmental impacts. GAO was asked to examine: (1) the extent to which FAA followed legal requirements for its environmental review, (2) the extent to which FAA's methodology in assessing operational and noise impacts was reasonable, and (3) the likelihood FAA will meet its projected time frames and costs of implementation. GAO's legal analysis covered applicable federal laws, regulations, court decisions, and FAA orders. GAO's analysis of FAA's methodology was based on criteria established through review of federal policy, FAA's guidance, prior GAO reports, and standards from the aviation and analytical community. With the assistance of the National Academy of Sciences, GAO identified experts in the fields of environmental policies and procedures, airspace operations, and aircraft noise measurement and obtained their views on relevant aspects of FAA's methodology.

FAA AIRSPACE REDESIGN

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What GAO Found

GAO evaluated FAA's compliance with the National Environmental Policy Act (NEPA) and environmental justice directives in conducting the New York/New Jersey/Philadelphia Airspace Redesign project. In assessing compliance, GAO used established court precedent applying these requirements, as well as the standard of review for agency actions established by the Administrative Procedure Act (APA), which is deferential to agency decision making. Courts interpret the APA standard—whether an agency's actions were “arbitrary, capricious, an abuse of discretion, or otherwise not in accordance with law”—as mandating that an agency act reasonably in carrying out NEPA's requirements and that the agency's ultimate decisions be reasonable and not arbitrary and capricious. GAO reviewed FAA's compliance with respect to five key issues: the statement of the project's purpose and need, the evaluation of alternatives, consideration of the project's environmental effects, public participation, and environmental justice matters. GAO selected these issues based on public concerns raised during and after the NEPA process, congressional interest, the views of experts we interviewed, and GAO's evaluation of the range of concerns presented.

Applying these legal requirements and the APA's reasonableness standard, GAO concluded that FAA complied with applicable NEPA requirements and related environmental justice directives. First, the statement of the project's purpose and need—which defines the objective of the project and which, in this case, was to increase the efficiency and reliability of the airspace while enhancing safety and reducing delays—was reasonable. The statement was reasonable in scope, as it was not defined too narrowly or too broadly, and it reasonably excluded noise reduction. Second, FAA developed a reasonable range of alternatives to the redesign and appropriately evaluated these alternatives. As required, FAA included a no-action alternative to serve as a baseline, as well as alternatives that would achieve the project's purpose and need. FAA also discussed options eliminated from detailed analysis, and explored and objectively evaluated the remaining alternatives. Third, FAA acted reasonably in not analyzing the indirect environmental effects of potential growth resulting from the redesign. Because FAA found the redesign in itself would not increase traffic demand and flight operations, it did not consider the potential environmental impacts of these system improvements. In the aviation context, courts have uniformly upheld similar decisions by FAA where, as in this case, the purpose of the project was not to induce growth and the project did not include capacity-enhancing construction, such as the addition of a runway. Fourth, FAA reasonably involved the public throughout the environmental review process. It took actions required to ensure public outreach including conducting an early and open process, providing notice of and holding public meetings, and soliciting and responding to public comments. Fifth, FAA satisfied environmental justice directives in Executive Order 12898 and related guidance and Orders. FAA prepared an analysis that identified minority and low-income populations significantly

What GAO Recommends

GAO recommends that FAA develop and follow a detailed implementation plan for the New York/New Jersey/Philadelphia Airspace Redesign that includes a time and cost schedule and follow a post implementation evaluation plan that includes an adaptive management strategy. In addition, GAO recommends that for future airspace redesign projects, FAA conduct an uncertainty analysis of key assumptions and inputs to provide information on the level of confidence of the estimated impacts and conduct a benefit-cost analysis for the purpose of evaluating redesign alternatives.

A draft was provided to DOT and FAA. While DOT said it does not agree with everything in the draft, due to pending litigation, DOT declined to specify its areas of agreement or disagreement. DOT provided technical comments that we incorporated as appropriate.

To view the full product, including the scope and methodology, click on [GAO-08-786](#). For more information, contact Susan Fleming, 202-512-2834, flemings@gao.gov or Susan Sawtelle, 202-512-6417, sawtelles@gao.gov.

What GAO Found (continued)

impacted by the proposed redesign, and determined whether the impact on these populations was disproportionate. FAA also involved these individuals throughout the environmental review process. In addition, FAA mitigated these significant impacts by altering arrival procedures and departure headings, raising arrival altitudes, and other related measures.

FAA's methodology to assess operational and noise impacts was reasonable, based on FAA's guidance for conducting airspace redesigns, standards from the aviation and analytical community, and the opinion of independent aviation operational and noise experts. FAA's guidance suggests activities for conducting a redesign's operational analysis and establishes specific guidelines for conducting a noise analysis. FAA generally adhered to this guidance in conducting the redesign, in that FAA generally followed its process for conducting operational analyses and used the noise modeling tool and metric specified in its guidance. In addition, according to experts, FAA used experienced contractors, the best available modeling tools, and appropriate data. For example, according to FAA and experts we interviewed, the data sources, such as FAA radar flight track data, U.S. Geological Survey terrain data, and U.S. Census Bureau data, are industry standard and generally recognized as providing reliable information. However, GAO and experts also identified some ways in which the methodology could be improved for future redesign projects. For example, when evaluating the alternatives, FAA did not analyze various economic impacts, such as implementation costs. GAO identified two types of analyses—an uncertainty analysis and a benefit-cost analysis—that could have benefited decision makers and the public in future redesign efforts. An uncertainty analysis would provide more information about the level of uncertainty associated with conducting the operational analysis, while a benefit-cost analysis would provide more information about the impacts of various alternatives.

FAA has not developed a detailed implementation plan for the New York/New Jersey/Philadelphia Airspace Redesign with a schedule, and therefore GAO was unable to determine whether FAA would meet its projected timetable. In addition, the final project configuration and costs are unknown since FAA has not determined the type of equipment and software that will be needed and FAA is currently reviewing whether to house operations for the redesigned airspace in existing FAA facilities, a new facility, or a consolidated facility. Given that the redesign represents a complex and comprehensive change to the region's airspace, GAO believes it is important to conduct evaluations of the redesign after each implementation step to ensure proper implementation. A potential strategy that could be used by FAA is an adaptive management strategy, which is a process that promotes flexible decision making as outcomes from management actions become understood.

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Abbreviations

APA	Administrative Procedure Act
ATC	Air Traffic Control
ATO	Air Traffic Organization
CAASD	Center for Advanced Aviation System Development
CEQ	Council on Environmental Quality
DNL	Day-Night Average Sound Level
DOT	Department of Transportation
EIS	environmental impact statement
FAA	Federal Aviation Administration
FFRDC	Federally Funded Research and Development Center
FHWA	Federal Highway Administration
FICON	Federal Interagency Committee on Noise
Handbook	FAA Airspace Management Handbook
ICC	Integrated Control Complex
JFK	John F. Kennedy International Airport
LaGuardia	LaGuardia Airport
NATCA	National Air Traffic Controllers Association
NEPA	National Environmental Policy Act
Newark	Newark Liberty International Airport
NextGen	Next Generation Air Transportation System
NIRS	Noise Integrated Routing System
NJCAAN	New Jersey Coalition Against Aircraft Noise
Philadelphia	Philadelphia International Airport
RNAV	Area Navigation (technology)
SEL	Sound Exposure Level
TAAM	Total Airspace and Airport Modeler
Teterboro	Teterboro Airport
TRACON	Terminal Radar Approach Control

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United States Government Accountability Office
Washington, DC 20548

July 31, 2008

The Honorable James Oberstar
Chairman
Committee on Transportation and Infrastructure
House of Representatives

The Honorable Jerry Costello
Chairman
Subcommittee on Aviation
Committee on Transportation and Infrastructure
House of Representatives

The Honorable Robert Andrews
The Honorable Joseph Sestak
House of Representatives

In September 2007, after 9 years of evaluation and a cost of over \$53 million, the Federal Aviation Administration (FAA) announced that it would implement a new airspace structure for the five major airports¹ and several regional airports serving the New York/New Jersey/Philadelphia metropolitan area.² According to FAA, the expected growth in the region's air travel contributed to the need for the airspace redesign, the goal of which is to increase the efficiency and reliability of the region's airspace, while maintaining safety. The efficient operation of the airspace is important, since the region's airports are critical to the nation's aviation system. For example, because the New York metropolitan area airports provide service to one of the most populated urban areas in the United States, as well as to substantial commercial air traffic,³ any delays in this

¹The five major airports include New York's John F. Kennedy International Airport (JFK) and LaGuardia Airport (LaGuardia), New Jersey's Newark Liberty International Airport (Newark) and Teterboro Airport (Teterboro), and Pennsylvania's Philadelphia International Airport (Philadelphia).

²Airspace for this project is the navigable area used by aircraft for purposes of flight. In addition, FAA maintains infrastructure for the National Airspace System to include FAA air traffic control (ATC) system, which relies on an extensive array of information technology systems, including radars, automated data processing, navigation, and communication equipment; and ATC facilities.

³In 2006, over 100 million passengers used JFK, LaGuardia, and Newark, alone.

region tend to ripple throughout the National Airspace System. The region's airspace, therefore, has become a critical chokepoint, and any resulting problems have substantial national impacts. FAA believes that the redesigned airspace will have several important benefits, including reducing airport delays, increasing the balance of air traffic controller workloads and operational flexibility, and maintaining the throughput of airports. FAA estimates that when compared to the current airspace structure, the redesigned airspace will produce \$300 million annual savings in direct costs and will reduce delay by 20 percent once fully implemented.⁴ However, many in the region's local communities disagree that the redesign will yield these benefits and worry that the redesign will substantially increase aircraft noise and produce other environmental impacts, both in communities already affected and in areas where aircraft traditionally have not flown. A number of critics maintain that FAA's decision to implement the new airspace structure is based on a flawed process and a predetermined outcome. For example, some critics question the methodology FAA used to develop the different alternatives evaluated in the airspace redesign and maintain that FAA did not fully assess nonairspace alternatives, such as requiring airlines to pay additional fees for airport use during peak demand times. Based on these and other objections, state and local governments and citizen groups have filed 13 separate lawsuits challenging the redesign, based primarily on FAA's alleged failure to comply with the National Environmental Policy Act (NEPA).⁵ While this litigation is pending, FAA has begun implementation of the redesign, with initial steps starting on December 19, 2007.⁶ Full implementation is estimated to be completed by 2012.

You asked us to review FAA's airspace redesign project for the New York/New Jersey/Philadelphia region. Accordingly, this report focuses on the following questions:

⁴The estimated benefits are based on FAA's operational analysis for 2011; however, full implementation is not estimated to be completed until 2012.

⁵Twelve of the 13 lawsuits are based primarily on NEPA grounds and have been consolidated in the U.S. Court of Appeals for the D.C. Circuit under the lead case, *County of Rockland v. FAA*, No. 07-1363. The other lawsuit, *County of Delaware v. USDOT*, No. 07-1385 (D.C. Cir.), challenges the redesign based on FAA's allegedly improper implementation of the Clean Air Act.

⁶The court in the NEPA litigation has denied requests that FAA temporarily stop implementation while the lawsuits are being resolved.

-
1. To what extent did FAA follow key legal procedures and requirements in conducting its environmental review?
 2. To what extent was the methodology used by FAA to assess the operational and noise impacts reasonable?
 3. What is the likelihood that FAA will meet its project time frames and costs of implementing its airspace redesign project?

To address our three research questions, we reviewed documents associated with the New York/New Jersey/Philadelphia Airspace Redesign, including the draft and final environmental impact statements (EIS) and selected appendices, underlying technical reports and analyses, and the administrative record filed by FAA with the court in the pending litigation. We also obtained and analyzed information from a variety of other sources, including previous FAA airspace redesigns similar to this project and other aviation evaluations and studies.⁷ We interviewed officials from the Department of Transportation (DOT) and from FAA's headquarters and eastern regional office, including representatives of FAA's airspace redesign team. We also contacted other stakeholders, including FAA's principal contractors⁸ for the operational and noise analyses, the Port Authority of New York and New Jersey, City of Philadelphia Department of Aviation, other participants in the EIS process, trade organizations for the aviation industry, the national air traffic controller's union, and community groups in the region.

To assess the extent to which FAA followed key legal procedures and requirements in conducting its environmental review, we reviewed

⁷The three similar FAA-sponsored redesigns included the Expanded East Coast Plan (1995), Chicago Terminal Airspace Project (2001), and Potomac Consolidated TRACON Facility Airspace Redesign (2002). These were determined to be most similar to the New York/New Jersey/Philadelphia Airspace Redesign project because they all included an EIS, changes to air traffic routes involving multiple airports, and an analysis of noise impacts.

⁸In this report, the term "contractors" refers to organizations used to conduct the operational and environmental analyses. This includes MITRE, the organization that was responsible for conducting the operational analysis. MITRE is a not-for-profit corporation, which operates a Federally Funded Research and Development Center (FFRDC) sponsored by FAA—the Center for Advanced Aviation System Development. An FFRDC is a unique organization that assists the U.S. government with scientific research and analysis, development and acquisition, and systems engineering and integration. FFRDCs are charged with addressing long-term problems of considerable complexity, analyzing technical questions with a high degree of objectivity, and providing creative and cost-effective solutions to government problems.

applicable federal laws, regulations, executive directives, and court decisions, as well as FAA and DOT Orders and FAA and Council on Environmental Quality (CEQ) guidance. We then conducted a legal analysis to determine FAA's compliance with respect to five key issues: the statement of the project's purpose and need, evaluation of alternatives, consideration of the project's environmental effects, public involvement, and environmental justice matters. We selected these five issues based on public concerns raised during and after the EIS process,⁹ congressional interest, the views of experts we interviewed, and GAO's evaluation of the range of concerns presented. To examine the extent to which the methodology used by FAA to assess the operational and noise impacts was reasonable, we compared FAA's methodology to criteria we established through review of federal policy, FAA guidance, prior GAO reports, and standards from the aviation and analytical community. In addition, with the assistance of the National Academy of Sciences, we identified experts in the fields of EIS policies and procedures, airspace operations and system modeling, and aircraft noise measurement and mitigation. These experts reviewed selected portions of the EIS related to FAA's operational and noise analysis. We then interviewed these experts within their area of expertise to obtain their views on the extent to which FAA followed applicable procedures and requirements, and on the methodology used by FAA to assess the operational and noise impacts. See appendix I for a list of the experts we interviewed.

As agreed with you, we did not prepare a new EIS or develop and analyze new alternatives to the airspace redesign. We conducted this performance audit from July 2007 to July 2008 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.

Results in Brief

Our evaluation of FAA's compliance with NEPA in conducting the New York/New Jersey/Philadelphia Airspace Redesign was based on established court precedent applying NEPA and its implementing regulations, and the standard of review for agency actions established by

⁹Although we took stakeholder concerns expressed after the NEPA process into account when developing our five key issues, a court may consider a petitioner to have waived their right to challenge issues that were not raised during the process.

the Administrative Procedure Act (APA), which is deferential to agency decision making. Courts interpret this APA standard—whether an agency’s actions were “arbitrary, capricious, an abuse of discretion, or otherwise not in accordance with law”—as requiring that an agency act reasonably in carrying out NEPA’s requirements and that the agency’s ultimate decisions be reasonable and not arbitrary and capricious. We reviewed FAA’s compliance with respect to five key issues: the statement of the project’s purpose and need, evaluation of alternatives, consideration of the project’s environmental effects, public involvement, and environmental justice matters. We selected these five issues based on public concerns raised during and after the EIS process, congressional interest, the views of experts we interviewed, and GAO’s evaluation of the range of concerns presented.

Applying these NEPA requirements and the APA’s reasonableness standard to these five key issues, we concluded that FAA complied with applicable NEPA and related requirements and environmental justice directives. First, the statement of the project’s purpose and need—which defines the objectives of the project and which, in this case, was to increase the efficiency and reliability of the airspace while maintaining safety and reducing delays—was reasonable. The statement was reasonable in scope because it was not defined too narrowly or too broadly, and it reasonably excluded noise reduction. Second, FAA developed a reasonable range of alternatives to the redesign and appropriately evaluated these alternatives. As required, FAA included a no action alternative, which served as the baseline, as well as alternatives that would achieve the project’s purpose and need. FAA also discussed options it eliminated from detailed analysis, and explored and objectively evaluated the remaining alternatives. Third, FAA acted reasonably in not analyzing the indirect environmental effects of potential growth resulting from the redesign. Because FAA found that the redesign in itself would not increase traffic demand and flight operations, it did not consider the potential environmental impacts of these system improvements. In the aviation context, the courts have uniformly upheld similar decisions by FAA where, as in this case, the purpose of the project was not to induce growth and the project did not include capacity-enhancing construction, such as the addition of a runway. Fourth, FAA reasonably involved the public throughout the environmental review process. It took the actions required to ensure appropriate public outreach, including conducting an early and open process, providing notice of and holding public meetings, and soliciting and responding to public comments. Fifth, FAA satisfied environmental justice directives in Executive Order 12898 and implementing CEQ guidance and DOT Orders. FAA prepared an analysis

that identified minority and low-income populations significantly impacted by the proposed redesign and determined whether the impact on these populations was disproportionate. FAA also involved these individuals throughout the environmental review process. In addition, FAA mitigated these significant impacts by altering arrival procedures and departure headings, raising arrival altitudes, and other related measures.

FAA's methodology to assess the operational and noise impacts was reasonable, based on FAA's guidance for conducting airspace redesigns, standards from the aviation and analytical community, and the opinions of experts we interviewed. FAA's guidance suggests activities for conducting a redesign's operational analysis and establishes specific guidelines for conducting a noise analysis. We found that FAA generally adhered to this guidance, generally following its process for conducting operational analyses and using the noise modeling tool and metric specified in its guidance. In addition, independent experts we interviewed generally agreed that FAA used experienced contractors and used the best available tools to model the operational and noise impacts of the airspace redesign. Furthermore, we found no evidence that the data used are unreliable, and experts interviewed generally agreed that FAA used data that were appropriate and standard to the industry and chose metrics to measure the operational impacts that were reasonable and aligned with the objectives of the airspace redesign. For example, according to FAA and experts we interviewed, such data sources as FAA radar flight track data, U.S. Geological Survey terrain data, and U.S. Census Bureau data are industry standard and generally recognized as providing reliable information. On the basis of generally accepted economic principles and practices, expert opinions, past FAA-sponsored airspace redesigns, and prior GAO reports, we also identified some limitations in FAA's methodology that, if addressed, would provide more information for decision makers and the public. We and the experts we interviewed do not believe these limitations are substantial enough to warrant redoing the analyses, but rather, would help identify ways in which FAA's methodology could be improved in future airspace redesigns. These limitations are not matters that FAA is required by law to address. One limitation is that because FAA assumed that traffic demand and flight operations would not increase in response to airspace system improvements—specifically, delay reductions and operating cost savings—FAA did not account for the potential effect of the system improvements in its operational analysis. FAA also did not fully assess the uncertainty associated with each alternative's estimated impacts: FAA did not consider a range of values for key assumptions and inputs, even though some key inputs, such as the aviation demand forecast, are inherently uncertain. In addition, when evaluating the

alternatives, FAA did not analyze economic impacts, such as implementation costs, the effect of the alternatives on the airlines, passengers' time value, or the effect of noise on the quality of life of residents living near the airports. FAA did not estimate the economic impacts of noise in part because the agency is not required under CEQ regulations to do so. We identified two analyses that, while FAA is not required by law or guidance to conduct, could benefit decision makers and the public. First, an uncertainty analysis that examines a range of key assumptions and inputs, such as the aviation demand forecast, would provide additional information on the potential range of the redesign's impact to decision makers and the public. Second, a benefit-cost analysis, which assesses the benefits and costs of each alternative compared to the status quo, would have provided decision makers and the public with more information on whether the estimated benefits of the redesigned airspace justify its costs.

Based on the information available to date, we are unable to fully assess the likelihood that FAA will meet its projected five-year implementation time frame or determine the costs of the airspace redesign project. Although FAA internal guidance recommends that an implementation plan—including specific implementation activities, such as establishing a project schedule or planning for potential challenges—be developed immediately after approval of the airspace redesign, FAA has not developed a detailed implementation plan that outlines these specific activities. However, even though FAA does not have a detailed implementation plan available, FAA began limited implementation at Philadelphia and Newark on December 19, 2007. Without a more detailed implementation plan, we cannot determine whether FAA is likely to meet its projected schedule or how it will deal with potential challenges. In addition, for two principal reasons, the final project configuration and costs are unknown. First, although FAA will use currently available equipment and software, FAA has not determined the type or amount that will be needed to support the common automation platform for air traffic controllers. Second, FAA is currently reviewing whether the common automation platform, which will allow different air traffic controllers to communicate with each other, will be housed in existing FAA facilities, a new facility, or in a consolidated facility. If FAA decides to house this platform in a new facility, FAA officials stated that a final cost estimate for the new facility will not be available until late 2008, and is not projected to be completed until 2015, 3 years after FAA has estimated full implementation of the airspace project. Given that the redesign represents a complex and comprehensive change to the region's airspace, the agency also should consider how it plans to conduct evaluations of the redesign.

One potential strategy for FAA to employ is adaptive management, which is a process that promotes flexible decision making as outcomes from management actions become understood, and is a strategy that GAO has recommended for other federal agencies. Furthermore, adaptive management is recognized by the CEQ and other federal agencies as a useful strategy.

To improve FAA's implementation of the New York/New Jersey/Philadelphia Airspace Redesign, we are recommending that the Secretary of the Department of Transportation direct the Acting Administrator of the Federal Aviation Administration to develop and follow a detailed implementation plan and postimplementation evaluation plan using an adaptive management strategy for this airspace redesign. To improve FAA's effectiveness and accountability in conducting future airspace redesigns we are recommending that the Secretary of the Department of Transportation direct the Acting Administrator of the Federal Aviation Administration conduct uncertainty analyses and benefit-cost analyses when evaluating the potential effect of future airspace redesigns.

In commenting on a draft of this report, DOT stated that it was pleased that the GAO review concluded the actions taken by FAA with regard to NEPA were reasonable. However, DOT also noted that while it did not necessarily agree with everything in the draft report, it is constrained from offering a detailed analysis of the draft report at this time, as the matters the report covers are the subject of pending litigation (see app. V for DOT comments). DOT provided technical comments that we incorporated as appropriate.

Background

For several reasons, the New York/New Jersey/Philadelphia airspace is unique and highly complex. First, numerous airports are located within a small geographic area, including some of the nation's most important major airports. In the New York City metropolitan area alone, there are four major airports, including New York's John F. Kennedy International Airport (JFK) and LaGuardia Airport (LaGuardia) and New Jersey's Newark Liberty International Airport (Newark) and Teterboro Airport (Teterboro). Philadelphia International Airport (Philadelphia) is located less than 100 miles southwest of New York City. The region also has

numerous satellite airports,¹⁰ which provide substantial aviation service to Connecticut, New Jersey, southeastern New York, and eastern Pennsylvania (see fig. 1). Second, the region's airports provide service to a very large air travel market. Since the New York metropolitan area has one of the largest urban populations in the United States, there is a substantial market for air travel, which is serviced by many domestic and international airlines. Third, three of these airports—JFK, Newark, and Philadelphia—serve as hubs for major U.S. airlines¹¹ to connect passengers to other flights. Finally, both LaGuardia and JFK have been slot controlled¹² in the past. In January 2007, the authority to issue slot restrictions at LaGuardia and JFK airports expired;¹³ however, due to the increased congestion and flight delays at LaGuardia, JFK, and Newark, FAA has imposed temporary slot controls at these airports with the goal of preventing an increase of scheduled flights during peak demand times.

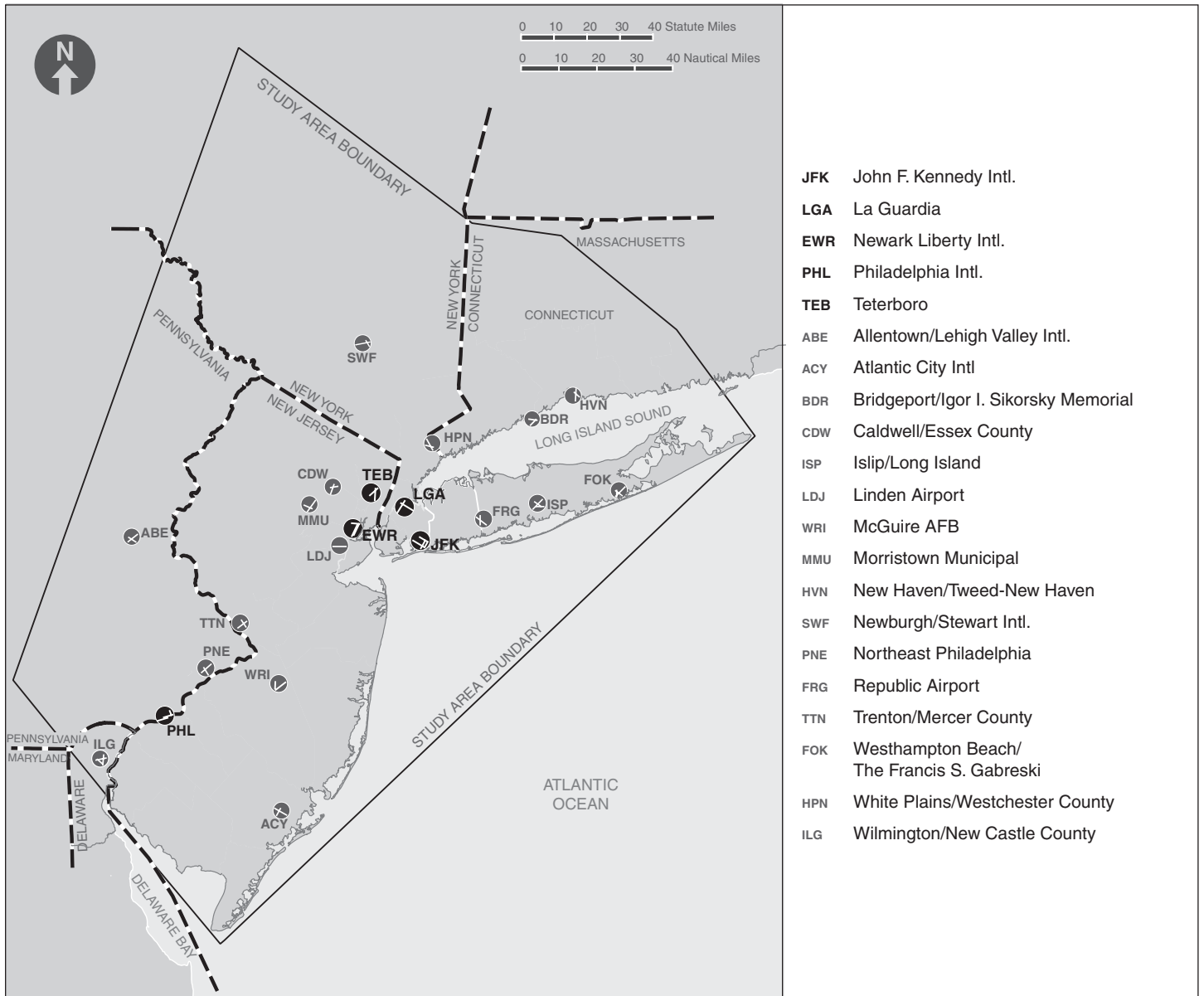
¹⁰For this airspace redesign project, FAA included in its study area 16 satellite airports, including (1) Allentown/Lehigh Valley International, (2) Atlantic City International, (3) Bridgeport/Igor I. Sikorsky Memorial, (4) Caldwell/Essex County, (5) Westhampton Beach/The Francis S. Gabreski, (6) Islip Long Island MacArthur, (7) Linden, (8) Morristown Municipal, (9) Newburgh/Stewart International, (10) New Haven/Tweed-New Haven, (11) Northeast Philadelphia, (12) Republic, (13) Trenton/Mercer County, (14) White Plains/Westchester County, (15) Wilmington/New Castle County, and (16) McGuire Air Force Base. There are other airports physically located within the region, but they were not included in FAA's operational analysis because they do not have a significant amount of Instrument Flight Rule traffic, thus there would be little or no change to their operations as a result of the proposed action. Instrument Flight Rule traffic from these other airports was included in the environmental analysis as overflights.

¹¹For example, JetBlue Airlines uses JFK as its hub airport, U.S. Airways uses Philadelphia as its hub airport, and Continental Airlines uses Newark as one of its hub airports.

¹²To minimize congestion and reduce flight delays, FAA promulgated the High Density Rule in 1968, 14 C.F.R. § 93, Subpart K, which set limits on the number of take-offs or landings—referred to as “slots”—that can occur during certain periods of the day at four congested airports—Chicago's O'Hare, Ronald Reagan Washington National, and New York's JFK and LaGuardia.

¹³Wendell H. Ford Aviation Investment and Reform Act for the 21st Century, also referred to as AIR-21, Pub. L. No. 106-181, 114 Stat. 108, Section 231, April 5, 2000.

Figure 1: Map of Regions with Major Airports and Satellite Airports Included in FAA's Analysis

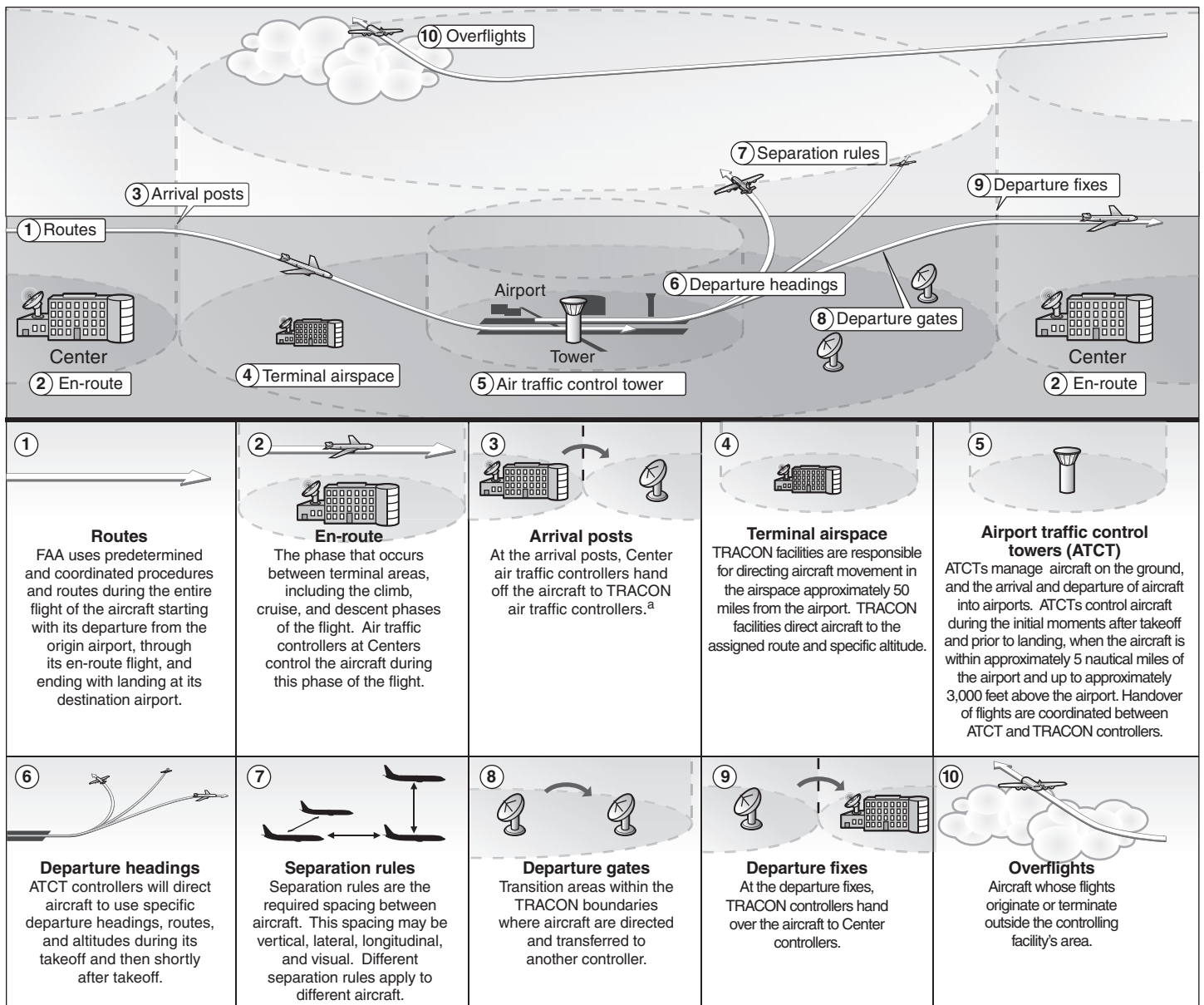


Source: FAA.

According to FAA, the current airspace structure—which basically has remained the same since the 1960s¹⁴—is inefficient and cannot meet future travel demands without increasing delays. The airspace was designed for lower air traffic volumes and different types of aircraft, and is characterized by complex, highly interrelated departure and arrival routes. FAA maintains that there is a need to redesign the region’s airspace because the current structure cannot efficiently address the increased air traffic levels, the use of new aircraft types, and emerging technologies to control air traffic. In addition, because specific routes used by aircraft taking off from one airport overlap routes from other airports, safety-related inefficiencies ensue. Severe weather conditions also may hinder aircraft’s access to departure routes at certain airports. According to FAA, the complexity of the airspace also has contributed to inefficiencies in the air traffic management for the region. To provide air traffic management for the region’s airspace, FAA uses a variety of air traffic control facilities and predetermined and coordinated procedures and routes. Each ATC facility has a specific—and different—area of responsibility for the overall management of the regional system. Figure 2 depicts a cross section of the different air traffic control facilities and procedures.

¹⁴In the mid-1980s, a plan to improve airspace efficiency in and around the New York metropolitan area was implemented. The Expanded East Coast Plan focused on developing common departure routes out of the New York metropolitan area. The plan, which included changes to routes and procedures above 3,000 feet, was implemented in phases in 1987 and 1988. Based on the public reaction to the Expanded East Coast Plan, FAA recognized that the New York/New Jersey/Philadelphia Airspace Redesign had the potential to be controversial based on potential environmental impacts.

Figure 2: General Representation of a Cross Section of the Different Air Traffic Control Facilities and Procedures



Source: GAO (data); Art Explosion (images).

^aTerminal Radar Approach Control (TRACON)—An FAA air traffic control facility that uses radar and two-way radio communication to provide separation of air traffic within a specific geographic area in the vicinity of one or more large airports.

In April 1998, FAA launched the nation's first-ever coordinated, comprehensive National Airspace Redesign program with goals of moving aircraft more efficiently and more safely through the airspace system. The goals of this program are identified in the National Airspace Redesign Strategic Management Plan,¹⁵ and include maintaining system safety, decreasing system delay, increasing system flexibility, increasing system predictability, and increasing user access. The Airspace Management Program Office is responsible for airspace redesign project planning and ensuring that planning goes beyond the design phase and includes an execution and implementation focus. Other organizations also are involved in the national airspace redesign efforts, such as the Environmental Protection Agency, which reviews and publicly comments on the adequacy of FAA's analysis of environmental impacts.

In 1998, as part of its National Airspace Redesign program, FAA initiated the New York/New Jersey/Philadelphia Airspace Redesign. To redesign the airspace, FAA uses its Airspace Management Handbook (Handbook)—which describes step-by-step procedures for airspace design management—to guide the overall management of the redesign project and must follow applicable environmental laws and regulations. The Handbook provides FAA guidance on all phases of the redesign project from characterizing the initial problem to conducting the operational analysis for the airspace redesign to postimplementation evaluation.¹⁶ FAA

¹⁵The National Airspace Redesign Strategic Management Plan was developed collaboratively by local facility and regional air traffic specialists, Air Transport Association representatives, and the National Air Traffic Controllers Association (NATCA). The plan works in conjunction with the March 16, 2001, FAA/NATCA Memorandum of Understanding regarding the National Airspace Redesign. In 2005, when the National Airspace Redesign transitioned to the Airspace Management Program, FAA terminated the assignments for NATCA representatives to the National Airspace Redesign.

¹⁶There are two versions of the Handbook. The Airspace Management Handbook Version 1 was first published in 1999 and consists of three parts—the Airspace Management Handbook: Checklist; the Airspace Management Handbook: Guidelines; and the Airspace Management Handbook: Metrics. In December 2005, FAA published Version 2.2, which combines all of the content of the previous documents and includes supporting information for safety risk management considerations. The steps established in these handbooks include (1) characterizing the extent of the airspace problem, (2) performing an initial evaluation (scoping), (3) initiating an airspace study, (4) conducting an airspace study, (5) summarizing and presenting the results of the airspace study, (6) implementing the recommended changes, and (7) evaluating the final implementation of the airspace redesign to ensure changes made to the airspace accomplished the redesign's intended goal. Because the FAA airspace redesign project was initiated in 1998, we are basing our review on Version 1.

also is required to comply with NEPA.¹⁷ NEPA requires that a detailed EIS be prepared for all major federal actions significantly affecting the quality of the human environment.¹⁸ To implement NEPA, CEQ has promulgated regulations that set forth specific requirements that all federal agencies must adhere to in the EIS process. Among other things, CEQ regulations require an EIS to (1) specify the purpose of and need for the federal action, (2) describe the environment that will be affected, (3) identify alternatives to the proposed action and identify the agency's preferred alternative(s), (4) present the environmental impacts of the proposed action (including the direct and indirect effects and cumulative impacts), (5) identify any adverse environmental impacts that cannot be avoided should the proposed action be implemented, and (6) identify any irreversible and irretrievable commitment of resources that would occur should the proposed action be implemented. Agencies also must make diligent efforts to involve the public throughout the EIS process.¹⁹ For additional direction on implementing NEPA and CEQ regulations, FAA developed Orders²⁰ that govern, among other things, its EIS process. In addition, Executive Order 12898,²¹ accompanying CEQ guidance, and DOT Order 5610.2²² set forth environmental justice directives, which FAA must adhere to in conducting its environmental review. The executive order directs agencies to address "disproportionately high and adverse human health or environmental effects of [an agency's] programs, policies, and activities on minority populations and low-income populations...."²³

¹⁷42 U.S.C. §§ 4321 *et seq.*

¹⁸NEPA section 102(c), 42 U.S.C. § 4332(c). An EIS is not required for all federal actions. Actions that do not individually or cumulatively have a significant effect on the human environment may be categorically excluded. 40 C.F.R. § 1508.4. Additionally, an EIS is not required for projects for which a project-specific Environmental Assessment discloses no significant impact. 40 C.F.R. § 1508.9.

¹⁹40 C.F.R. § 1506.6.

²⁰At the start of the airspace redesign in 1998, FAA Order 1050.1D, *Environmental Impacts: Policies and Procedures*, was the current guidance. The Order was updated to FAA Order 1050.1E, *Environmental Impacts: Policies and Procedures*, on June 8, 2004, and again on March 20, 2006, to FAA Order 1050.1E, Chg 1.

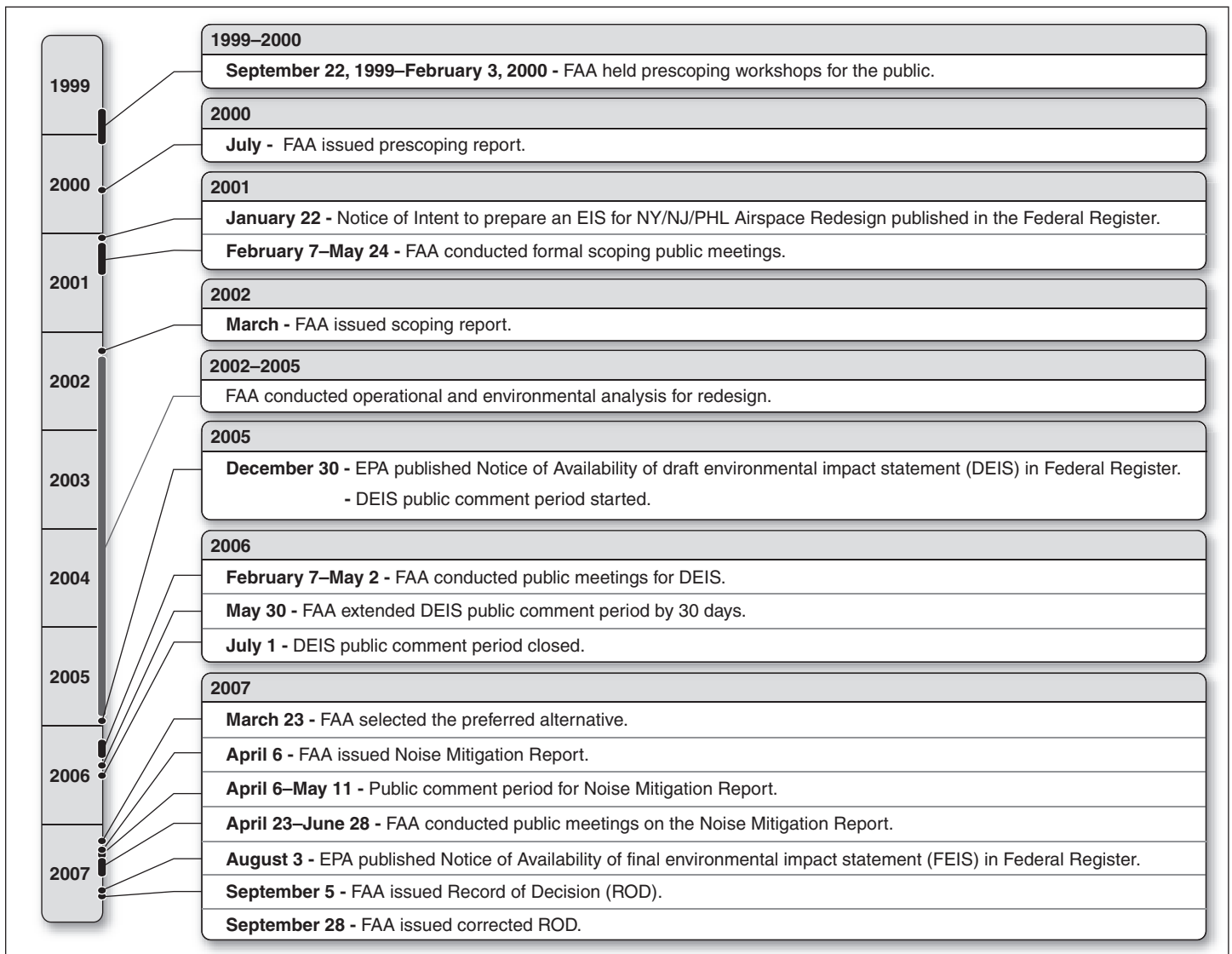
²¹Executive Order 12898, *Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations*, 59 Fed. Reg. 7629 (Feb. 16, 1994).

²²DOT Order 5610.2, *Environmental Justice in Minority and Low-Income Populations*.

²³Executive Order 12898, Sec. 1-101.

Figure 3 shows some of the key dates in the preparation of FAA’s airspace redesign and the EIS for the New York/New Jersey/Philadelphia project.

Figure 3: Timeline of FAA’s New York/New Jersey/Philadelphia Airspace Redesign Project



Sources: GAO and FAA.

After determining that it would prepare an EIS, and following 5 years of scoping and options development, in December 2005, FAA issued a draft EIS for public comment that identified four basic alternatives. The first

alternative, mandated by NEPA as a baseline, was the Future No Action Alternative, which represents what the airspace structure would be if the airspace redesign did not occur. The second alternative, the Modifications to Existing Airspace Alternative, would have made only slight adjustments within the existing airspace. That is, this alternative would have maintained the current boundaries of the control tower, the Terminal Radar Approach Control (TRACON) facility, and the Center facility. The third alternative, the Ocean Routing Airspace Alternative, would have sent all departing flights from Newark over the Raritan Bay to the Atlantic Ocean before turning them back over land to head to their departure gates. The main purpose of this alternative was to reduce the noise impacts on the citizens of New Jersey. The final alternative was evaluated using two versions. The Integrated Airspace Alternative Variation without Integrated Control Complex (ICC) would have changed the current boundaries of the airspace, to the extent possible, but would have done so with the existing ATC facilities and equipment. The second version, the Integrated Airspace Alternative Variation with ICC, would have fully integrated the airspace using a common automation platform for ATC equipment. It also may have involved consolidating air traffic controllers into a consolidated facility.²⁴ Figure 4 provides a summary of the different alternatives, the eight evaluation criteria applied to each alternative, and the measures or “metrics” used to compare each alternative.

²⁴In this airspace redesign, ICC refers to the existence of a common automation platform in existing facilities, a new facility, or a consolidated facility. A common automation platform refers to a single radar data processing system and the information it provides to controllers. It includes shared displays on screens, radar, data processing and presentation, and communications.

Figure 4: Alternatives Considered under the FAA New York/New Jersey/Philadelphia Airspace Redesign EIS

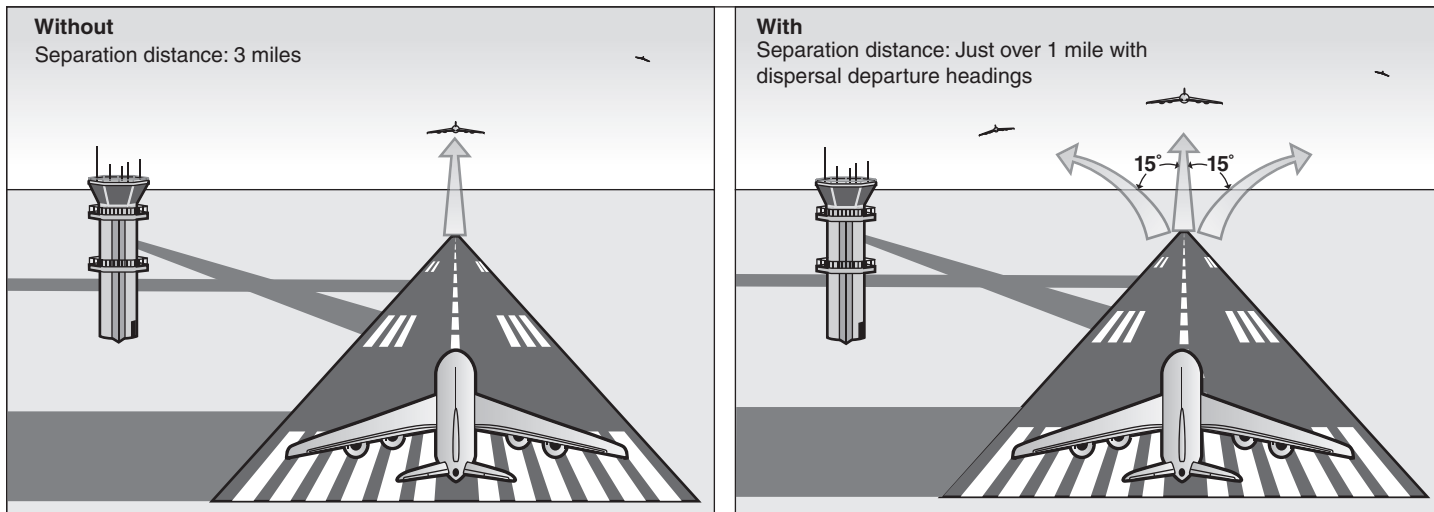
Alternatives		Evaluation Criteria	How Measured
Future No Action Airspace Alternative	Maintains the current airspace structure	Reduce complexity	<ul style="list-style-type: none"> • Jet route delays plus time below 18,000 feet: Measures over a 24-hour period average flight delay and average flight time for a departing aircraft to reach 18,000 feet altitude. • Arrival distance below 18,000 feet: Measures average distance traveled by an arriving aircraft from 18,000 feet altitude to landing.
Modification to Existing Airspace Alternative	Modifies existing airspace but maintains the current boundaries of the ATC facilities	Reduce voice communication	<ul style="list-style-type: none"> • Maximum interfacility handoffs per hour: Measures number of controller-to-controller communications an hour to transfer aircraft responsibility from one ATC facility to another.
Ocean Routing Airspace Alternative	Sends all Newark departing flights over the Raritan Bay to the Atlantic Ocean before routing flights back over land to head to their departure gates	Reduce delay	<ul style="list-style-type: none"> • Traffic weighted arrival delay 2011 and traffic weighted departure delay: Measures the difference in estimated time required for an aircraft to arrive or depart absent any delays and to arrive or depart under a specific alternative.
Integrated Airspace Alternative Variation without Integrated Control Complex	Combines the New York TRACON airspace with portions of surrounding Centers' airspace to permit more seamless operations without a common automation platform or a consolidated facility	Balance controller workload	<ul style="list-style-type: none"> • Equity of west gate fix traffic counts: Measures the balance of aircraft traffic among departure fixes—where aircraft responsibility is handed over between ATC towers—in a particular departure gate—the transition area within TRACON boundaries.
Integrated Airspace Alternative Variation with Integrated Control Complex	Combines the New York TRACON airspace with portions of surrounding Centers' airspace to permit more seamless operations with a common automation platform and the possibility of a consolidated facility	Meet system demands and improve user access to system	<ul style="list-style-type: none"> • End of day's last arrival push: Measures time when the final bank of scheduled flights from all study area airports enters the TRACON system.
		Expedite arrivals and departures	<ul style="list-style-type: none"> • Time below 18,000 feet: Measures average flight time spent descending or climbing per flight in a 24-hour period. • Change in route length per flight: Measures the difference in distance flown between Future No Action Airspace Alternative and each alternative. • Change in block time: Measures average departure gate to arrival gate flight time in a 24-hour period.
		Flexibility in routing	<ul style="list-style-type: none"> • Minutes of delay saved per flight per day: Measures modeled delay caused by waiting out or flying around a 4-hour weather disruption divided by the total number of flights.
		Maintain airport throughput	<ul style="list-style-type: none"> • Arrival maximum sustainable throughputs: Measures number of landings per hour. • Departure maximum sustainable throughputs: Measures number of takeoffs per hour.

Sources: GAO and FAA.

FAA recommended the Integrated Airspace Alternative Variation with ICC as its preferred alternative, as it scored highest on 10 of the 13 metrics FAA used to compare the alternatives. Appendix III provides the full

operational comparison of the alternatives. Because the preferred alternative involves integrating the New York TRACON and portions of the surrounding Centers' airspace, air traffic controllers will be able to reduce aircraft separation rules from 5 miles to 3 miles over a larger geographical area than the current airspace structure allows. In addition, the preferred alternative will modify other key airspace components. Appendix IV provides a more detailed summary of the Integrated Airspace Alternative Variation with ICC. Under this alternative, for example, FAA will be able to increase the number of departure headings air traffic controllers can assign to aircraft during take-offs, and adjust the routes air traffic controllers can assign aircraft during their final approach to an airport. Figure 5 shows an example of departures without and with dispersal headings (increasing the number of departure headings).

Figure 5: Example of Departures without and with Dispersal Headings



Source: GAO (data); Art Explosion (images).

Note: These separation distances are based on normal conditions with similar types of aircraft. Separation distances can be increased depending on certain weather conditions or if smaller aircraft are taking off after a large-body aircraft.

After the preferred alternative was announced, FAA initiated a noise mitigation study to develop measures to alleviate, to the extent possible, the noise impacts associated with the preferred alternative. The study identified several mitigation measures for analysis—some of which were later incorporated into the preferred alternative based on the results of this analysis. The mitigation measures changed some aspects of the preferred alternative, including reducing the number of departure dispersal headings, shifting certain departure routes, and changing certain

arrival altitudes. According to FAA, the mitigation measures incorporated into the preferred alternative would not substantially reduce the operational gains that FAA believes would occur once the mitigated preferred alternative is fully implemented. For example, at Philadelphia, FAA originally planned to increase the number of new departure dispersal headings on one of its runways from one to six, which would have allowed air traffic controllers to decrease the time between aircrafts on take-offs and increase the number of departures in a given amount of time. However, FAA's analysis of the mitigation measures recommended that the number of headings could be reduced from six to three headings, while minimizing the loss of operational efficiency. The preferred alternative with mitigation measures was identified as the selected project in FAA's Record of Decision, which was issued on September 5, 2007.²⁵

FAA officials have projected a 5-year time frame for full implementation of the redesigned airspace, which will be implemented in four stages. According to FAA, each stage will take 12 to 18 months to implement; elements that do not require large-scale changes to the current airspace structure will be implemented first, while more complex changes will be implemented later. For example, during the first stage, implementation focuses on procedural changes, such as adjusting the departure dispersal headings at three of the major airports. FAA implemented the use of additional departure dispersal headings at Philadelphia and Newark as of December 19, 2007.

²⁵FAA issued a corrected version of the Record of Decision on Sept. 28, 2007 after FAA identified several items in the original document that were omitted or incorrect due to editing mistakes.

FAA Complied with Key Legal Requirements in Conducting Its Environmental Review for the Regional Airspace Redesign

Our evaluation of FAA’s compliance with NEPA and related requirements, in conducting the airspace redesign, was based on established court precedent applying NEPA and its implementing regulations. In deciding whether an agency adequately carried out these requirements, a court uses a standard of review articulated in the APA, which is deferential to agency decision making—whether an agency’s actions were “arbitrary, capricious, an abuse of discretion, or otherwise not in accordance with law.”²⁶ Courts interpret this APA standard as requiring that an agency act reasonably in carrying out NEPA’s requirements and that the agency’s ultimate decisions be reasonable and not arbitrary and capricious. We reviewed FAA’s compliance with respect to five key issues: the statement of the project’s purpose and need, evaluation of alternatives, consideration of the project’s environmental effects, public involvement, and environmental justice matters. We selected these five issues based on public concerns raised during and after the EIS process, congressional interest, the views of experts we interviewed, and GAO’s evaluation of the range of concerns presented. Applying these NEPA requirements and the APA’s reasonableness standard, we concluded that FAA complied with respect to these five key issues. Our detailed legal analysis is contained in appendix II and is summarized below.

FAA’s Statement of Purpose and Need Complied with Requirements

FAA’s statement of purpose and need, which defined the objectives and parameters of the project, complied with NEPA requirements. FAA developed the following purpose and need statement:

“The purpose of the airspace redesign is to increase the efficiency and reliability of the airspace structure and ATC system. The need is to accommodate growth in aircraft operations while maintaining safety, mitigating delays, and accommodating changes in the types of aircraft using the system.”²⁷

CEQ regulations require that FAA “...briefly specify the underlying purpose and need to which the agency is responding in proposing the alternatives including the proposed action.”²⁸ Additionally, FAA Order 1050.1E requires that the purpose and need statement “...present[] the problem being addressed ... and essentially provide [t]he parameters for

²⁶5 U.S.C. § 706(2)(A).

²⁷Draft EIS, p. 2-2; final EIS, p. 2-2.

²⁸40 C.F.R. § 1502.13.

defining a reasonable range of alternatives to be considered.”²⁹ FAA specified the purpose and need and defined the parameters of the project such that a reasonable number of alternatives could be developed—the statement was not too narrowly or too broadly defined. During the EIS process, members of the public and certain advocacy groups supported the inclusion of noise minimization in the redesign’s stated purpose. According to FAA officials, although the agency was aware that noise was an important issue to the public from the onset of the EIS process, it is not FAA’s policy to minimize noise impacts for one community at the expense of another. FAA noted in the final EIS that its highest priority must be to maintain a safe and secure airspace. Based on our legal review, we find FAA’s decision to exclude noise from the purpose and need to be reasonable, in part, because NEPA does not require agencies to elevate environmental concerns—in this case noise—over other appropriate considerations. Rather, NEPA requires only that agencies consider the environmental impacts of their actions as part of their decision making. FAA’s decision also is consistent with court precedent, including a court decision upholding an FAA purpose and need statement excluding noise from a major airport expansion, even though the project would have caused significant noise impacts.³⁰

FAA’s Range and Evaluation of Alternatives Complied with Requirements

FAA complied with the various NEPA requirements for evaluating the four alternatives, including the selected project, during the EIS process. In the EIS, the agency included a no action alternative and discussed alternatives eliminated from detailed analysis. In addition, the evaluated alternatives were responsive to the agency’s purpose and need and were reasonably developed, rigorously explored, and objectively compared to each other throughout the EIS.

- *Representation of a baseline of current airspace conditions in an alternative.* By including a Future No Action Alternative, FAA complied with the requirement³¹ to provide a no action alternative that provided a baseline of current conditions to which the other alternatives were compared.

²⁹FAA Order 1050.1E, section 506(d).

³⁰Experts we interviewed also agreed that the scope of the purpose and need was reasonable.

³¹40 C.F.R. § 1502.14(d).

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- *Discussion of alternatives eliminated.* FAA “...briefly discuss[ed] the reasons...”³² for alternatives that were evaluated but subsequently eliminated from detailed consideration in the EIS.³³ For example, during the formal scoping period, there was public support for the development of alternatives that included either alternate modes of transport or improvements to airport infrastructure (such as additional runways at Philadelphia) as means to reduce delays or improve operational efficiency. In addition, during subsequent public comment periods stakeholders suggested other alternatives, such as peak hour demand controls. Within the EIS, FAA explained that while it had considered these alternatives, it ultimately eliminated them because they did not meet the purpose of reducing the inefficiencies of the airspace.
 - *Assessment and evaluation of reasonable alternatives.* In order to be “reasonable,” the range of alternatives must first be responsive to the purpose and need.³⁴ Our review showed that to develop the alternatives, FAA worked with modelers and air traffic controllers in an iterative and collaborative process specifically to design alternatives that were feasible within the parameters of the redesign’s purpose and need. Furthermore, FAA used the project’s purpose and need to evaluate the alternatives, both quantitatively and qualitatively, as each evaluative criterion informed an aspect of the stated purpose and need. Some community stakeholders and government officials criticized the range of alternatives considered, pointing out that FAA did not include an alternative that focused on noise reduction. However, FAA officials explained that as noise reduction was not among the defined purposes of the redesign, it did not have to be considered when developing the alternatives. Furthermore, with the inclusion of the noise mitigation for the preferred alternative, FAA believes it minimized environmental impacts, such as noise, to the extent possible while continuing to address the purpose and need. Despite stakeholder concerns, as noted above, we find FAA was responsive to the project’s purpose and need, which did not include noise reduction; additionally, the selected project, which did include noise mitigation

³²40 C.F.R. § 1502.14(a).

³³An agency’s discussion of alternatives will be upheld as long as the alternatives are reasonable and are discussed in reasonable detail. *Citizens Against Burlington, Inc. v. Busey*, 938 F.2d 190, 196 (D.C. Cir. 1991), *cert. denied*, 502 U.S. 994 (1991).

³⁴See *Citizens Against Burlington, Inc.*, 938 F.2d at 196.

measures, minimized noise impacts to the extent possible while still addressing the project’s purpose and need.³⁵

- *Alternatives’ comparative merits.* To comply with the CEQ regulation, alternatives also must be discussed in reasonable detail;³⁶ there must be a rigorous exploration of each alternative.³⁷ As demonstrated by the thorough discussion throughout the EIS, FAA substantially evaluated each of the four primary alternatives, including both operationally—discussing routing procedures, reduction of complexity, delay, voice communication, and balancing controller workload—and in terms of the alternative’s environmental consequences. FAA also compared the alternatives using specified criteria and presented the alternatives in summary comparison tables, thereby enabling “reviewers [to] evaluate [the alternatives’] comparative merits.”³⁸

FAA’s Decision Not to Consider Environmental Effects of the Potential Growth Inducement Resulting from Airspace Redesign Complied with Requirements

FAA complied with NEPA in its decision not to analyze the environmental effects of a potential increase in capacity resulting from the regional airspace redesign. CEQ regulations require that within the EIS process, an agency must consider the direct and indirect effects and cumulative impacts of a proposed action when evaluating the environmental consequences.³⁹ Indirect effects,⁴⁰ which are reasonably foreseeable future effects caused by the current project, may include growth-inducing effects, among others. FAA did not analyze the indirect effects of potential growth resulting from the redesign because it found that the redesign would not in itself create a growth-inducing effect or increase capacity. Therefore, FAA concluded that such an analysis was not required. Members of the public and government agencies criticized FAA’s decision, stating that the efficiencies gained from a redesigned airspace would lead to an increase in capacity and consequently would increase air traffic and emissions. In

³⁵In addition, experts interviewed by GAO agreed that the alternatives were feasible and met the purpose and need of the project.

³⁶See *Citizens Against Burlington, Inc.*, 938 F.2d at 196.

³⁷40 C.F.R. § 1502.14(a).

³⁸40 C.F.R. § 1502.14(b).

³⁹40 C.F.R. §§ 1502.16, 1508.7.

⁴⁰40 C.F.R. § 1508.8(b).

other words, an indirect effect would occur as a result of the redesigned airspace.

We found that FAA’s decision not to consider these potential indirect environmental effects was reasonable under court decisions applying these NEPA requirements. In the aviation context, courts have uniformly upheld similar decisions by FAA not to analyze the effects of induced growth where the purpose of the project was not growth inducing and did not add runway capacity. The U.S. Court of Appeals for the Ninth Circuit, for example, ruled that FAA complied with NEPA even though it did not consider the possible growth-inducing effects of altering arrival procedures at Los Angeles International Airport, where there would be no changes to the airport’s infrastructure. The court explained that although growth might certainly be foreseeable, “the project was implemented in order to deal with existing problems; the fact that it might also facilitate further growth is insufficient to constitute a growth-inducing impact...” under CEQ regulations.⁴¹ Likewise in this case, the purpose of the regional airspace redesign was to increase the efficiency and reliability of the existing airspace structure and ATC system—not growth inducement—and the project does not add runway capacity. Therefore, we found that FAA was not required to analyze potential environmental effects of increased growth that might result from the airspace redesign.

FAA Complied with Public Participation Requirements

FAA complied with NEPA requirements to make “...diligent efforts to involve the public...”⁴² during the EIS process by (1) conducting an early and open process to determine the scope of issues,⁴³ (2) providing notice of and holding public meetings,⁴⁴ and (3) soliciting and responding to public comments.⁴⁵ We determined that FAA used an “early and open” process, as demonstrated by an extensive prescoping campaign: 31

⁴¹*Morongó Band of Mission Indians v. FAA*, 161 F.3d 569, 580 (9th Cir. 1998); *see also Seattle Community Council Federation v. FAA*, 961 F.2d 829 (9th Cir. 1992) (re-routing of flights at Seattle-Tacoma International Airport involving no infrastructure changes did not require FAA analysis of environmental effects of increased flights that may indirectly result from efficiency improvements).

⁴²40 C.F.R. § 1506.6(a).

⁴³40 C.F.R. § 1501.7.

⁴⁴40 C.F.R. § 1506.6(b) and (c).

⁴⁵40 C.F.R. § 1506.6(d), 40 C.F.R. § 1503.1(4) and 40 C.F.R. § 1503.4.

“prescoping” workshops were conducted prior to the formal scoping period⁴⁶ which drew 1,174 attendees and prompted 712 written comments. As with the scoping meetings, according to FAA, the purpose of these meetings included improving public understanding of the project and increasing FAA’s understanding of public issues that would need to be addressed as part of the redesign process. For these meetings, as well all other public meetings conducted for the redesign, FAA advertised in local media outlets for upcoming meetings and developed a mailing list to send notifications about public meetings and periodic updates on the redesign.⁴⁷ FAA continued to conduct public meetings and to solicit public comments for the scoping and draft EIS periods by holding 58 public meetings that drew over 2,000 attendees. In addition, FAA held seven public meetings during the Noise Mitigation Report comment period, drawing the largest number of participants—2,200. According to FAA officials, meeting locations for the different phases of the EIS process were selected based on multiple criteria including site suggestions from government officials and their staffs, proximity to areas that would be by the proposed action, and FAA’s goal to hold at least one meeting in each affected state.⁴⁸

During the EIS process, public comments included criticism that the meeting locations were not widely dispersed around the affected states. There also was criticism that the comment period for the Noise Mitigation Report was too short and that there were too few public meetings regarding this report, which addressed one of the most controversial and technically complex issues of the redesign. As demonstrated in table 1, although FAA held the fewest number of public meetings for this phase of the EIS process, the meetings had the highest number of attendees. FAA officials stated that they recognized that noise mitigation issues would attract a lot of public attention. Despite stakeholder concerns, we concluded that FAA complied with their requirements.⁴⁹

⁴⁶FAA stated that its decision to hold prescoping meetings was due to prior experiences with airspace redesign and a desire to better educate the public on airspace redesigns.

⁴⁷FAA’s contractors stated the mailing list kept the same names throughout the various EIS periods and added new names and addresses to the master list during the process.

⁴⁸FAA stated that the mailing list developed during the Expanded East Coast Project was used to contact members of the public about the airspace redesign.

⁴⁹Experts we interviewed also stated that FAA’s involvement of the public throughout the EIS process was sufficient given the scope and complexity of the redesign.

FAA also solicited public comments and considered and responded to comments, as required by CEQ regulations, in an adequate manner.⁵⁰ The public comment period for the Scoping and Noise Mitigation periods lasted at least 30 days. For the draft EIS comment period, FAA extended the initial 5-month comment period by 30 days to allow the public more time to submit its comments. FAA also solicited public comments at the public meetings and accepted them during the public comment periods via U.S. mail and e-mail. Receiving numerous public comments, FAA categorized and responded to all substantive comments for the draft EIS comment period in the final EIS. Based on FAA’s solicitation and response to public comments received throughout the EIS process, we concluded FAA’s actions complied with requirements. See table 1 for a summary of public participation opportunities during the EIS process.

Table 1: Summary of Public Participation Opportunities during the EIS Process

Phase	Total number of public meetings	Time period for public meetings (days)	Total number of public attendees	Length of comment period (days)
Prescoping	31	135	1,174	
Scoping	28	107	1,031	159
Draft EIS	30	85	1,166	184
Noise Mitigation	7	67	2,200 ^a	36

Sources: GAO and FAA.

^aThe source documentation cites that “over 2,200 people” attended the noise mitigation meetings. As a specific number was not included by FAA in its documentation, GAO used the number that was listed—2,200.

FAA Complied with Environmental Justice Directives

FAA complied with environmental justice directives set forth in Executive Order 12898,⁵¹ accompanying guidance,⁵² and DOT Order 5610.2,⁵³ including (1) identifying and addressing, as appropriate, disproportionately high and adverse environmental impacts of the proposed action on minority and

⁵⁰40 C.F.R. §§ 1503.1(4), 1503.4, 1506.6(d).

⁵¹Executive Order 12898, *Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations*, Feb. 11, 1994.

⁵²CEQ, *Environmental Justice: Guidance under the National Environmental Policy Act*, Dec. 10, 1997.

⁵³DOT 5610.2, *Environmental Justice in Minority and Low-Income Populations*.

low-income populations and (2) eliciting public involvement from minority and low-income populations during the EIS process. Understanding that potential significant noise impacts could result from the alternatives, FAA identified and addressed any disproportionately high and adverse human health or environmental impacts on minority and low-income populations in the study area. First, FAA used U.S. Census Bureau block data to identify the areas that could be significantly impacted by noise. Then, FAA determined whether the impact on minority and low-income populations was disproportionate.⁵⁴ While certain areas were identified as locations with significant environmental impacts to minority and low-income populations, the mitigation measures outlined in the selected project reduced the expected impacts by 2011 to below significant levels, as defined by FAA's standard of noise exposure. Therefore, FAA concluded that no additional measures were needed to minimize noise impacts for the identified minority and low-income populations. By conducting this assessment, FAA met the directive to identify and address disproportionate significant impacts on low-income and minority populations.⁵⁵

To comply with DOT Order 5610.2 and guidance accompanying Executive Order 12898, FAA elicited opportunities for public involvement of minority and low-income populations for the public meeting periods of the EIS. As the final EIS described, prior to the start of the public meeting periods, the agency worked with congressional offices to determine appropriate locations that would accommodate the specific needs of minority and low-income populations. According to FAA officials, a number of meetings during each public meeting period of the EIS process were held in locations accessible by public transit. Additionally, public meetings throughout the EIS process period were held in low-income and minority communities. Foreign language translators were also provided at certain meetings and information was presented in a variety of formats. Lastly, FAA published advertisements for the draft EIS public meetings in specialized local foreign language media throughout the redesign's

⁵⁴Congressional members and citizens raised concerns about FAA's environmental justice assessment around Newark Liberty Airport during the public comment period for the draft EIS.

⁵⁵In the final EIS, FAA stated that the definitions of "minority" and "low-income" populations in Order DOT 5610.2 were broad. Therefore the agency also used definitions from the CEQ to more narrowly define the two populations.

affected states. Thus, FAA complied with requirements outlined in Executive Order 12898 and related guidance and Orders.

Methodology Used to Assess Key Impacts Was Reasonable, However Additional Analyses Could Have Benefited Decision Making and the Public's Understanding

FAA's methodology to assess the operational and noise impacts was reasonable, based on FAA's guidance for conducting airspace redesigns, standards from the aviation and analytical community, and opinions of experts we interviewed. We used FAA's guidance—specifically the Handbook and FAA Order 1050.1E—to establish criteria to examine FAA's methodology. The Handbook suggests activities for conducting a redesign's operational analysis. In addition, FAA Order 1050.1E establishes specific guidelines for conducting its noise analysis. We found that FAA generally adhered to its guidance in conducting the redesign. Specifically, FAA generally followed the process outlined in its Handbook and used the noise modeling tool and metrics specified in FAA Order 1050.1E. In addition, experts we interviewed generally agreed that FAA used experienced contractors, used best available tools to model the operational and noise impacts of the airspace redesign, used data that were appropriate and standard to the industry, and chose metrics to measure the operational impacts that were reasonable and aligned with the objectives of the airspace redesign. However, based on generally accepted economic principles and practices, expert opinions, past FAA-sponsored airspace redesigns, and prior GAO reports⁵⁶ we identified four limitations in FAA's operational and noise analyses and an additional limitation in not analyzing economic impacts when evaluating the alternatives. Based on our analysis and the opinions of experts we interviewed, we do not believe that these limitations are substantial enough to warrant redoing the analyses, but help identify ways in which FAA's methodology could be improved in future airspace redesigns. Consequently, we identified two types of analyses—uncertainty analyses and benefit-cost analyses—that, although not required by law, would provide more comprehensive information for decision makers and may increase public understanding of FAA's process and decision making in future airspace redesigns.

⁵⁶GAO, *Surface Transportation: Many Factors Affect Investment Decisions*, [GAO-04-744](#) (Washington, D.C.: June 30, 2004); GAO, *Highway and Transit Investments: Options for Improving Information on Projects' Benefits and Costs and Increasing Accountability for Results*, [GAO-05-172](#) (Washington, D.C.: Jan. 24, 2005); and GAO, *Intercity Passenger Rail: National Policy and Strategies Needed to Maximize Public Benefits from Federal Expenditures*, [GAO-07-15](#) (Washington, D.C.: Nov. 13, 2006).

Methodology Used to Assess Operational and Noise Impacts Was Reasonable

FAA's methodology to assess the operational and noise impacts was reasonable, based on FAA's guidance for conducting airspace redesigns, standards from the aviation and analytical community, and opinions of experts we interviewed. To examine FAA's methodology, we focused on five components—process, contractors, modeling tools, data, and metrics—which we identified from FAA's guidance, interviews with FAA officials and experts, and prior GAO reports.⁵⁷ Specifically, we found that FAA generally followed the process outlined in its Handbook and used the noise modeling tool and metric specified in FAA Order 1050.1E. In addition, FAA used experienced contractors and, according to experts we interviewed, the best available modeling tools in its operational and noise analyses. Furthermore, we found no evidence that the data used are unreliable, and experts interviewed generally agreed that FAA used data that were appropriate and standard to the industry and chose metrics to measure the operational impacts that were reasonable and aligned with the objectives of the airspace redesign.

Process. FAA generally followed the process outlined in its Handbook. Airspace studies are generally iterative and involve substantial professional judgment. FAA formulated alternatives for redesigning the airspace through an iterative process with FAA's airspace redesign team⁵⁸ and MITRE (the organization responsible for the operational analysis). Initially, as outlined in FAA's Handbook, conceptual ideas were developed based on the project's objectives. Then using an operational modeling tool, the conceptual ideas were simulated to check that they were technically feasible. If there were parts of the conceptual design that did not work as evidenced through the modeling, the design was adjusted, and the new design was simulated. This iterative process was used in designing the

⁵⁷ GAO, *Bureau of Reclamation: An Assessment of the Environmental Impact Statement on the Operations of the Glen Canyon Dam*, [GAO/RCED-97-12](#) (Washington, D.C.: Oct. 2, 1996); GAO, *Army Corps of Engineers: An Assessment of the Draft Environmental Impact Statement of the Lower Snake River Dams*, [GAO/RCED-00-186](#) (Washington, D.C.: July 24, 2000); GAO, *Oregon Inlet Jetty Project: Environmental and Economic Concerns Still Need to Be Resolved*, [GAO-02-803](#) (Washington, D.C.: Sept. 30, 2002); GAO, *Assigning Air Traffic Control Costs to Users: Elements of FAA's Methodology Are Generally Consistent with Standards but Certain Assumptions and Methods Need Additional Support*, [GAO-08-76](#) (Washington, D.C.: Oct. 19, 2007).

⁵⁸ FAA's airspace redesign team initially included air traffic controllers in the study area and neighboring areas.

Modifications to Existing Airspace Alternative and the two variations of the Integrated Airspace Alternative.⁵⁹

Once the conceptual alternatives were designed, FAA collaborated with MITRE to develop simulation models for each alternative to measure the operational impacts. Performance metrics,⁶⁰ which are selected based on the project's objectives, were used to measure the operational impacts, or system improvements, of each alternative. As discussed in the Handbook, the purpose of the metrics is to allow FAA to evaluate and compare the alternatives, which contributed directly to FAA's decision. The Total Airspace and Airport Modeler (TAAM) was the primary tool used to model the alternatives' operations and quantify the operational impacts in terms of the performance metrics. Additional modeling tools were used to supplement the operational analysis. FAA, MITRE, and air traffic controllers validated each operational design through an iterative process, as outlined in the Handbook, to ensure that the models would provide reliable results by reviewing the model output, making adjustments, and continuing that process until there was agreement that the design was valid.

After the operational designs were validated, the four alternatives were evaluated for environmental impacts, and the results were included in the draft EIS. In conducting the noise analysis, FAA collaborated with its environmental contractors and MITRE to develop scenarios for each alternative to measure the noise impacts in terms of a cumulative noise metric. The Noise Integrated Routing System (NIRS) model was the primary tool used to measure the noise impacts. While developing the input for the noise model, quality assurance checks were conducted by the modelers to help assure accuracy in the model output. Using an iterative process, FAA's airspace redesign team, the environmental contractors, and MITRE reviewed portions of the input for the noise model and output from the operational simulations and validated them against one another to help ensure consistency between the operational and noise analyses.

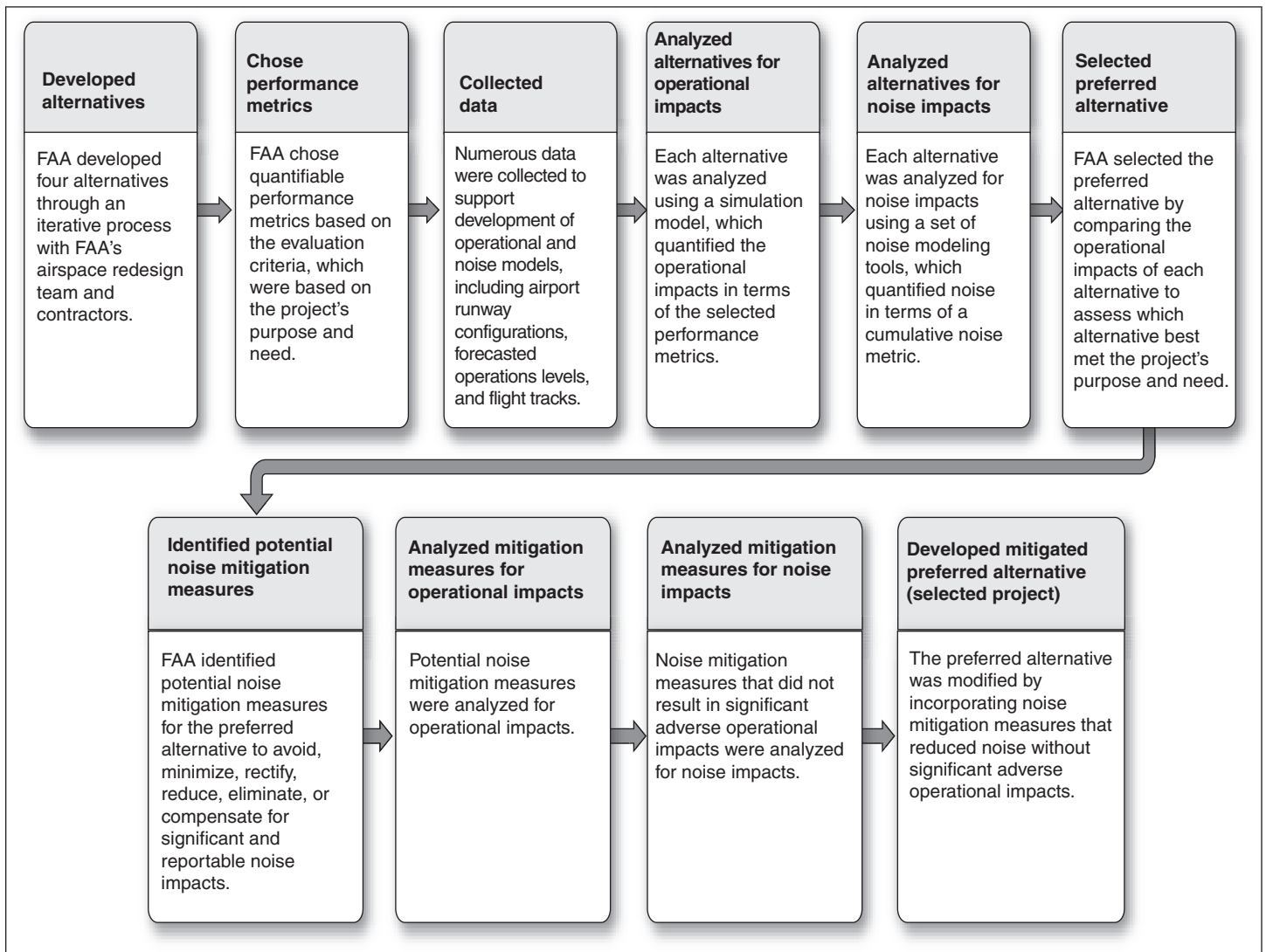
⁵⁹The Future No Action Alternative was included in the evaluation as required by NEPA and CEQ regulations. The Ocean Routing Airspace Alternative was developed by the New Jersey Citizens for Environmental Research, Inc., at the request of the New Jersey Coalition Against Aircraft Noise (NJCAAN) and was evaluated as a potential alternative due to long-standing concerns of the NJCAAN.

⁶⁰As defined in FAA's Handbook, metrics are parameters, algorithms, or formulas used to quantify system performance, and they are measured either directly in the National Airspace System or in models of the National Airspace System.

FAA selected the Integrated Airspace Alternative Variation with ICC as its preferred alternative because, according to FAA, it best met the project's objectives. However, after selecting the preferred alternative, FAA began the process of identifying measures to mitigate the noise impacts associated with the preferred alternative. This process again was iterative and involved identifying potential noise mitigation strategies and using operational and noise modeling tools to measure the operational and noise impacts. The potential noise mitigation measures were continually adjusted and evaluated until measures were identified that would reduce noise impacts without substantial adverse impact on operational efficiency. Several noise mitigation measures were incorporated into the preferred alternative, resulting in the mitigated preferred alternative—the Integrated Airspace Alternative Variation with ICC and mitigation measures. In the Record of Decision, FAA identified this alternative as its selected project.

The operational and noise models required substantial amounts of data. As highlighted in the Handbook, some data were used as direct inputs to the models, such as the airport and runway configurations for the airports, while other data were used as supporting data when developing the model inputs. For example, in the noise analysis, a sample of radar data was analyzed to develop the locations of the terminal and en route flight tracks. In addition, numerous assumptions were required for the operational and noise analyses. FAA and its contractors made assumptions not only when developing the simulations (including the simulations' scope and detail), but also when developing the data inputs, including the aviation demand forecast. For example, the operational models included details down to the airport level based on the judgment that the redesign has the possibility of improving flexibility of runway use. In addition, while developing the aviation demand forecast, which is a key input to the models, numerous assumptions were made, including assumptions about future traffic demand and the introduction of new aircraft. Figure 6 represents a simplified representation of FAA's methodology used to assess operational and noise impacts.

Figure 6: Simplified Representation of the Methodology Used by FAA to Assess Operational and Noise Impacts



Sources: GAO and FAA.

Contractors. Key to our finding that FAA’s contractors were reasonable is the contractors’ substantial experience conducting FAA-sponsored aviation studies. Experience is important because both operational and noise analyses inherently involve substantial professional judgment, including determining the detail included in the model to validating the model and interpreting the results. For example, the Handbook states that some of the key consequences of airspace changes may not be captured

well by models and that a model's quantitative metrics often need to be supplemented with a qualitative review by knowledgeable experts. For this reason, one expert we interviewed stated that the results of a study depend on the contractor's expertise. MITRE, the organization that conducted the operational analysis, is well-respected in the industry, according to experts we interviewed. MITRE's aviation program has a long-standing relationship with FAA, as evidenced by its designation as a Federally Funded Research and Development Center, and according to MITRE representatives, has generally conducted FAA's more complex airspace redesigns. One expert highlighted that over the years, MITRE has improved the main modeling tool used in the operations analysis to create more valid simulations. Metron Aviation, Inc., a contractor responsible for about half of the noise modeling, developed the NIRS model for FAA and has worked on several airspace studies, including the Potomac Consolidated TRACON Facility Airspace Redesign and the Chicago Terminal Airspace Project. Landrum & Brown and Northrop Grumman, the contractors responsible for the other half of the noise modeling, also have experience with airspace projects.

Modeling tools. The experts we interviewed agreed that FAA used generally accepted tools to model the operational and noise impacts of the airspace redesign. TAAM, the primary operations modeling tool, is used to model airspace, airports, and traffic flows. Some experts said that TAAM was generally the best tool to use for this airspace redesign. It allows for fast-time simulation and analysis of changes to route or sector structure, procedures, and traffic levels. For that reason, FAA and aviation stakeholders, such as airport owners, also have used TAAM to model airport and airspace operations.

Noise analysis experts that we interviewed uniformly agreed that the NIRS modeling tool was the best available tool for this multiairport airspace redesign. NIRS is capable of evaluating complex air traffic designs involving high-altitude routing, broad-area airspace changes affecting multiple airports, and other airspace modifications in the terminal and en route environments. While this airspace redesign presented noise exposure in terms of 1 metric, NIRS is capable of computing 13 predefined noise metrics. NIRS was first released as a prototype model in 1998 and has been used in two previous FAA airspace studies (the Potomac Consolidated TRACON Facility Airspace Redesign and the Chicago Terminal Airspace Project). In addition, FAA Order 1050.1E states that the NIRS model must be used for noise analysis of regional airspace studies.

Data. Based on our examination of the data sources and steps taken by FAA and its contractors to ensure the completeness and accuracy of the data, we found that data used in this airspace redesign (such as the airport runway configurations and flight tracks) were appropriate and standard to the industry. While we did not conduct our own reliability assessments for any data used by FAA, our review disclosed no evidence that these data are unreliable. According to FAA and experts we interviewed, the data sources are industry-standard and generally recognized as providing reliable information. For example, most of the data were obtained from governmental sources, such as the radar flight track data, U.S. Geological Survey terrain data, and U.S. Census Bureau data. Data obtained from nongovernmental sources (such as the Official Airline Guide, Airframe Manufacturers Forecast, and other aviation and population forecasting studies) were primarily used to support aviation demand forecasting, rather than as direct inputs for modeling. While FAA did not employ specific procedures to test these data's reliability, according to FAA and its contractors, basic professional care was undertaken. After data were obtained, generally in electronic format to avoid data entry errors, FAA and its contractors took additional steps to ensure that the data were complete and accurate. For example, FAA and its contractors conducted consistency checks throughout the analyses. According to FAA, consistency checks were used to identify discrepancies between data sets that, if identified, were then reviewed and rectified. In addition, consistency checks were conducted on model inputs that were developed. For example, in the noise analysis, a sample of radar flight track data was analyzed to develop the locations of the terminal and en route flight tracks and the flight track dispersions,⁶¹ which were used as direct inputs to the noise model. Furthermore, two experts we interviewed noted that the use of actual radar data in the noise analysis was a good practice.

Metrics. FAA generally used appropriate metrics to measure the operational noise impacts. According to the Handbook, the selection of performance metrics should be linked to development of the alternatives, as well as the project's objectives. For this airspace redesign, FAA used several performance metrics from the Handbook's list of standard performance metrics. For example, the Change in Route Length per Flight metric is correlated to the Handbook's Average Arrival Flight Distance

⁶¹Flight track dispersion occurs because flights do not all follow the same exact path. There is natural variation of flight tracks based on operational factors, such as pilot variation and weather conditions.

metric. The Handbook states, however, that the standard performance metrics do not preclude the use of additional metrics. For this airspace redesign, FAA also selected and customized additional performance metrics based on the airspace redesign's specific goals of improving user access and increasing flexibility. Experts that we interviewed generally agreed that the performance metrics used to measure the operational impacts were reasonable and aligned with the project's objectives. One expert also said that customizing performance metrics was a good practice because the effects of the changes made in the airspace redesign could then be isolated.

To measure noise exposure, FAA used the Day-Night Average Sound Level (DNL) metric that, under FAA Order 1050.1E, must be used as the primary noise metric.⁶² DNL averages the magnitude of sound levels generated by all individual events occurring during a 24-hour period, with a 10-decibel penalty for noise events occurring during typical sleeping hours (between 10:00 p.m. and 7:00 a.m.). To assess the significance of the noise impacts, FAA used the generally accepted method, which sets a significant noise impact threshold criteria based on a dose-response relationship—the correlation of DNL to the percentage of population highly annoyed by recurring noise sound events. The correlation shows that the percentage of people highly annoyed by noise exposure increases significantly above DNL of 65 decibels. Some aviation noise consultants, however, have noted disadvantages of DNL as a metric to measure noise, and suggest the use of supplemental metrics that measure the frequency and intensity of individual noise events, which may provide a more adequate measure of aviation noise as experienced by people. In 1992, after a comprehensive review of measurement approaches, the Federal Interagency Committee on Noise (FICON) concluded there were no other metrics of sufficient scientific standing to replace DNL, and consequently DNL is used by all federal agencies when analyzing airport-related noise in environmental assessments and impact statements.⁶³ This conclusion was still valid as of 2000, according to the chairman of the Federal Interagency Committee on Aviation Noise,⁶⁴ which focuses on aviation research related to noise. Although FICON recommended in 1992 continuing the use of the DNL

⁶²Use of this metric also has been upheld by courts. See *City of Grapevine v. DOT*, 17 F.3d 1502, 1508 (D.C. Cir. 1994); *Sierra Club v. DOT*, 753 F.2d 120, 128 (D.C. Cir. 1985).

⁶³FICON, *Federal Interagency Review of Selected Airport Noise Analysis Issues*, August 1992.

⁶⁴FICON was the predecessor of the Federal Interagency Committee on Aviation Noise.

noise metric as the principal means of describing airport noise exposure, the Federal Interagency Committee on Aviation Noise recognized in 2002 that supplementing this description with noise analyses based on alternative metrics would provide valuable information that is not easily captured by DNL, and that the use of some supplemental noise metrics can provide a more meaningful estimate of impacts than a single DNL estimate.

Our Review Identified Limitations, Which Had They Been Addressed, Would Have Provided More Comprehensive Information for Decision Makers and the Public

Based on generally accepted economic principles and practices, expert opinions, past FAA-sponsored airspace redesigns, and prior GAO reports,⁶⁵ we identified four limitations in FAA’s operational and noise analyses and an additional limitation in not analyzing the economic impacts when evaluating the alternatives. We and the experts we interviewed do not believe that the limitations identified are substantial enough to warrant redoing the analyses. Addressing these limitations would have provided more comprehensive information for decision makers and may have increased public understanding of the process and decision. For example, although not required, FAA did not fully assess the uncertainty associated with its estimated impacts—that is, it did not consider a range of values for key assumptions and inputs—even though some key inputs, such as the aviation demand forecast, are inherently uncertain. In addition, although FAA was not required to analyze the economic impacts (such as implementation costs or the effect of noise on the quality of life of residents living near the airports) when evaluating the alternatives, GAO has previously highlighted the importance of analyzing economic impacts for agency decision making.

FAA Did Not Account for the Potential Effect of Delay Reductions and Operating Costs Savings on Passengers and Airline Traffic

Because FAA assumed that traffic demand and flight operations would not increase in response to airspace system improvements—specifically, delay reductions and operating cost savings—FAA did not account for the potential effect of system improvements in its operational analysis. While our legal review found that FAA’s decision to not analyze the potential increase in capacity in its EIS is reasonable from a legal standpoint, we believe that FAA’s assumption that traffic demand and flight operations would not change as a result of system improvements poses a methodological limitation. FAA estimated that the airspace redesign will reduce airport delay by about 20 percent and annual operating costs by about \$285 million once implemented (see fig. 7 for the calculation and

⁶⁵See [GAO-04-744](#), [GAO-05-172](#), and [GAO-07-15](#).

context of the 20 percent delay reduction). Despite these estimated reductions, however, FAA assumed that traffic demand and flight operations would not change as result of system improvements.⁶⁶

⁶⁶The flight operations forecast is based on the traffic demand forecast.

Figure 7: Description of FAA’s Estimated 20 Percent Reduction in Airport Delay

FAA projected that the selected project will reduce airport delays by 20 percent once fully implemented. While the scope of our study did not include a validation of FAA’s estimates, we describe below additional information about FAA’s projected delay reduction and how FAA calculated the 20 percent airport delay reduction for the selected project because the detailed calculations were not included in documentation that FAA provided to the public.

- The 20 percent delay reduction is the difference in airport delay in 2011 between the selected project and the Future No Action Alternative, not a reduction from today’s airport delay.
- This airspace redesign addresses delays within FAA’s control—that is, delays in the National Airspace System, as well as flexibility in severe weather. Thus, some causes of delay, such as air carrier and security delay, will not be reduced as a result of this project.
- The 20 percent airport delay reduction was calculated by combining the minutes of delay in clear weather (arrival delay, departure delay, and jet route delay) and severe weather (route flexibility). The difference in minutes of delay in 2011 between the selected project and the Future No Action Alternative was then translated into a percentage.
- Estimated delay reduction for the redesign is not equal for all airports—that is, delay reductions at some airports will be significantly greater than at others. In addition, some airports (most notably LaGuardia) will continue to experience significant airport delays. (See the table below for estimated airport arrival and departure delays.)

Airport Arrival and Departure Delays in 2011

Airport		Future No Action Alternative (minutes per flight)	Integrated Airspace with ICC (minutes per flight)	Difference (minutes per flight)	Percentage difference
JFK	Arrivals	3	1.7	-1.3	-43%
	Departures	11.7	9.4	-2.3	-20%
LaGuardia	Arrivals	53.7	49.4	-4.3	-8%
	Departures	74.7	65	-9.7	-13%
Teterboro	Arrivals	6.4	5.3	-1.1	-17%
	Departures	2.2	2.2	0	0%
Philadelphia	Arrivals	14.6	14.3	-0.3	-2%
	Departures	8.2	7.4	-0.8	-10%
Newark	Arrivals	34	26.7	-7.3	-21%
	Departures	20.1	13	-7.1	-35%

Sources: GAO; GAO analysis of FAA data (table).

Note: The table in fig. 7 does not include jet route delay or route flexibility used in FAA’s calculation of the 20 percent airport delay reduction.

FAA's assumption that travel demand will not increase, however, is contrary to economic theory and FAA internal guidance.⁶⁷ Based on economic theory, because delays impose costs on airlines (by requiring them to operate their aircraft for longer periods and use more fuel) and on passengers (by requiring them to spend more time in delayed aircraft), a reduction in delays and an airline's operating costs would reduce the total price (or cost) of air travel.⁶⁸ The reduced total price of air travel would generally provide airlines with an incentive to lower fares (that is, they would be able to provide the same volume of service at a lower price) and because travelers will generally fly more at lower prices, the reduction in price could induce an increase in the amount of travel demanded by passengers, all else the same. FAA also failed to provide economic evidence to support its underlying rationale that traffic demand and flight operations will not change as a result of system improvements because the demand for air travel in the New York area is "price inelastic" (that is, relatively unresponsive to price changes).⁶⁹ FAA guidance, experts we interviewed, and our own previous work indicate that the responsiveness of travelers to changes in travel price depends on factors such as distance traveled, nature of the trip (nonbusiness versus business), and the availability of substitute travel modes (for example, rail). Specifically, FAA's benefit-cost guidance for capacity-related airport projects (for example, building a new runway) indicates that the demand for travel over shorter distances and travel by nonbusiness travelers is price elastic (that is, relatively responsive to changes in price).⁷⁰ In addition, an economist in

⁶⁷See "FAA Airport Benefit-Cost Analysis Guidance," Office of Aviation Policy and Plans, FAA, Dec. 15, 1999. FAA officials told GAO that this guidance does not apply to airspace redesign projects. Nonetheless, the officials agreed that the economic principles embodied in the guidance are generally applicable.

⁶⁸Total price includes air fare and travel time.

⁶⁹More specifically, inelastic demand means that a 1 percent change in price results in a less-than-proportionate change in demand, and elastic demand means that a 1 percent change in price results in a greater-than-proportionate change in demand. By holding traffic demand constant across alternatives, FAA essentially assumed that demand is perfectly inelastic or completely unresponsive to price changes.

⁷⁰FAA's guidance also states that investments that lower average delay at an airport will generally induce some customers who formerly avoided the airport to use it, thereby placing new demands on the facility and eroding some delay savings. The guidance also states that if the project reduces delay in excess of an average of 1 minute per operation, then travel demand forecasts should be adjusted. The guidance states that as a rule of thumb, one 2 percent increment should be simulated for each 3-minute savings. In addition, the guidance states that it is DOT policy that passengers recognize small time savings and can use them effectively. Therefore, a relatively small time savings should be valued at the same rate as longer time savings.

the aviation industry whom we interviewed noted that air travelers who use the New York and Philadelphia airports have multiple travel options, especially options that compete with short-distance flights, and as a result, demand for air travel on these routes is relatively elastic. Our prior work also indicates that passenger rail competes with short-distance flights, such as the New York to Washington, D.C., market.⁷¹

We also question FAA's underlying rationale that flight operations would not increase as a result of the airspace redesign because the redesigned airspace does not increase overall system capacity. Specifically, FAA explained that the capacity of the entire airspace system—which includes the airspace, runways, and airport terminals—is determined by the element in the system with the least capacity, which, for the New York metropolitan area, is the capacity of the airport runways. Because this redesign does not increase runway capacity, FAA concluded that operations would not increase. However, FAA's National Airspace Capital Investment Plan states that an objective of this airspace redesign project is to increase capacity to meet projected demand and reduce congestion.⁷² In addition, officials from the Port Authority of New York and New Jersey—which operates JFK, LaGuardia, and Newark—said that this redesign could increase capacity and that additional operations at these airports could be achieved. Finally, most of the experts that we interviewed believe that the capacity in the airspace would increase, which could allow for additional operations. Most of these experts, however, also stated that any increase in system capacity resulting from the redesign would likely be relatively small, such that any increase in new operations would also be small. One expert that we interviewed stated that there needs to be a major increase in the capacity, such as a new runway, before airlines would substantially increase their operations. Also, airlines could use a larger aircraft, with more available seats, instead of increasing the number of operations. While we believe this was a methodological limitation, it is uncertain what the net effect of the airspace redesign will be since the final results will depend upon the actions of the airlines and passengers in responding to the estimated delay reduction and operating cost savings.

⁷¹See [GAO-07-15](#).

⁷²National Airspace System Capital Investment Plan FY 2008–2012.

FAA Did Not Fully Account for Future Use of New Technology in the Noise Analysis

FAA's assumptions in the noise analysis did not fully account for the future use of Area Navigation (RNAV) technology.⁷³ Specifically, FAA modeled RNAV procedures in the noise analysis of the mitigation measures for the preferred alternative, but did not model RNAV in the noise analysis used to compare the alternatives, which is inconsistent with the operational analysis. RNAV is designed to allow aircraft to fly a more precise track, thus examining the effect of RNAV on noise impacts could have provided more precise information for decision makers and the public. FAA said that it modeled RNAV for some mitigation measures of the preferred alternative because mitigation of noise impacts could be improved by using RNAV procedures. In the noise analysis used to compare the alternatives, however, FAA did not model RNAV because FAA said it did not know whether all aircraft using a particular route would be equipped with RNAV technology; FAA also did not predict which flight tracks airlines would choose. Thus, FAA officials said that they did not want to model anything that was not guaranteed to be implemented. Our review, however, showed that FAA had some indication as to which routes would be used with RNAV because some tracks in the operational models were designed to be RNAV compatible. An expert whom we interviewed further explained that because FAA had designed flight tracks to be more efficient for the purposes of this airspace redesign, it could be expected that airlines would use RNAV on those tracks that are most efficient. Furthermore, it would be reasonable to assume that RNAV will be used within the time frame of this airspace redesign because as one expert explained, RNAV reduces fuel burn and reduces flight time. FAA's own estimate reflects that about 80 percent of operations at the top 35 busiest airports in the National Airspace System are estimated to be RNAV capable.⁷⁴

FAA officials also said that RNAV was not modeled in the noise analysis because the amount of dispersion depends on a route's designated accuracy value,⁷⁵ which is decided during development of the route

⁷³RNAV enables aircraft to fly on any desired flight path within the coverage of ground- or space-based navigation aids, within the limits of the capability of the self-contained systems, or a combination of both capabilities. As such, RNAV aircraft have better access and flexibility for point-to-point operations.

⁷⁴FAA's 2006 Roadmap for Performance-Based Navigation.

⁷⁵For example, typically route procedures that are designated with an accuracy value of 2 (designated RNAV-2), require aircraft to be within 2 nautical miles of their assigned flight path 95 percent of the flight time.

procedure. According to FAA and its contractors, however, the effect of using RNAV in the noise analysis would have created a more concise concentration of flight tracks over specific geographic areas and would have concentrated noise under these tracks. Therefore, in most cases, RNAV may have resulted in fewer people impacted by noise but to a greater degree, depending on the location of the RNAV route. FAA included some RNAV procedures as noise mitigation measures, however. For example, when RNAV is used in the river approach to Philadelphia, the flight tracks are concentrated over the river, in effect reducing the number of people impacted by noise, as well as concentrating the higher noise levels over nonpopulated areas. Experts with whom we discussed FAA's use of RNAV said that examining the effect of RNAV procedures on the noise impacts could have provided more accurate information on the noise impacts. One expert, however, considered the FAA's assumption to not fully model RNAV in the noise analysis conservative given the uncertainty of the extent to which RNAV would become a key part of the airspace system.

FAA Did Not Assess the Effect of Noise Using Supplemental Noise Metrics

FAA only assessed noise impacts using a single cumulative noise metric that is required under FAA guidance, where additional metrics, not required by law or guidance, that measure noise in other ways—called supplemental noise metrics—would have provided information that may be more readily understood by decision makers and the public than the DNL metric.⁷⁶ As mentioned previously in this report, the Federal Interagency Committee on Aviation Noise recognized in 2002 that supplementing the DNL cumulative noise metric with alternative noise metrics would provide valuable information that is not easily captured by DNL, and the use of some supplemental noise metrics can provide a more meaningful estimate of physical impacts than a single DNL estimate. For example, Sound Exposure Level (SEL)⁷⁷ and Time-Above⁷⁸ are recognized as appropriate metrics for evaluating physical impacts associated with

⁷⁶These metrics also can be calculated using the same noise modeling tools used to calculate DNL. The noise model is capable of calculating up to 13 noise metrics, some of which include the supplemental metrics mentioned by the experts.

⁷⁷Sound Exposure Level, or SEL, metric is used to measure noise exposure for a single aircraft flyover. It identifies the cumulative sound that a person is exposed to during the event if the sound were compressed into 1 second of time.

⁷⁸The Time-Above metric can identify how much time during a designated time period—such as a day—the noise exposure levels will exceed a specified decibel level. The sound level must be specified—for example, 60 decibels. This method can then determine the length of time during a 24-hour period that noise levels will exceed 60 decibels.

FAA Did Not Fully Assess
Uncertainty Associated with
Estimated Impacts of the
Alternatives

noise, such as sleep disturbance and speech interference.⁷⁹ According to FAA representatives, supplemental noise metrics were not calculated because the size and complexity of this regional airspace redesign would have made their inclusion in the EIS more confusing to the public. FAA has, however, calculated supplemental metrics, including SEL and Time-Above, in previous airspace redesigns.⁸⁰ While experts we interviewed recognized that presenting supplemental metrics in this EIS would have been challenging, they said that it was possible, and one expert explained that in some cases, it may have helped FAA more easily respond to public concerns. One expert said that limiting the information to discrete areas may have made presenting supplemental metrics in the EIS more manageable. For example, FAA could have reported single-event noise levels only for schools or the most common or loudest aircraft. In previous airspace redesigns where FAA calculated supplemental metrics, they reported the supplemental metrics only for areas that experienced noise impacts above a selected DNL value.

FAA did not fully assess the uncertainty associated with the estimated impacts—that is, it did not consider a range of values for the key assumptions and inputs—even though some inputs are inherently uncertain.⁸¹ Rather, when assessing the estimated impacts of the four alternatives, FAA generally used point estimates to represent traffic demand in 2006 and 2011, such as a point estimate for the future fleet mix and traffic levels. As a result, FAA’s analysis implies greater precision about the redesign’s impacts than is warranted. Assessing the uncertainty associated with the key assumptions and inputs would have provided a range of estimated impacts.

As FAA’s own Handbook recognizes, questions are likely to be raised about analyses based on uncertain assumptions, and “one way to protect a study’s integrity ... is to develop a few scenarios that reflect alternative assumptions for key uncertain elements,”⁸² that is, perform a sensitivity analysis. We heard a range of opinions from experts we interviewed about

⁷⁹According to FICON.

⁸⁰FAA calculated supplemental metrics in the Potomac Consolidated TRACON Facility Airspace Redesign and the Chicago Terminal Airspace Project.

⁸¹For example, a key input into the operational analysis was the travel demand forecast—an inherently uncertain input because future conditions cannot be precisely predicted.

⁸²Airspace Management Handbook, Version 1, p. 21.

assumptions made in the airspace redesign's demand forecast. Two experts said that the demand forecast did not fully account for new classes of aircraft, such as the change in use of air taxis or regional jets, while one expert noted that the forecast did not account for changes in the airlines' hub-and-spoke operations. Other experts disagreed with assumptions about airline yields or the effects of fuel costs. What most experts that we interviewed shared, however, was the belief that FAA should have assessed uncertainty by evaluating how changes in key assumptions made in the demand forecast would affect the estimated impacts of the alternatives.

FAA did, however, conduct a very limited sensitivity analysis to assess the uncertainty associated with one element of the forecasted fleet mix and one comparative analysis. According to FAA, based on the results of the limited sensitivity analysis, the relative ranking for the alternatives did not change. In 2006, FAA—in recognizing that the aviation industry had changed since the forecast was conducted—conducted a comparative analysis of some elements of its 2006 forecast with the observed levels in 2005 and some elements of the 2011 forecast of Philadelphia traffic to the 2012 forecast used for the Capacity Enhancement Plan.⁸³ This comparative analysis did not assess the uncertainty associated with estimated impacts, but, rather, assessed the accuracy of parts of the 2006 and 2011 forecasts developed for the airspace redesign. Through the comparative analysis, FAA determined that some of the forecasted elements were essentially correct (for example, the traffic counts for the 2006 forecast were 6 percent to 8 percent higher than the 2005 observed levels for the major airports in the region)⁸⁴ while some were inaccurate (for example, the estimated fleet mix).⁸⁵ Based on the results of this comparative analysis, FAA determined that the number of regional jets at Newark needed further analysis and as a result, conducted a very limited sensitivity analysis by increasing the estimated proportion of regional jets at Newark in 2006 and recalculating the operational impacts for each alternative in 2006. According to FAA, the results of the limited sensitivity analysis showed that the relative ranking of the alternatives was not affected by the change.

⁸³DOT, FAA, Office of System Capacity, 2001 Aviation Capacity Enhancement Plan, December 2001.

⁸⁴An expert interviewed said that this level of difference appeared reasonable.

⁸⁵Specifically, the forecast underestimated airlines' use of regional jets and the level of air traffic at many regional airports.

FAA Did Not Analyze Economic Impacts when Evaluating the Alternatives

The criteria used to evaluate the alternatives did not include economic impacts, such as implementation costs, the effect of the alternatives on the airlines, passengers' time value, or the effect of noise on the quality of life of residents living near the airports. According to experts interviewed, considering these impacts could have been helpful for decision makers because it would have provided more information for FAA to better assess whether the estimated benefits of the alternatives (relative to the Future No Action Alternative) justified the estimated costs. Experts we interviewed also said that a fuller discussion of the airspace redesign's potential costs may have increased stakeholders' understanding of FAA's decision and, in turn, made FAA's decision more palatable to the public. FAA, however, is neither required to, nor precluded from, considering these impacts in its decision under CEQ regulations.

Implementation costs. Some experts we interviewed noted that FAA did not assess implementation costs when comparing the alternatives with the Future No Action Alternative. According to FAA, because implementation costs, such as facility or training costs, would be the same for all alternatives, their inclusion in the operational analysis would not have affected FAA's decision. For example, FAA said that the cost for training air traffic controllers is an ongoing agency cost; that is, training will occur independently of the airspace redesign. However, because the selected project, unlike the other alternatives, will require a common automation platform,⁸⁶ its implementation costs⁸⁷ will be different from the other alternatives' implementation costs. Furthermore, although implementation costs were not explicitly analyzed when comparing the alternatives, FAA suggested in the airspace redesign's operational technical report that costs and benefits were assessed. Specifically, the operational technical report states that the Integrated Airspace with ICC is the only alternative "worth the effort and expense of implementing an airspace redesign of this magnitude."⁸⁸

Other economic impacts. We also found that FAA did not assess other economic impacts, such as the effect of the alternatives on the airlines,

⁸⁶ A common automation platform refers to a single radar data processing system and the information it provides to controllers. It includes shared displays on screens, radar, data processing and presentation, and communications.

⁸⁷ FAA officials do not currently know what the costs will be to develop the common automation platform.

⁸⁸ App. C of the final EIS, p. 10-4.

passengers' time value, or the effect of noise on the quality of life of residents living near the airports. FAA representatives said they did not measure the economic impact on airlines or passenger time value because they were trying to keep the analysis "clean," and did not believe that those impacts were part of the NEPA process. In addition, FAA did not estimate the economic impacts of noise, in part because they are not required under CEQ regulations to conduct a benefit-cost analysis, and noise reduction was not part of the airspace redesign's purpose and need.⁸⁹ While methods to determine the economic costs associated with noise impacts are not firmly established, economists have used methods for assessing the economic impact of changes in noise.⁹⁰ For example, according to one expert we interviewed, FAA could have estimated property devaluation associated with noise using the DNL cumulative noise metric calculated in the noise analysis. Although not required under CEQ regulations, FAA would have had a more comprehensive picture of the trade-offs for each alternative had it assessed these economic impacts.

Uncertainty Analyses and Benefit-Cost Analyses Could Benefit Decision Makers and the Public

We identified two analyses that would have provided decision makers and the public with more comprehensive information. For example, an uncertainty analysis using a range of values for key assumptions and inputs, such as future demand and operations levels, would have provided decision makers and the public with a range of projected impacts. In addition, a benefit-cost analysis, which could have been used to assess the economic trade-offs between each airspace redesign alternative and the status quo, could provide more comprehensive information for decision makers to determine whether the estimated benefits associated with

⁸⁹Even though reduction of noise was not part of the purpose and need for the airspace redesign, thus not a criterion in the decision-making process, FAA emphasized that noise impacts were considered. Specifically, FAA explained that it considered noise after selecting the preferred alternative by identifying measures to mitigate the noise impacts associated with the preferred alternative. Several noise mitigation measures were incorporated into the preferred alternative, which according to FAA, would result in the mitigation of all significant noise impacts by 2011. As determined by FAA, "significant" noise impacts occur if a proposed action would result in a minimum 1.5 DNL increase where noise exposure already exceeds 65 DNL or would exceed 65 DNL after the increase. FAA also explained that it did not use noise metrics when comparing alternatives because there are no established standards for significance of noise reduction. For instance, there is no standard to answer the question, "Which is better: reducing the noise impacts for 1,000 people by 3 decibels, or reducing the noise impacts for 500 people by 5 decibels?"

⁹⁰These methods include hedonic price techniques, which can be used to measure the effect of economic attributes like noise on housing values.

Uncertainty Analysis Would Provide Information on the Range of the Redesign's Impacts

redesigning airspace justify the costs, and provide more transparency in the decision-making process to increase the public's understanding.

An uncertainty analysis that examined a range of key assumptions and inputs, such as the aviation demand forecast and the future use of RNAV, would have been useful. For example, a sensitivity analysis (a way to assess uncertainty) is used to change the values for key assumptions and to assess the effect on the estimated impacts, thereby providing decision makers and the public with information to understand the sensitivity of the results to changes in the assumptions. The analysis can be used to assess the uncertainty associated with the estimated impacts—that is, provide a range of projected impacts. The basic approach is to vary key assumptions, estimates, and forecasts systematically over appropriate ranges and to measure the impact on the results. In some cases, the relative impact of competing alternatives may be altered as a result of the sensitivity analysis, while in others it will not. As we stated in a prior section, FAA did not conduct a full sensitivity analysis on the demand forecast's key assumptions but only a limited analysis to assess uncertainty in the number of regional jets at Newark. FAA reported that the results of this limited sensitivity analysis showed that the relative ranking of the alternatives was not affected by the change.⁹¹

An uncertainty analysis is common for evaluations of projects that will have future impacts. For example, a 2007 report on the region's travel demand used a sensitivity analysis to assess the effect of low, baseline, and high scenarios for its 2025 forecast.⁹² In addition, FAA's Handbook recommends a sensitivity analysis when conducting airspace studies and evaluating airspace alternatives. Specifically, the Handbook recommends a sensitivity analysis be performed "even if assumptions have a strong basis in precedence and factual information. Other assumptions are known to be inherently uncertain from the beginning because they are based on imperfect or incomplete information. This is clearly the case for all future events, such as the level and characteristics of the future traffic demand

⁹¹FAA also did some comparative analyses that involved comparing some elements of the 2006 forecast with the observed levels in 2005 and some elements of the 2011 forecast for Philadelphia traffic with the 2012 forecast used in the Capacity Enhancement Plan.

⁹²*FAA Regional Air Service Demand Study, Summary Report*. Sponsored by FAA, The Port Authority of New York and New Jersey, New York State Department of Transportation, and Delaware Valley Regional Planning Commission, May 2007.

Benefit-Cost Analysis Would Provide Information on Whether Estimated Benefits Outweigh Estimated Costs

since the future cannot be predicted precisely.”⁹³ Experts interviewed said that given the inherent uncertainty associated with projecting future events, when feasible, uncertainty should be assessed. Several experts told us that a sensitivity analysis could have been used for key factors in the operational analyses.⁹⁴ For example, a sensitivity analysis could have been performed on aircraft fleet operations at the region’s smaller airports to account for the growing segment of business jet operations.

A benefit-cost analysis, which can be used to assess the benefits and costs associated with each alternative compared to the status quo, would have provided decision makers and the public with more comprehensive information on whether the estimated benefits of the selected project justified its costs. Benefit-cost analyses are used to identify the alternative, if any, that maximizes the net benefits (benefits minus costs) relative to the status quo. The alternative that maximizes net benefits is economically justified. The analysis also can be used to identify how the benefits and costs associated with each alternative are distributed across different subpopulations or income groups.

FAA stated that it did not conduct a benefit-cost analysis for the airspace redesign because the agency was not required to do so.⁹⁵ GAO believes, based on prior work, that benefit-cost analyses can provide valuable information for decision makers and should be considered in analyzing transportation investments.⁹⁶ While conducting benefit-cost analyses

⁹³Handbook, p. 21. FAA’s Benefit-Cost Analysis Guidance also recommends the use of sensitivity analysis.

⁹⁴Experts noted that a sensitivity analysis would have less of an effect on a noise analysis than on an operational analysis. As one expert noted, this is because traffic on one day will not significantly impact the noise model, which reflects annual average conditions. In addition, according to this expert, there would need to be a 35 percent to 40 percent error in the traffic forecast to affect DNL.

⁹⁵Although not required, a benefit-cost analysis is permitted under CEQ regulations. Under 40 C.F.R. § 1502.23, “[i]f a cost-benefit analysis relevant to the choice among environmentally different alternatives is being considered for the proposed action, it shall be incorporated by reference or appended to the [EIS] as an aid in evaluating the environmental consequences.” The regulation further states that when a cost-benefit analysis is prepared, the EIS should discuss the relationship between that analysis and any analyses of unquantified environmental impacts, values, and amenities. The regulation states that the merits and drawbacks of the alternatives need not be displayed in a monetary cost-benefit analysis and should not be when there are important qualitative considerations.

⁹⁶See [GAO-04-744](#) and [GAO-05-172](#).

requires an investment in time and resources, FAA uses benefit-cost analyses in making other investment decisions, such as the Next Generation Air Transportation System (NextGen) projects. Moreover, FAA has guidance for conducting benefit-cost analyses for airport projects and investment analyses for air traffic control procurements.⁹⁷ FAA requires benefit-cost analyses in granting discretionary airport improvement program funds and for investment analysis for air traffic control procurements. In addition, the Office of Management and Budget requires benefit-cost analyses for new regulations. The Air Traffic Organization (ATO), which includes the division that develops airspace redesigns, also includes a division that is charged with assessing investments for the air traffic control system. FAA's Office of Aviation Policy and Plans conducts benefit-cost analyses on investment and regulatory decisions and discretionary Airport Improvement Program grants.⁹⁸

Furthermore, only after FAA selected the final alternative did it assess the economic benefits associated with the selected project. Specifically, in describing the benefits of the airspace redesign to the public, FAA stated that the selected project would result in 12 million minute delay savings (see fig. 8 for further discussion) and a reduction of up to \$285 million⁹⁹ in annual operating costs, when compared to the Future No Action Alternative. These benefits were calculated using FAA's economic values for investment decisions, which are used in FAA's benefit-cost analyses for

⁹⁷FAA *Airport Benefit-Cost Analysis Guidance*, Office of Aviation Policy and Plans, FAA, Dec. 15, 1999 and FAA Web page entitled "The FAA Acquisition System Toolset, AMS Policy vs. Guidance," <http://fast.faa.gov> (accessed March 15, 2008). FAA, along with the U.S. National Aeronautics and Space Administration Transport Canada, also is sponsoring research to develop analytical tools to assess the benefits and costs of different environmental policies and research and development investment strategies. One area of research is focusing on how to monetize the health and welfare impacts of aviation noise, local air quality, and climate effects to enable a robust cost-benefit analysis of policy alternatives.

⁹⁸We recognize that the guidance does not apply to the Air Traffic Organization, which includes the FAA division responsible for airspace redesigns.

⁹⁹FAA reported in the Record of Decision that the airspace redesign would reduce annual operating costs by \$248 million and severe weather delay costs by another \$37 million, totaling \$285 million. However, in a letter to Senator Robert Menendez in February 2008, FAA estimated that there would be \$300 million annual savings in direct operating costs. FAA stated that the higher reduction in annual operating costs was due to an increase in jet fuel prices.

investment and regulatory decisions.¹⁰⁰ However, the dollar amounts for delay savings were done only for airline operating costs and not for others such as delay savings to passengers. Moreover, because FAA did not estimate costs, the information on benefits cannot be used to assess whether the selected project is economically justified.

¹⁰⁰*Economic Values for FAA Investment and Regulatory Decisions, A Guide*. Prepared by GRA Incorporated for the FAA Office of Aviation Policy and Plans (Washington, D.C., Dec. 31, 2004).

Figure 8: Description of the 12 Million Minutes Saving in Delay Savings

FAA stated in press releases that there will be a projected annual 12 million minutes in delay savings. We present this description because FAA did not include an explanation of the calculation in the documents it released to the public.

- This measure was developed as a means to communicate the delay benefits of the redesigned airspace to the public. FAA officials said that because this measure only reflects delay, it is not a useful measure in evaluating the different alternatives. Furthermore, it was developed after FAA made its decision.
- The 12 million minutes is not a straight multiplier of the average minutes delay savings—which FAA estimates to be 3 minutes of arrival delay per flight—by the number of operations at the airports. Rather, the 12 million minutes was calculated from 4 performance metrics—traffic-weighted arrival delay, traffic-weighted departure delay, departure airspace delay, and delay savings from flexibility—of the 13 metrics used in the operational analysis to compare the alternatives. FAA multiplied the daily per flight savings by the number of affected flights and then annualized the savings for each of the four metrics. The total savings calculated for all four metrics was approximately 12 million minutes (see table below).
- In one press release, FAA stated that the 12 million minutes savings were for the four major metropolitan airports—JFK, LaGuardia, Newark, and Philadelphia. However, the operational analysis included other satellite airports.

Calculation of 12 Million Minutes Savings

Metric	Minutes saved	Number of operations	Annualizing factor	Annual savings (minutes/year)
Minutes saved per flight for arrival	2.948	3,558	368	3,860,145
Minutes saved per flight for departures	4.113	3,566	368	5,398,744
Minutes saved per flight for departure airspace delay	0.49	3,566	368	643,021
Minutes saved per flight for routing flexibility	12.60	3,566	36	1,617,538
Total minutes saved				11,519,448

Sources: GAO; FAA (table).

FAA’s limited economic analysis focused only on select benefits of only one alternative—the selected project—and does not account for costs. A comprehensive benefit-cost analysis would have increased transparency about the range of potential economic impacts of the airspace redesign. For example, a benefit-cost analysis that estimated the economic impact on passengers, airlines, and residents living near the airports, would have allowed a decision maker to assess which alternative, if any, would maximize net benefits, and to identify how the benefits and costs are

distributed among population or income groups. As one expert explained, it is difficult to identify from the operational analysis the beneficiaries of the system improvements. For example, system improvements, such as reducing delay, benefit passengers and airlines, but other improvements, such as reduce voice communications and balance controller workload, benefit the ATC system.

Experts we spoke with indicated that a benefit-cost analysis for the airspace redesign would have been useful. For example, one expert noted that the list of system improvements and metrics in the alternatives analysis focused on impacts related to efficiency, while the implementation costs were not included. In addition, if the economic impacts of noise had been included, costs could have varied by alternative. For example, FAA estimated that the Ocean Routing Airspace Alternative would result in fewer people impacted by noise compared to other alternatives. If the economic effect of noise, approximated by a change in home values due to aviation noise, had been taken into account, then an alternative like the Ocean Routing Airspace Alternative might have performed better than the other alternatives on this metric. In addition, the potential economic effect on passengers and airlines also would have been assessed in a comprehensive benefit-cost analysis. For example, the effect of delay on passengers could have been assessed using the value of passenger time lost or gained as a result of the airspace redesign.

Lack of Detailed Implementation Plan Raises Questions about Time Frames and Costs

Based on the information available to date, we are unable to determine whether FAA will meet its projected 5-year implementation time frame, what the final project configuration and implementation costs will be, and any details regarding FAA's postimplementation evaluation plan. For example, FAA has not yet developed a detailed implementation plan that includes a schedule of when the new redesigned airspace will be in place. Additionally, FAA has not yet determined the type or amount of equipment or software that will be needed to implement the project.

Lack of Detailed Implementation Plan Raises Questions on FAA Meeting Its 5-Year Completion Goal

FAA is in the process of preparing an implementation plan, and therefore, we are unable to determine whether FAA can meet its projected 5-year implementation time frame, overcome potential obstacles to implementation, and transition from the current airspace structure to the redesigned structure. FAA is responsible for ensuring that the selected project is implemented in a manner that avoids any interruption in air traffic services and minimizes disruptions to air traffic. To ensure that new airspace redesign projects are successfully implemented, FAA's Handbook

lays out specific activities for transitioning between the current airspace structure and the redesigned airspace. Based on our prior work¹⁰¹ and the experts we interviewed, we have identified three specific activities recommended in FAA's Handbook and one additional activity emphasized by our experts that we believe are important to include in an implementation plan to successfully implement the redesigned airspace.

- *Scheduling.* FAA's Handbook recommends preparing a schedule that identifies the exact time that the new redesigned airspace will be in place so that all affected FAA regions and facilities, airports, airlines, air traffic controllers, and general aviation pilots can prepare for the change. For example, a major component of the redesigned airspace is the integration of the airspace, which will allow air traffic controllers to use the terminal separation rules over a larger geographical area. Although FAA acknowledges that integrating the airspace will require new procedures and potentially reallocation of staff, there is no detailed information on when these procedures will be implemented, how ATC staff may be reallocated, and what type of air traffic controller training will be required. Without this information, it is difficult for the agency to clearly track and report progress, as well as to ensure timely implementation. In our prior work,¹⁰² we have highlighted the importance of developing an implementation timeline to build momentum and show progress from day one. For example, to help federal agencies implement successful transformation of their cultures in a transparent and accountable manner, a key implementation step is to make implementation goals and timelines public.
- *Risk mitigation.* According to the Handbook, as part of its implementation plan, FAA should identify potential risks and develop a risk mitigation plan to minimize the impact if the risk does occur. FAA, however, has not developed risk mitigation strategies to deal with

¹⁰¹GAO, *Results-Oriented Cultures: Implementation Steps to Assist Mergers and Organizational Transformations*, [GAO-03-669](#) (Washington, D.C.: July 2, 2003); GAO, *Intercity Passenger Rail: Issues Associated with the Recent Settlement between Amtrak and the Consortium of Bombardier and Alstom*, [GAO-05-152](#) (Washington, D.C.: Dec. 1, 2004); GAO, *United States Coast Guard: Improvements Needed in Management and Oversight of Rescue System Acquisition*, [GAO-06-623](#) (Washington, D.C.: May 31, 2006); GAO, *Telecommunications: Full Adoption of Sound Transition Planning Practices by GSA and Selected Agencies Could Improve Planning Efforts*, [GAO-06-476](#) (Washington, D.C.: June 6, 2006); GAO, *2010 Census: Costs and Risks Must be Closely Monitored and Evaluated with Mitigation Plans in Place*, [GAO-06-822T](#) (Washington, D.C.: June 6, 2006).

¹⁰²See [GAO-03-669](#).

potential challenges that may arise during the redesign's implementation. Without details on proposed risk mitigation, it is unclear whether FAA has taken steps to identify possible risk factors. FAA officials noted that there are a number of separate FAA projects and initiatives that, while not directly linked to the airspace redesign project, will influence how FAA implements the airspace redesign. For example, FAA has not decided whether it will house the new common automation platform in existing facilities, a new facility, or a consolidated facility. In some of our prior work,¹⁰³ we have recommended that agencies should develop a risk analysis to show the potential impacts if task and milestones are not achieved, develop methods to accurately evaluate and measure the progress of implementation, and develop contingency plans should task and milestones not be met. FAA does not have such plans in place for implementing the redesign. Furthermore, if there is no consideration of risk mitigation, FAA may be unable to minimize potential risks.

- *Transition planning.* The Handbook also recommends that FAA identify the steps that need to be taken to transition between the current airspace to the redesigned airspace in a transition plan that includes key decision points along the way. Transitional plans provide details on the activities and time schedules for the transition from the current airspace to the redesigned airspace. The purpose of these plans includes ensuring that services associated with the airspace and airports continue throughout implementation and that the multiple users of the airspace—such as pilots, FAA personnel, and air traffic controllers—are aware of the ongoing changes. Given this redesign's high level of complexity and multiple implementation stages, transitional planning could be beneficial to FAA's implementation. However, FAA has not developed a transitional plan for the redesign's implementation. We have highlighted in a prior GAO report¹⁰⁴ that FAA should include proper transition planning when implementing highly technical and complex projects that involve numerous stakeholders, such as NextGen. For example, in February 2008, we testified that FAA faces a number of management challenges—such as better aligning costs with revenue—in its transition to NextGen.¹⁰⁵

¹⁰³See [GAO-05-152](#).

¹⁰⁴GAO, *Next Generation Air Transportation System: Progress and Challenges Associated with the Transformation of the National Airspace System*, [GAO-07-25](#) (Washington, D.C.: Nov. 13, 2006).

¹⁰⁵GAO, *Federal Aviation Administration: Challenges Facing the Agency in Fiscal Year 2009 and Beyond*, [GAO-08-460T](#) (Washington, D.C.: Feb. 7, 2008).

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- *Monitoring.* It is important for FAA to monitor the implementation throughout the transition process to ensure that FAA is actually implementing the changes in the airspace that were identified in the selected project. We have reported in prior GAO work¹⁰⁶ that monitoring efforts can help agencies transition to new systems. For example, as FAA transitions to NextGen, we believe it will be critical for FAA to monitor and address equipment outages to ensure the safety and efficiency of the current ATC system. In addition, experts we spoke with also believe that monitoring is an important step for implementing the airspace. For example, one expert interviewed by GAO stated that FAA should get a current baseline of information on the airspace, and continue to monitor and evaluate throughout implementation. Another expert interviewed by GAO also stated that both operational and noise impacts should be assessed (as part of monitoring and evaluation) to further enhance management of the implementation. Although FAA has already begun implementing the redesign, it is unclear how the agency will monitor and evaluate the process since there is no monitoring plan in place. Periodic monitoring and evaluation will both ensure that FAA is complying with the operational and environmental objectives outlined in the selected project, as well as increase the project's accountability and transparency.

Final Project Configuration and Costs Are Unknown

FAA has not determined the final project configuration and costs. Based on our prior work,¹⁰⁷ it is critical for an agency to have a full understanding of project costs to ensure that implementation is successful. For example, by understanding project costs, agencies can ensure they have the required resources. However, FAA has not yet determined the costs due, in part, to two reasons. First, although FAA officials have stated that they will be using currently available technology and software, FAA has not determined the type or amount of equipment and software that will be needed to implement the common automation platform for the ICC. Second, it is still unclear whether the ICC will be housed in existing FAA facilities, a new facility, or in a consolidated facility. Under FAA's Facility Replacement Program, FAA is reviewing whether to build a new TRACON facility for the New York region. However, FAA officials estimated that the

¹⁰⁶See [GAO-05-152](#), [GAO-08-76](#), and GAO, *Next Generation Air Transportation System: Status of the Transition to the Future Air Traffic Control System*, [GAO-07-784T](#) (Washington, D.C.: May 9, 2007).

¹⁰⁷See [GAO-08-460T](#) and GAO, *National Airspace System: Transformation Will Require Cultural Change, Balanced Funding Priorities, and Use of All Available Management Tools*, [GAO-06-154](#) (Washington, D.C.: Oct. 14, 2005).

final decision as to whether to approve the design and construction of a new TRACON will be made sometime in September 2008, but it will not include costs estimates. Cost estimates will require FAA to make specific decisions on the location of the TRACON, the size of the facility, and any supporting infrastructure requirements. If FAA approves the construction of a new TRACON, the final cost estimate for this new facility will not be available until September 2011 when the contract is to be awarded, and the new facility is not projected to be completed until September 2015—3 years after FAA has estimated full implementation of the selected project.

An Adaptive Management Strategy May Help FAA Successfully Evaluate the Implementation of the Redesign

Although the redesign's implementation is planned to take multiple years, FAA's Handbook offers few actions and steps for the agency to use for a postimplementation evaluation of the redesign. Given that the redesign represents a complex and comprehensive change to the region's airspace, it is important for FAA to determine how it plans to conduct evaluations of the redesign. One potential strategy is adaptive management. As defined by the National Research Council, adaptive management is a process that promotes flexible decision making in the face of uncertainties, as outcomes from management actions and other events become understood. Adaptive management is recognized by CEQ and other federal agencies as a valuable strategy.¹⁰⁸ For example, in 2007, CEQ issued a guide¹⁰⁹ that recognizes the value of adaptive management when there are uncertainties in the prediction of the impacts or outcome of project implementation. GAO also has recommended adaptive management, and practices like it, as a strategy for other federal agencies. For example, we recommended that the U.S. Department of Agriculture adopt a systematic application of adaptive management principles and develop a monitoring program for Yellowstone's bison¹¹⁰ to improve its overall management of the program. Adaptive management elements that FAA could use include implementing a monitoring program to systematically obtain information about the management objectives identified in the selected project and communicating and engaging the results with key stakeholders. This

¹⁰⁸The strategy is already used by some federal, state, and local agencies, such as the South Florida Ecosystem Restoration Task Force.

¹⁰⁹The guide does not establish new requirements and does not constitute formal CEQ guidance.

¹¹⁰GAO, *Yellowstone Bison: Interagency Plan and Agencies' Management Need Improvement to Better Address Bison-Cattle Brucellosis Controversy*, [GAO-08-291](#) (Washington, D.C.: Mar. 7, 2008).

approach also would emphasize FAA's accountability and transparency to its stakeholders. In addition, a 2004 FAA paper describes elements for using adaptive management.¹¹¹ One expert interviewed by GAO stated that a benefit of using an adaptive management strategy as a review tool, both to assess operational and environmental impacts, is the effect it could have on the design and development of future airspace redesigns.

Conclusions

When conducting its airspace redesign, FAA complied with legal requirements under NEPA and environmental justice directives for the identified five key issues. In addition, FAA's methodology to assess operational and noise impacts was reasonable. Nonetheless, we found that FAA's methodology contained some limitations that if addressed in future efforts, could improve FAA's decision making and the public's understanding of FAA's decision and process. In particular, FAA could undertake two types of analyses—uncertainty analyses and benefit-cost analyses—in future airspace redesigns to help avoid limitations similar to those identified during our evaluation. An uncertainty analyses would provide decision makers and the public information on the extent to which estimated impacts may vary under alternative assumptions. As highlighted in our study, the realization of the redesign's operational benefits are dependent on the accuracy of key assumptions—particularly the aviation demand forecast. FAA has already established through a comparative analysis that the traffic counts for the 2006 forecast are higher than the 2005 observed levels; thus, while an uncertainty analysis might not have resulted in a change in the relative ranking of the alternatives, our confidence that the level of estimated benefits will be realized is reduced. A benefit-cost analysis, although not required, could provide more comprehensive information for FAA to assess whether the estimated benefits associated with redesigning airspace justify the costs. More information on the trade-offs would also increase transparency in FAA's decision for the public, thus, in turn, likely making the decision more understandable. Although a benefit-cost analysis would require an investment in time and resources, FAA conducts these types of analyses for other investment decisions, such as ATC procurements and new regulations, and has specific guidance for them. In addition, economists have used methods to estimate the economic impact of changes in noise,

¹¹¹See "Environmental Management Systems and NEPA Adaptive Management" available at http://www.faa.gov/regulations_policies/policy_guidance/envir_policy (accessed on May 29, 2008).

and supplemental noise metrics, which provide different information about noise impacts not captured by DNL, are recognized as appropriate methods for analyzing physical impacts.

Our study also raises concerns about FAA's future actions for this airspace redesign. Despite implementing the initial steps of the redesigned airspace last December, FAA has not published a detailed implementation plan. The lack of such a plan raises concerns that FAA may not meet its estimated implementation time frame, be able to deal with potential obstacles, or be able to transition from the current airspace structure to the redesigned structure. Furthermore, it is important for FAA to determine how it plans to evaluate the implementation, which would help FAA ensure that the operational and environmental objectives are met and increase the project's transparency and accountability. One strategy used by other federal agencies for evaluating a project's implementation is the adaptive management strategy. Adaptive management is a strategy that recognizes the need for flexibility and would allow for modification of the redesigned airspace if the results of future research indicate a need for change, as long as these changes do not significantly affect the quality of the human environment. This strategy would include implementing a monitoring program to collect information and communicating and engaging with key stakeholders.

Recommendations for Executive Action

To improve FAA's effectiveness and accountability in implementing the New York/New Jersey/Philadelphia Airspace Redesign, we recommend that the Secretary of the Department of Transportation direct the Acting Administrator of the Federal Aviation Administration to take the following two actions for the New York/New Jersey/Philadelphia Airspace Redesign:

- Develop and follow a detailed implementation plan that includes a time and cost schedule, risk mitigation plan, transition planning, and monitoring and evaluation plan.
- Follow a postimplementation evaluation plan that includes an adaptive management strategy for monitoring implementation of the redesign and communicating the results to key stakeholders.

To improve FAA's effectiveness in conducting future airspace redesigns, we recommend that the Secretary of the Department of Transportation direct the Acting Administrator of the Federal Aviation Administration to take the following actions in developing and implementing future airspace redesigns:

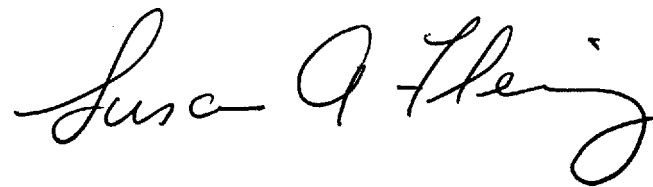
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- Conduct an uncertainty analysis of key assumptions and inputs—particularly on elements within aviation demand forecasts. The analysis should be used to assess the extent to which the estimated impacts for the airspace redesign alternatives would change using different values for key assumptions and inputs and to provide information on the level of confidence in the project’s estimated impacts and the relative ranking of the alternatives.
 - Conduct a benefit-cost analysis for the purpose of assessing the economic effect of alternatives for airspace redesigns (including the status quo). Such an analysis should include an assessment of the key impacts associated with redesigning the airspace, including implementation costs and, as appropriate, the economic effect associated with noise.

Agency Comments

We provided a draft of this report to the Department of Transportation for its review and comment. In commenting on a draft of this report, DOT stated that it was pleased to see that the GAO review concluded the actions taken by FAA with regard to NEPA were reasonable. DOT also noted that while it did not necessarily agree with everything in the draft report, it is constrained from offering a detailed analysis of the draft report at this time, as the matters the report covers are the subject of pending litigation. DOT also provided technical comments that we incorporated as appropriate.

As agreed with your office, unless you publicly announce the contents of this report earlier, we plan no distribution until 30 days from the report date. At that time, we will send copies of this report to interested congressional committees, the Secretary of Transportation, and other interested parties. We also will make copies available to others upon request. In addition, the report will be available at no charge on the GAO Web site at <http://www.gao.gov>.

If you or your staffs have any questions about this report, please contact Susan Fleming at (202) 512-2834 or flemings@gao.gov or Susan Sawtelle at (202) 512-6417 or sawtelles@gao.gov. Contact points for our Offices of Congressional Relations and Public Affairs may be found on the last page of this report. Individuals making key contributions to this report are listed in appendix VI.



Susan A. Fleming
Director, Physical Infrastructure Issues



Susan D. Sawtelle
Managing Associate General Counsel

Appendix I: Objectives, Scope, and Methodology

In assessing the Federal Aviation Administration's (FAA) airspace redesign of the New York/New Jersey/Philadelphia region, the report addresses the following questions: (1) To what extent did FAA follow applicable key legal procedures and requirements in conducting its environmental review? (2) To what extent was the methodology used by FAA to assess the operational and noise impacts reasonable? (3) What is the likelihood that FAA will meet its project time frames and costs of implementing its airspace redesign project?

To address our three research questions, we reviewed documents associated with the New York/New Jersey/Philadelphia Airspace Redesign, including the draft and final environmental impact statements (EIS) and selected appendices, underlying technical reports and analyses, and the Administrative Record filed by FAA with the court in the pending litigation. We also obtained and analyzed information from a variety of other sources, including federal laws, regulations, executive directives, and court decisions; FAA and the Department of Transportation (DOT) Orders and FAA and Council on Environmental Quality (CEQ) guidance; the final EISs for three previous FAA-sponsored airspace redesigns determined to be similar to this project;¹ prior GAO work; and other aviation evaluations and studies. We interviewed officials from DOT, the Environmental Protection Agency, the Port Authority of New York and New Jersey, City of Philadelphia Department of Aviation, and FAA's headquarters and eastern regional offices, including representatives of FAA's airspace redesign team and its principal contractors for the operational and environmental analyses. We also contacted other stakeholders, including a trade organization for the aviation industry, the national air traffic controller's union, and local governments and community groups in the region.

To assess the extent to which FAA followed key legal procedures and requirements, we reviewed applicable federal laws, regulations, executive directives, and court decisions, as well as FAA and DOT Orders and FAA and CEQ guidance, to establish criteria by which to compare FAA's actions. We then conducted a legal analysis to determine whether FAA

¹The three similar FAA-sponsored redesigns included the Expanded East Coast Plan (1995), Chicago Terminal Airspace Project (2001), and Potomac Consolidated Terminal Radar Approach Control (TRACON) Facility Airspace Redesign (2002). These were determined to be most similar to the New York/New Jersey/Philadelphia Airspace Redesign project because they all included an EIS analysis, changes to air traffic routes involving multiple airports, and analysis of noise impacts.

complied with five key issues for the airspace redesign to include the statement of the project’s purpose and need, evaluation of alternatives, consideration of the project’s environmental effects, public involvement, and environmental justice matters. We selected these five issues based on public concerns raised during and after the EIS process, congressional interest, the views of experts we interviewed, and GAO’s evaluation of the range of concerns presented. To examine the extent to which the methodology used by FAA to assess the operational and noise impacts was reasonable, we reviewed FAA’s methodology for conducting the operational and noise analyses. We compared FAA’s methodology to criteria we established through our review of federal policy, FAA guidance, prior GAO reports, and standards from the aviation and analytical community, including generally accepted economic principles and practices, and statistical principles.

In addition, with the assistance of the National Academy of Sciences, we identified 11 experts in the fields of EIS policies and procedures, airspace operations and system modeling, and aircraft noise measurement and mitigation. These experts reviewed selected portions of the EIS related to FAA’s operational and noise analysis. We interviewed these experts within their area of expertise to obtain their views on the extent to which the FAA followed applicable procedures and requirements, and on the methodology used by FAA to assess the operational and noise impacts. (Table 2 identifies the list of participating experts.)

Table 2: List Of Experts Providing Input During Our Review

Expert	Area(s) of expertise
Hamsa Balakrishnan, Assistant Professor of Aeronautics and Astronautics, Massachusetts Institute of Technology	Airspace operations and system modeling
Mike Ball, Orkand Corporation Professor of Management Science, Decision and Information Technologies Department, University of Maryland	Airspace operations and system modeling
William Dunlay, Director, Jacobs Consultancy	EIS policies and procedures
Charles Etter, Staff Scientist, Gulfstream Aerospace Company	Aircraft noise measurement and mitigation
Bill Jeffers, Senior Director, ARINC, Inc. (retired)	Airspace operations and system modeling
Margaret Jenny, Chief Executive Officer, MJF Strategies, LLC	Airspace operations and system modeling
Vincent Mestre, Principal, Mestre Greve Associates, Inc.	Aircraft noise measurement and mitigation
Clint Oster, Professor, School of Public and Environmental Affairs, Indiana University	Airspace operations and system modeling
Neil Planzer, Vice President of Air Traffic Management Strategy, The Boeing Company	Airspace operations and system modeling
John Putnam, Partner, Kaplan Kirsch & Rockwell	EIS policies and procedures
Ian Waitz, Jerome C. Hunsaker Professor of Aeronautics and Astronautics, Massachusetts Institute of Technology	Aircraft noise measurement and mitigation

Source: GAO.

To determine the likelihood that FAA will meet its project time frames and costs of FAA's airspace redesign, we reviewed documents associated with the redesign's impacts, time frames, and direct costs, and met with FAA to discuss plans for project implementation. We also reviewed prior GAO work related to environmental reviews and project implementation.

As agreed with you, we did not conduct a new EIS, or develop and analyze new alternatives to the airspace redesign. We conducted this performance audit from July 2007 to July 2008 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.

Appendix II: FAA's Legal Compliance with Key NEPA Requirements and Environmental Justice Directives

Introduction and Summary of Conclusions

As part of GAO's review of the FAA's airspace redesign for the New York/New Jersey/Philadelphia region, we examined FAA's legal compliance with certain requirements of the National Environmental Policy Act (NEPA), 42 U.S.C. §§ 4321 *et seq.*, and with the environmental justice directives of Executive Order 12898, "Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations," 59 Fed. Reg. 7629 (Feb. 16, 1994). Specifically, based on public concerns raised during and after the EIS process,¹ congressional interest, the views of experts we interviewed, and GAO's evaluation of the range of concerns presented, we reviewed FAA's compliance with respect to five issues:

- whether FAA's purpose and need statement in its EIS for the airspace redesign was reasonable;
- whether FAA developed a reasonable range of alternatives to the redesign and rigorously explored those alternatives in the EIS;
- whether FAA reasonably decided not to analyze environmental effects of a potential increase in growth resulting from the redesign;
- whether FAA reasonably involved the public in its environmental review process; and
- whether FAA appropriately considered environmental justice issues in its environmental review process.

Based on the information available to us and for the reasons discussed below, we conclude that FAA met NEPA and Executive Order 12898 requirements in conducting the airspace redesign with respect to these issues.²

¹Although we took stakeholder concerns expressed after the NEPA process into account when developing our five key issues, a court may consider a petitioner to have waived their right to challenge issues that were not raised during the process.

²In conducting our analysis, we relied on FAA's draft and final Environmental Impact Statements and its Record of Decision, and the Administrative Record filed by FAA with the D.C. Circuit in December 2007 in the *County of Rockland* litigation (hereafter, Administrative Record).

Background

As discussed in greater detail in this report, in 1998, FAA launched a comprehensive national airspace redesign effort to more efficiently and safely move aircraft through the nation's airspace system. As a part of this program, FAA initiated the New York/New Jersey/Philadelphia airspace redesign in 1999. For a federal project of this magnitude, FAA must comply with NEPA and implementing regulations issued by CEQ, as well as FAA's own NEPA Orders and guidance.³ FAA also must follow environmental justice directives set forth in Executive Order 12898. After determining that NEPA required an EIS for the project, FAA issued a draft EIS in December 2005. Following public hearings and a public comment period, FAA issued a final EIS in July 2007 and, based on the final EIS, issued a Record of Decision in September 2007, designating one of its redesign alternatives as the selected project. FAA has begun implementing this project and anticipates that it will take 5 years to complete implementation.

Among other things, an EIS must: (1) address the purpose of and need for the proposed action;⁴ (2) identify alternatives to the proposed action;⁵ and (3) present the reasonably foreseeable environmental impacts of the proposed action, including the direct and indirect effects and cumulative impacts.⁶ Furthermore, throughout the environmental review process, an agency must make diligent efforts to involve the public⁷ and, to the greatest extent practicable and as appropriate, must identify and address any disproportionately high and adverse human health or environmental effects of its activities on minority and low-income populations.⁸ We address FAA's compliance with each of these requirements in turn.

³Section 102(2)(C) of NEPA requires all federal agencies to prepare an EIS for "major Federal actions significantly affecting the quality of the human environment . . ." 42 U.S.C. §§ 4332(2)(C). CEQ's NEPA regulations are set forth at 40 C.F.R. Part 1500 *et seq.*; FAA's NEPA requirements and guidance are set forth in FAA Order 1050.1E and in the *FAA Airspace Redesign Handbook*.

⁴40 C.F.R. § 1502.13.

⁵42 U.S.C. § 4332(2)(C)(iii); 40 C.F.R. § 1502.14.

⁶42 U.S.C. § 4332(2)(C)(ii); 40 C.F.R. §§ 1502.16, 1508.7, 1508.8.

⁷40 C.F.R. § 1506.6.

⁸Executive Order 12898, Sec. 1-101.

Issues and Analysis

1. Was FAA's purpose and need statement reasonable?

As discussed below, FAA's statement of the purpose and need for the airspace redesign was reasonable and therefore complied with NEPA requirements. It satisfied the statutory and regulatory requirements as they have been applied by the courts—the statement was not too narrowly or broadly defined—and it reasonably excluded noise reduction as a purpose.

NEPA Requirements

CEQ regulations implementing NEPA require an agency to include in the EIS a statement specifying the purpose of and need for the project—commonly referred to as a “purpose and need statement.” In particular, 40 C.F.R. § 1502.13 requires that the agency include a statement to “briefly specify the underlying purpose and need to which the agency is responding in proposing the alternatives including the proposed action.” Further, FAA Order 1050.1E, section 506(d) requires the purpose and need statement to “present[] the problem being addressed . . . and essentially provide[] the parameters for defining a reasonable range of alternatives to be considered.” As the courts have explained, an agency “bears the responsibility for defining at the outset the objectives of an action.” *Citizens Against Burlington, Inc. v. Busey*, 938 F.2d 190, 195-96 (D.C. Cir. 1991), *cert. denied*, 502 U.S. 994 (1991). The scope of the project, as articulated by the agency, informs the alternatives it considers and guides its decision-making process.

In determining whether an agency has complied with NEPA, courts grant substantial deference to an agency's actions as required by the

Administrative Procedure Act.⁹ With respect to the purpose and need statement in particular, courts generally apply a “rule of reason” and uphold the statement as long as it is reasonable. *City of Alexandria v. Slater*, 198 F.3d 862, 867 (D.C. Cir. 1999), *cert. denied*, 531 U.S. 820 (2000). The agency can neither define a project’s purpose and need so narrowly that there is only one logical alternative to accomplish it, nor so broadly that an infinite number of alternatives would accomplish its goals. *Citizens Against Burlington*, 938 F.2d at 196 (upholding FAA approval of airport expansion). An agency complies with NEPA if it meets these procedural requirements.

⁹Agency compliance with NEPA is evaluated according to § 10 of the Administrative Procedure Act (APA), 5 U.S.C. § 706, which provides that a court may “hold unlawful and set aside agency action, findings, and conclusions found to be arbitrary, capricious, an abuse of discretion or otherwise not in accordance with the law.” This standard grants deference to agency decisions, with courts presuming that an agency’s action is valid. *See Vermont Yankee Nuclear Power Corp. v. NRDC*, 435 U.S. 519 (1978); *Citizens to Preserve Overton Park v. Volpe*, 401 U.S. 402 (1971); *City of Olmsted Falls v. FAA*, 292 F.3d 261 (D.C. Cir. 2002); *North Slope Borough v. Andrus*, 642 F.2d 589 (D.C. Cir. 1980). To determine whether an agency’s action was “arbitrary or capricious,” courts assess whether the agency came to grips with the obvious ramifications of its approach and addressed them in a reasoned fashion. *See NRDC v. EPA*, 859 F.2d 156 (D.C. Cir. 1988). This requires an examination of the relevant data and an articulation of a satisfactory explanation for its action—including “a rational connection between the facts found and the decision made.” *Id.* at 209 (citations omitted).

In the NEPA context, this “arbitrary and capricious” standard has been interpreted as requiring an agency act reasonably in carrying out NEPA’s requirements (applying a “rule of reason”) or that an agency take a “hard look” at the environmental consequences of its proposed actions. *See, e.g., Citizens Against Burlington*, 938 F.2d at 196 (upholding FAA approval of airport expansion); *City of Grapevine v. DOT*, 17 F.3d 1502, 1504 (D.C. Cir. 1994), *cert. denied*, 513 U.S. 1043 (1994) (same). As long as an agency meets this standard, a court should not substitute its own judgment, and the agency’s action should be affirmed. *Kleppe v. Sierra Club*, 427 U.S. 390, 410 n.21 (1976) (upholding the Department of the Interior’s decision not to conduct comprehensive EIS on speculative proposals). In addition to its basis in the APA, this deference stems from NEPA’s imposition of procedural rather than substantive requirements—NEPA’s purpose is to ensure that government agencies consider environmental consequences and act on full information, and that interested groups have access to such information, but NEPA does not mandate a particular environmental result. *Sierra Club v. United States Forest Service*, 46 F.3d 835, 837 n.2 (8th Cir. 1995). “[O]nce an agency has made a decision subject to NEPA’s procedural requirements, the only role for a court is to insure that the agency has considered the environmental consequences . . .” *Strycker’s Bay Neighborhood Council, Inc. v. Karlen*, 444 U.S. 223, 227-28 (1980).

FAA Actions

FAA initiated a redesign of the New York/New Jersey/Philadelphia region's airspace as a first step in its national airspace redesign effort to accommodate air traffic growth while maintaining safety and mitigating delays, and to accommodate changes in the types of aircraft using the airspace system. FAA's basic objective was to create a system to better manage traffic and capacity in the region, and to replace the air traffic system designed in the 1960s. FAA noted that while the volume of traffic and the type of aircraft used have changed considerably since that time, the basic structure of the airspace has stayed the same, and emerging technologies have not been taken into account.

To increase the efficiency and reliability of the airspace structure and air traffic control (ATC) system in the New York/New Jersey/Philadelphia region, FAA began by identifying a formal purpose and need for the airspace redesign. To do this, MITRE's Center for Advanced Aviation System Development (CAASD)—a Federally Funded Research and Development Center sponsored by FAA—identified problems and performance shortfalls. In a parallel effort, FAA developed focused leadership teams, composed of experts from throughout the United States, who began a systematic effort to identify airspace inefficiencies and solutions to ensure national integration of local efforts.¹⁰ Based on these efforts, FAA developed the following purpose and need statement:

"The purpose of the airspace redesign is to increase the efficiency and reliability of the airspace structure and ATC system. The need is to accommodate growth in aircraft operations while maintaining safety, mitigating delays, and accommodating changes in the types of aircraft using the System."¹¹

FAA has identified these same objectives—increased efficiency and safety—for several of its previous airspace redesign projects, such as the Potomac Consolidated Terminal Radar Approach Control (TRACON)¹² in

¹⁰See Administrative Record, Document No. 9358, MITRE Report, "Eastern U.S. Problem Assessment and Multi-Cen." Among other things, MITRE modeled and simulated all alternatives for the airspace redesign project.

¹¹Draft EIS, p. 2-2; final EIS, p. 2-2.

¹²A TRACON is an air traffic control facility that uses radar and two-way radio communication to separate air traffic within a specific geographic area in the vicinity of one or more large airports.

the Washington/Baltimore area and the Chicago Terminal Airspace Project.

FAA's purpose and need statement for the New York/New Jersey/Philadelphia airspace redesign established the overall criteria against which different alternatives were examined (see section 2 below). Notably, FAA did not include noise reduction as part of the project's formal purpose and need. As FAA explained in the final EIS: "Noise reduction is not a component of the purpose and need for the proposed action. Reduction of noise is not appropriately identified as a purpose because it is not FAA policy to reroute aircraft to reduce noise levels in one community at the expense of another."¹³ Rather, according to FAA, the "first consideration and highest priority in defining the Purpose and Need for any proposed action is to serve the public interest by exercising its authority to assign, maintain, and enhance safety and security of the national airspace (per 49 U.S.C. § 40101(d))."¹⁴ This is consistent with FAA's statement of its mission: to provide the safest, most efficient aerospace system in the world.¹⁵

Nonetheless, there was considerable public controversy regarding the potential noise effects of FAA's redesign and, as the project progressed, congressional committees urged FAA to consider noise impacts and

¹³Final EIS pp. 1-25.

¹⁴Final EIS pp. 1-21. In 49 U.S.C. § 40101(d), Congress declared national policy to be that FAA shall: "(1) assign[], maintain[], and enhanc[e] safety and security [as] the *highest* priorities in air commerce; . . . [and] (4) control[] the use of the navigable airspace and regulat[e] civil and military operations in that airspace in the interest of the safety and efficiency of both of those operations . . ." (Emphasis added.)

¹⁵See <http://www.faa.gov/about/mission/> (accessed on May 5, 2008). FAA has certain general noise reduction authority, see 14 C.F.R. Part 150, but noise reduction is not part of FAA's statutory mission.

mitigation where appropriate.¹⁶ FAA took several such actions, beginning with a commitment in its early scoping meetings to reduce noise where possible—for instance, by increasing altitudes, dispersing or concentrating routes where appropriate, reducing fly time, and routing aircraft over less noise-sensitive areas.¹⁷ Additionally, FAA included a detailed analysis of noise impacts for each alternative considered in detail¹⁸ and included one alternative—the Ocean Routing Alternative—that would have reduced noise overall. Finally, FAA included proposed mitigation measures along with its preferred alternative, and issued a separate 62-page noise mitigation report.¹⁹ As FAA noted in the final EIS, however, the airspace redesign was not a cure-all for aircraft-related noise problems in the region.²⁰

Analysis

FAA's purpose and need statement for the airspace redesign complied with NEPA requirements. FAA's statement defined the parameters of the project, as required by 40 C.F.R. §1502.13. It also satisfied the requirements courts have developed in evaluating agency statements of purpose and need. FAA did not define the project's purpose so broadly that it generated an infinite number of alternatives, as demonstrated by its exclusion of such options as airport infrastructure modification, congestion management measures, and alternate modes of transportation²¹

¹⁶See S. Rep. No. 108-146, at 22 (2003), accompanying S. 1589 (“As FAA moves forward with its redesign program in the New York/New Jersey and Philadelphia area, the Committee encourages FAA, where appropriate, to consider air noise impacts as part of the redesign effort.”). See also S. Rep. No. 107-224, at 43 (2002), accompanying S. 2808. Additionally, certain appropriations committee reports stated that FAA may not use funds for its New York/New Jersey/Philadelphia redesign NEPA review “as long as the FAA fails to consider noise mitigation,” see H.R. Rep. No. 108-792, at 1366 (2004), accompanying H.R. 4818. See also H.R. Rep. No. 109-307, at 136 (2005), accompanying H.R. 3058; H.R. Rep. No. 109-307, at 136 (2005), accompanying H.R. 3058. Cf. H.R. Rep. No. 108-671, at 16 (2004), accompanying H.R. 5025 (stating FAA may not use funds for NEPA review of New York/New Jersey/Philadelphia redesign “unless the FAA formally declares noise mitigation to be a primary objective of the redesign project.”) (statement not included in conference report).

¹⁷Final EIS, pp. 1-25, 1-26.

¹⁸Final EIS, p. ES-2.

¹⁹Noise Mitigation Report, FAA, Apr. 6, 2007.

²⁰Final EIS, pp. 1-26.

²¹Final EIS, pp. 2-8.

(see section 2 below). Nor did FAA define the purpose so narrowly that only one alternative would be satisfactory, as evidenced by the fact that it could be met by multiple alternatives (see section 2). While FAA ultimately selected a single alternative that best met the project's purpose and need, more than one alternative would have done so.

FAA also acted reasonably in excluding noise reduction as part of the project's formal purpose and need statement. As noted, in analyzing the environmental impacts of the proposed redesign, FAA gave substantial consideration to possible noise effects. It was nevertheless reasonable to exclude noise reduction as a formal objective of the redesign, because NEPA "[does] not require agencies to elevate environmental concerns over other appropriate considerations." *Baltimore Gas & Electric Co. v. NRDC*, 462 U.S. 87, 97 (1983); see also *Strycker's Bay*, above, 444 U.S. at 227. Rather, through NEPA's requirement that agencies prepare an EIS for all major federal actions significantly affecting the environment, the statute requires only that agencies consider the environmental impacts of their actions as part of their decision making, not that they use environmental impacts as the deciding factor. *Kleppe v. Sierra Club*, above, 427 U.S. at 409.

Courts have approved other purpose and need statements that excluded environmental concerns. In *City of Alexandria v. Slater*, above, for example, the D.C. Circuit evaluated the purpose and need statement prepared by the Federal Highway Administration (FHWA) for the planned replacement of the Woodrow Wilson Bridge in the Washington, D.C., area. The agency's statement focused primarily on traffic and safety concerns, rather than on environmental concerns such as noise. In finding the agency's purpose and need statement to be reasonable, the court stated that "[t]he proper question to ask at the outset of a NEPA inquiry is not whether the [FHWA] focused on environmental goals but rather . . . whether its stated objectives were reasonable. It seems rather obvious to us that it is not unreasonable in articulating its objectives for an agency to 'focus primarily on transportation and safety issues' when replacing a massively congested and structurally unsound bridge." 198 F.3d at 867-68. Similarly, in *Citizens Against Burlington*, above, the D.C. Circuit approved FAA's EIS for a major airport expansion that would cause significant noise impacts, even though FAA's stated purpose and need focused only on creating a new cargo hub, and did not mention noise mitigation.

By contrast, in *California v. DOT*, 260 F. Supp. 2d 969 (N.D. Cal. 2003), the court rejected FAA's purpose and need statement in its environmental

assessment of a major airport expansion, because it was so narrow that it effectively eliminated consideration of any significant environmental effects. While FAA stated that the purpose of the expansion was simply to “provide the necessary runway length to safely allow [larger aircraft] . . . to operate at the Airport,” and the court agreed that such a narrow purpose might result in no significant environmental impacts, in fact, the record showed the project’s very purpose was to induce growth by attracting thousands of additional tourists to a local ski resort. The court therefore rejected FAA’s “myopic view of the airport project” and, based on this and other reasons, required a full EIS to be prepared. *Id.* at 974.

As in *City of Alexandria* and *Citizens Against Burlington*, the issue with respect to the New York/New Jersey/Philadelphia Airspace Redesign is not whether FAA included environmental concerns in its purpose and need statement, but whether the agency’s purpose and need statement was reasonable. As discussed above, we conclude it was, because it identified the problem being addressed and thus essentially provided the parameters for defining a reasonable range of alternatives to be considered, as the regulations and FAA’s Orders require.²² This is not a case like *California v. DOT*, where the facts belie the agency’s stated purpose.

Finally, the congressional committee reports directing FAA to consider or mitigate the project’s noise impacts²³ did not create a legal requirement to include noise reduction or mitigation as part of the project’s formal purpose and need. The D.C. Circuit noted in *Citizens Against Burlington*, above, that in formulating a statement of purpose and need, agencies “should always consider the views of Congress, expressed, to the extent that the agency can determine them, in the agency’s statutory authorization to act, as well as in other congressional directives.” 938 F.2d at 196. FAA did consider the “views of Congress” in developing the project’s purpose and need—it complied with the mandate in 49 U.S.C. § 40101(d) to give the highest priority to enhancing the safety and efficiency of the national airspace. FAA also considered the congressional report statement directing FAA to address noise issues in its New York/New Jersey/Philadelphia Airspace Redesign, by conducting detailed technical noise analyses and including noise mitigation measures for the selected

²²The experts we interviewed also found that FAA’s purpose and need statement was reasonable and that the agency did not need to include noise or environmental concerns in its objectives.

²³See footnote 16 above.

project. These report directives did not, however, legally bind FAA to include noise mitigation as a purpose of the redesign because they were not contained, or incorporated by reference, in enacted legislation. *See generally Cherokee Nation of Oklahoma v. Leavitt*, 543 U.S. 631, 646 (2005); *Lincoln v. Vigil*, 508 U.S. 182, 192 (1993); GAO, *Consolidated Appropriations Act, 2008—Incorporation by Reference*, B-316010 (Feb. 25, 2008).

4. Did FAA develop a reasonable range of alternatives to the proposed redesign and rigorously explore those alternatives in the EIS?

As discussed below, FAA developed a reasonable range of alternatives and rigorously explored those alternatives, as required by NEPA. The agency included a no action alternative and reasonable alternatives outside the agency’s current legal jurisdiction, and discussed categories of alternatives it ultimately eliminated from more detailed analysis. In addition, the alternatives were responsive to the agency’s purpose and need and were reasonably developed, rigorously explored, and objectively evaluated, supporting a fully informed and well-considered decision.

NEPA Requirements

NEPA section 102(2)(C)(iii) requires an EIS to include alternatives to the proposed action. 42 U.S.C. § 4332(2)(C)(iii). In implementing this requirement, CEQ regulations mandate, among other things, that agencies shall: “(a) Rigorously explore and objectively evaluate all reasonable alternatives . . . ; (b) Devote substantial treatment to each alternative considered in detail including the proposed action . . . ; (c) Include reasonable alternatives not within the jurisdiction of the lead agency; and (d) Include the no action alternative.” 40 C.F.R. § 1502.14. In addition, FAA’s NEPA Orders recognize that analysis of alternatives:

“...is the heart of the EIS. It presents a comparative analysis of the no action alternative, the proposed action, and other reasonable alternatives to fulfill the purpose and need of the action . . . Reasonable alternatives not within the jurisdiction of the lead agency should be considered. The FAA may include alternatives proposed by the public or other agenc[ies]. However, they must meet the basic criteria for any alternative: it must be reasonable, feasible, and achieve the project’s purpose . . .”

FAA Order 1050.1E, Section 506e. Again, courts grant substantial deference to agency actions and apply a “rule of reason” when evaluating an agency’s range of alternatives. *Vermont Yankee Nuclear Power Corp. v. NRDC*, 435 U.S. 519 (1978); *NRDC v. Morton*, 458 F.2d 827 (D.C. Cir. 1972).

NEPA requires only that the agency weigh all reasonable alternatives and come to a “fully informed” and “well-considered” decision. *North Slope Borough v. Andrus*, 642 F.2d 589, 599 (D.C. Cir. 1980). *See also Vermont Yankee*, 435 U.S. at 558; *NRDC v. Hodel*, 865 F.2d 288, 294 (D.C. Cir. 1988). “This ‘rule of reason governs both “*which* alternatives the agency must discuss, and the *extent to which* it must discuss them.” ‘ “ *City of Grapevine*, 17 F.3d at 1506 (citation omitted) (emphasis in original).

A project’s purpose and need statement guides the appropriate range of alternatives to be considered by an agency. In turn, the chosen range of alternatives must achieve the proposed action’s purpose and need, and the preferred alternative must be the one that best satisfies those parameters. *See Citizens Against Burlington*, above. It is the agency itself that must determine the alternatives to be considered and how extensive the treatment of those alternatives should be. *Vermont Yankee*, 435 U.S. at 558. Although the choice of alternatives is a matter of agency discretion, the alternatives must be “bounded by some notion of feasibility.” *Id.* at 551. A court must uphold an agency’s decision so long as “the alternatives are reasonable and the agency discusses them in reasonable detail.” *Citizens Against Burlington*, 938 F.2d at 196.

FAA Actions

FAA began its identification of alternatives by considering five categories of potential alternatives: (1) alternate modes of transportation and communication; (2) changes in airport use, including additional infrastructure; (3) congestion management measures; (4) improved air traffic control technology; and (5) airspace redesign.²⁴ Of these five categories, only the airspace redesign category met FAA’s purpose and need, and the agency therefore eliminated the other categories from further consideration.²⁵

FAA then formed the Airspace Redesign Team working group, charged with designing and evaluating conceptual airspace redesign alternatives. The Airspace Redesign Team was composed of representatives from each of the affected FAA ATC facilities (New York TRACON, Philadelphia TRACON, New York Center, Washington Center and Boston Center), as well as representatives from ATC facilities outside the study area. In

²⁴Final EIS, p. ES-2.

²⁵Final EIS, p. 2-8.

addition to internal coordination among working group representatives, FAA solicited and considered input from airlines, airport operators, and other air transportation stakeholders.²⁶ Recommendations also were received from RTCA, Inc., a nonprofit corporation that functions as a Federal Advisory Committee and develops industry consensus regarding air traffic management issues.²⁷ The Airspace Redesign Team explored four broad airspace redesign concepts—Four Corner-Post, Modifications to Existing Routing, Ocean Routing, and Clean Sheet—that met a series of nine objectives.²⁸

Four basic airspace redesign alternatives were then developed for detailed consideration, ranging from the Future No Action Airspace Alternative (maintaining the status quo) to the Integrated Airspace Alternative Variation with Integrated Control Complex (creating a more fully integrated airspace). These alternatives met the purpose and need, reflected public concern about the airspace redesign, or were required by NEPA.²⁹ In the final EIS, FAA recommended the Integrated Airspace Alternative Variation with Integrated Control Complex (ICC) as the preferred alternative, and in its September 2007 Record of Decision, named this alternative, together with noise mitigation measures, as the selected project.³⁰

FAA conducted detailed analyses of each of the four basic alternatives. The primary evaluative tool used was the Total Airspace and Airport Modeler (TAAM), a fast-time simulation tool that can model ground, terminal, and en-route airspace environments. Under FAA's instruction, MITRE's CAASD used TAAM to simulate all of the alternatives and

²⁶Final EIS, p. 2-9.

²⁷Final EIS, p. 2-9.

²⁸These objectives included reducing airspace congestion, reducing environmental impacts, where possible, and accommodating projected growth. Final EIS, pp. 2-9 – 2-11.

²⁹The alternatives considered in detail were the Future No Action Airspace Alternative (required by NEPA), the Modifications to Existing Airspace Alternative, the Ocean Routing Airspace Alternative, and the Integrated Airspace Alternative Variation with, and without, Integrated Control Complex (ICC) (ICC refers to a common automation platform). Final EIS, p. ES-4. FAA considered the Ocean Routing Alternative, even though it did not meet the purpose of increasing the efficiency and reliability of the New York/New Jersey/Philadelphia airspace, because of long-standing concerns of New Jersey Citizens Against Aircraft Noise, a citizens group. Final EIS, pp. 2-10, 2-11.

³⁰App. IV to this report describes the selected project in more detail.

measure their operational impacts. The area’s eight airports likely to be most affected by the airspace redesign were included in the model in detail. In addition, for each alternative, FAA conducted an analysis of the noise impacts resulting from redesign-related changes in air operations.

FAA used a specific set of criteria to evaluate and compare each alternative, both quantitatively and qualitatively. Alternatives were evaluated based on two types of criteria—operational viability and operational efficiency—to determine how well each alternative met the purpose and need.³¹ In its evaluation of each alternative, FAA summarized the changes that would occur at specific airports under each alternative, and then evaluated and compared each alternative using the criteria. An analysis of the noise impacts also was conducted for each alternative.³²

Analysis

FAA’s range of alternatives complied with NEPA because: (a) FAA included a no action alternative and reasonable alternatives outside the agency’s jurisdiction and discussed the categories of potential alternatives eliminated from detailed analysis; (b) the alternatives were responsive to the agency’s purpose and need; and (c) the alternatives were reasonably developed, rigorously explored, and objectively evaluated, which supported a fully informed and well-considered decision.

As noted, FAA considered four basic alternatives in detail, including a “no action” alternative as required by CEQ regulations.³³ Additionally, FAA considered, although eventually eliminated from detailed analysis, categories of alternatives outside the agency’s jurisdiction, for instance, use of satellite airports and improvements to airport infrastructure, also as required by CEQ regulations.³⁴

³¹Operational viability refers to whether a particular airspace redesign is workable and thus safe; criteria include reduced airspace complexity and reduced voice communications. Operational efficiency refers to how well a particular design works; criteria include reducing delay, balancing controller workload, meeting system demand, improving user access to the system, expediting arrivals and departures, increasing flexibility in routing, and maintaining airport throughput (throughput is explained in note 36 below).

³²Final EIS, Chapter 4.

³³40 C.F.R. § 1502.14(d).

³⁴40 C.F.R. § 1502.14(c).

Further, these alternatives were responsive to the purpose and need statement, and FAA engaged in a detailed and collaborative process to ensure this result. This process included development of the Airspace Redesign Team, solicitation of input from facilities outside the study area as well as various stakeholders, and exploration of broad concepts using specific objectives. In addition, FAA used the project's purpose and need to evaluate the four alternatives both quantitatively and qualitatively. Each evaluative criterion flowed from an aspect of the stated purpose and need.

Finally, the iterative process used by FAA and the detail and consideration given to the development and exploration of the alternatives suggest that FAA's range and scope of alternatives was "well-informed" and developed and that the agency came to a "well-considered" decision. FAA engaged in a detailed process to develop and explore a range of alternatives. In creating the Airspace Redesign Team, which then collaborated with outside and industry stakeholders and RTCA, the agency sought to gather all potential input and objectively develop feasible alternatives with both a regional and national focus. Additionally, once the alternatives were winnowed down, FAA engaged in another detailed process which modeled these alternatives. FAA's last step was to evaluate the alternatives based on criteria developed to meet the project's purpose and need. This process, which took several years to complete, contributed to an objective, well-developed, and well-considered range and scope of alternatives. The exploration of the alternatives based on the criteria also was rigorous. FAA conducted quantitative and qualitative evaluations, which are discussed at length in the EIS. FAA summarized the changes that would occur at specific airports under each alternative and then evaluated the alternative using the criteria. FAA also conducted an analysis of the noise impacts for each alternative. Under the governing "rule of reason" standard, these actions produced a reasonable range of alternatives, which were rigorously explored.³⁵

3. Did FAA reasonably decide not to analyze environmental effects of the potential growth resulting from its airspace redesign?

As discussed below, FAA complied with NEPA in deciding not to analyze environmental effects of the potential growth resulting from its airspace redesign. In the aviation context, courts have uniformly upheld FAA's

³⁵Although we conclude FAA's selection and analysis of alternatives met the legal requirements of NEPA, we nevertheless have identified deficiencies in FAA's analysis. See pp. 36-45 of this report.

decision not to analyze the effects of induced growth or induced capacity where the project’s purpose was not to induce growth and the project did not entail construction of additional runway capacity.

NEPA Requirements

One of NEPA’s overarching requirements is that the agency consider and discuss the environmental effects of its proposed action. 40 C.F.R. §§ 1502.16, 1508.7. This includes considering all direct and indirect effects and cumulative impacts of an action. *Id.* CEQ regulations define “indirect effects” as reasonably foreseeable effects caused by the action which appear later in time or farther in distance. 40 C.F.R. § 1508.8(b). This includes growth-inducing effects and other effects related to induced changes in the pattern of land use, population density or growth rate, and related effects on air and water and other natural systems, including ecosystems. *Id.*

FAA Actions

A number of external stakeholders involved in the New York/New Jersey/Philadelphia Airspace Redesign argued that the greater efficiencies resulting from a redesign of the airspace would necessarily and foreseeably lead to an increase in air traffic volume, and that FAA therefore was required to analyze the environmental effects of this induced traffic. FAA disagreed, stating that the airspace redesign itself—which does not include infrastructure improvements such as additional runways—would not induce growth, and thus the agency was not required to (and did not) analyze the environmental impacts of such growth. As FAA explained in its response to comments, the airspace redesign “does not increase capacity. It increases the efficiency with which existing

capacity is used”³⁶ Similar statements were part of the Administrative Record.³⁷

Analysis

FAA complied with NEPA in deciding not to analyze the potential growth-inducing effects of the airspace redesign, because the purpose of the redesign is neither to induce growth, nor create additional runway capacity.³⁸ In cases where the project’s purpose did not include growth inducement and where the project did not create additional runway capacity, courts have routinely upheld FAA’s decision not to analyze the effects of induced growth.

In *Seattle Community Council Federation v. FAA*, 961 F.2d 829, 836 (9th Cir. 1992), for example, the U.S. Ninth Circuit Court of Appeals found that because planned rerouting procedures at Seattle-Tacoma International Airport were designed to enhance the safety and efficiency of existing traffic rather than to induce growth, and involved no physical infrastructure changes, NEPA did not require FAA to address the environmental effects of an increased number of flights that might indirectly result from such efficiency improvements. In upholding FAA, the court emphasized the project’s stated purpose of improving safety and efficiency, the same as FAA’s purpose and need here. Although the challenges in *Seattle Community Council* related to FAA’s failure to

³⁶Final EIS, Appendix N, p. 1164. FAA further explained: “Throughput is not the same as capacity. Throughput is the actually achieved number of aircraft using a resource in a given time. It is measured by counting aircraft, whether in a real system or a simulated one. Capacity is the theoretical maximum number of aircraft that could use a resource in a given time. It is measured by surveying, queuing simulations, or mathematical models. A decrease in throughput does not mean a reduction in the number of flights; it means that delays increase. Likewise, an increase in throughput does not mean an increase in flights, it means a decrease in delays. When throughput is below capacity, the system is inefficient. Reducing the difference between the throughput and the capacity is the purpose of this airspace redesign” *Id.*

³⁷See Administrative Record Document No. 8239, Meeting minutes with NY DOT, Dec. 17, 2003 (“airspace redesign is not related to increasing capacity because the capacity of the system is currently limited by the pavement (runways) at the airports. Airspace redesign produces a more efficient system and reduces delay.”).

³⁸While we believe FAA’s decision not to assess environmental impacts from possible growth from the redesign would likely survive challenge as a legal matter, particularly given the deferential standard of review, we nevertheless find FAA’s induced-growth analysis contained several limitations, as discussed at pp. 36-40 of this report.

prepare an EIS, rather than the adequacy of an EIS as in the airspace redesign situation, the underlying issue is the same.

Similarly, in *Morongo Band of Mission Indians v. FAA*, 161 F.3d 569 (9th Cir. 1998), FAA proposed to alter arrival procedures at Los Angeles International Airport without making changes to the airport's physical infrastructure. Relying in part on *Seattle Community Council*, the Ninth Circuit ruled that FAA complied with NEPA even though its pre-EIS environmental assessment did not consider possible growth-inducing effects of its action. The court explained that while “[g]rowth certainly may be a foreseeable indirect effect of the [project] . . . , the project was implemented in order to deal with *existing* problems; the fact that it might also facilitate further growth is insufficient to constitute a growth-inducing impact under 40 C.F.R. §1508.8(b).” *Id.* at 580 (emphasis added). And in *City of Los Angeles v. FAA*, 138 F.3d 806 (9th Cir. 1998), the court found that FAA had given the requisite “hard look” at the environmental effects of a terminal expansion project at Burbank-Glendale-Pasadena Airport that did not include additional runways, even though FAA did not consider expansion's growth-inducing effects. The court relied in part on the fact that FAA's technical forecasts of air transportation demand and airfield capacity should be accorded significant deference. *Id.* at 807, n.2.

Finally, in *City of Olmsted Falls v. FAA*, 292 F.3d 261 (D.C. Cir. 2002), the U.S. D.C. Circuit Court of Appeals rejected a challenge to FAA's plan to move an existing runway at Cleveland Hopkins International Airport as part of an airport redevelopment project. The city argued that FAA had improperly failed to consider increased air emissions that would result from increased airport capacity. The court found FAA's actions were reasonable, however, even though FAA did not consider increased capacity, because as FAA determined, air travel demand and increased capacity were independent of rerouting the runway. (As the court phrased FAA's argument, “In other words, ‘if you don't build it, they will come anyway.’” *Id.* at 272.) As in *City of Los Angeles*, the court relied in part on the fact that “FAA's expertise in forecasting air transportation demand and airfield capacity are areas where courts accord significant deference.” *Id.* at 272 (citations omitted).

These cases are unlike *California v. DOT*, 260 F. Supp. 2d 969 (N.D. Cal. 2003), discussed in section 1 above. There, the court found that FAA's decision not to analyze the environmental effects of a substantial growth-inducing expansion of a small town airport violated NEPA. In contrast to the present case, the expansion project in *California* would have extended and strengthened the airport's runway, created an air carrier

apron, added access roads and parking, and constructed a passenger terminal complex. As noted above, the *California* court found that the very purpose of the expansion was to induce growth, by attracting thousands of additional tourists to a local ski resort. Distinguishing the projects in *Seattle Community Council and City of Los Angeles* because they each occurred in “a large city with substantial established commercial air service,” the court in *California* emphasized that the project there involved “expansion of an airport to accommodate regular commercial air service, where none currently exists, in a scenic, mountain region with unique, largely undeveloped natural resources.” 260 F. Supp.2d at 977. As the court concluded, “[s]uffice it to say that [FAA’s] argument that the airport project is growth-accommodating rather than growth-inducing . . . is belied by the record.” *Id.* at 976-77. Because FAA had failed to take a hard look at the project’s environmental consequences, the court found that the agency’s decision not to conduct an EIS was unreasonable, and ordered a halt to the project until an EIS was completed.

We believe FAA’s decision not to analyze potential growth-inducing effects of the New York/New Jersey/Philadelphia Airspace Redesign is akin to *Seattle Community Council, City of Los Angeles, and City of Olmsted Falls* and distinguishable from *California v. DOT*. As discussed in section 1 above, the purpose of the airspace redesign is to increase the efficiency and reliability of the airspace system while maintaining safety. The purpose is not, as in *California v. DOT*, to induce growth or enhance runway capacity, and the redesign does not, as in *California*, involve any additional physical infrastructure. In addition, in the current case, FAA specifically found that growth would not result from the project itself, a technical judgment similar to those accorded deference by *City of Los Angeles* and *City of Olmsted Falls*. Further, the project will, as in *Seattle Community Council and City of Los Angeles*, affect a region already saturated with air traffic. Under existing law, therefore, FAA was not required to analyze the potential indirect effects of increased growth that may result from the redesign.

4. Did FAA reasonably involve the public in the environmental review process?

As discussed below, FAA complied with NEPA in reasonably involving the public in its environmental review process. FAA conducted an early and open process and made substantial efforts to involve the public throughout the environmental review process. It also sponsored a reasonable number of public meetings and provided the public with

adequate advance notice. Finally, FAA considered and responded to comments in an adequate manner.

NEPA Requirements

CEQ regulations and FAA Order 1050.1E implement NEPA requirements for public participation. The regulations require that agencies involve the public in a number of different ways. An agency should begin by conducting an “...early and open process for determining the scope of issues related to a proposed action”³⁹ and [m]ake “diligent efforts to involve the public...”⁴⁰ throughout the environmental review process. To this end, the regulations require that an agency “provide public notice of NEPA-related . . . public meetings . . . and the availability of environmental documents...”⁴¹ and hold or sponsor public meetings whenever appropriate or in accordance with statutory requirements...⁴² so as to solicit appropriate information from the public.⁴³ Finally, in receiving information from the public, the regulations require an agency to “assess and consider comments both individually and collectively, and . . . respond . . . stating its response in the final statement . . .”⁴⁴

FAA Order 1050.1E provides further guidance on how FAA should comply with the foregoing regulations. As relevant here, the order provides that “[a]t the earliest appropriate stage of the action and early in the process of preparing NEPA documentation, the responsible . . . official . . . must provide pertinent information to the affected community and agencies and consider the affected communities’ opinions...”⁴⁵ To accomplish this, the order specifies that FAA must provide the public with an opportunity to review and comment on the draft EIS and must formally respond to those substantive public comments in the final EIS.⁴⁶ Additionally, the order

³⁹40 C.F.R. § 1501.7.

⁴⁰40 C.F.R. § 1506.6(a).

⁴¹40 C.F.R. § 1506.6(b).

⁴²40 C.F.R. § 1506.6(c).

⁴³40 C.F.R. §§ 1503.1(4), 1506.6(d).

⁴⁴40 C.F.R. § 1503.4(a).

⁴⁵FAA Order 1050.1E, § 208b.

⁴⁶FAA Order 1050.1E, §§ 208d, 508(g).

emphasizes the discretion granted to FAA in this area by stating that there is “...no standard approach to public scoping...”⁴⁷ and “...no requirements for a scoping meeting or for a specific number of meetings”;⁴⁸ nonetheless, “...it is important that FAA facilitate public participation in [the scoping process]....”⁴⁹

FAA Actions

FAA involved the public in an extensive prescoping process for the airspace redesign. This included holding 31 prescoping public meetings, referred to as “Airspace Redesign Workshops,” as a strategy to begin public education on airspace redesign, concepts, and expected benefits of the project.⁵⁰ A total of 1,174 people attended the workshops and 712 comments were submitted. Further, during the formal scoping period, FAA held 28 meetings throughout the study area with the purpose of educating the public on the purpose and need of the project. A total of 1,031 people attended the scoping meetings and 901 comments were submitted and presented in a Scoping Report. This was followed by a formal public comment period, which was extended to solicit further public participation. During the public comment period, FAA conducted 30 public meetings in the five states affected by the redesign’s proposed alternatives. Subsequently, FAA issued a Noise Mitigation Report on the preferred alternative and solicited public input on the report by holding seven additional meetings, with at least one meeting in each state affected by the preferred alternative.

FAA also advertised the meetings in local media through newspaper advertisements, press releases, and public service announcements. Additionally, FAA compiled a running list of all participants at each meeting and sent any subsequent announcements to those individuals by postcard, e-mail, or other means. FAA held its initial meetings in potentially affected communities and held its draft EIS and noise-mitigation meetings in areas where the most significant impacts of the airspace redesign would be felt. These meeting locations were accessible by public transit and were located to generate the most participation. (As

⁴⁷FAA Order 1050.1E, § 208c.

⁴⁸FAA Order 1050.1E, § 505a.

⁴⁹FAA Order 1050.1E, § 208c.

⁵⁰Final EIS Table 6.1; Record of Decision, pp. 28, 48.

discussed in section 5 below, the meeting locations also satisfied environmental justice directives.) At each meeting, FAA provided handouts and visual maps and displayed videos to assist the public in understanding the process. Representatives from FAA, including air traffic controllers and contractors, were on hand at scoping, draft EIS and noise-mitigation meetings to explain the project and answer questions. Throughout the EIS process, FAA solicited public comments and responded to each substantial comment, as required by CEQ regulations.⁵¹ Comments could be made at public meetings as well as by U.S. mail and e-mail. The public comment periods lasted at least 30 days and in some cases were extended to accommodate additional public participation.⁵²

Analysis

Making a determination whether the public has been adequately involved in the EIS process is “a fact-intensive inquiry made on a case-by-case basis.” *Biodiversity Conservation Alliance v. Bureau of Land Mgmt.*, 404 F. Supp. 2d 212, 220 (D.D.C. 2005). In this case, FAA conducted an early and open process and made considerable efforts thereafter to involve the public in the environmental review process. The prescoping campaign designed by the agency garnered extensive public participation and comments. The large number of meetings held in accessible areas in the study area (chosen to elicit the largest number of attendees) reflects FAA's efforts to educate the public about the redesign and address concerns, gather information, and solicit comments early in the process. FAA drew large crowds at the 31 meetings and received numerous formal public comments. Further, FAA made substantial efforts to involve the public in the formal scoping period, post-draft EIS period, and post-noise mitigation period, by similarly conducting another round of public meetings (65 in total), which educated the public on additional elements of the project. Meetings were accessible, they drew a substantial audience, and yielded a substantial number of public comments. Additionally, in each of these stages, FAA engaged in an open campaign to invite the public's attendance and comments by advertising through various media and keeping a running list of attendees. FAA also carefully chose locations which would contribute to this open process—accessibility for all and locations which would generate the most participation. Finally, FAA structured its

⁵¹A summary of the public comments and FAA's responses to these comments are contained in appendices N and Q of the final EIS.

⁵²Additional detail on the public comment periods is contained in table 1, p. 26.

meetings so that the public could learn about the process in various formats and ask questions of FAA and its contractors. These factors all contributed to the conduct of an “early and open process” and the use of “diligent efforts” to involve the public, as the CEQ regulations require, including sponsoring a reasonable number of public meetings (96 in all) and providing adequate notice of those meetings in various forms.

FAA solicited public comments in various forms and responded to comments consistent with its responsibilities outlined in its Order. FAA solicited comments at public meetings and accepted them via U.S. mail and e-mail, as well. Public comment periods lasted 30 days or longer, and some were extended to garner additional public participation. FAA advised that it responded to all substantive comments received in the final EIS,⁵³ directly addressing the question presented and showing consideration of concerns. Based on FAA's solicitation efforts and responses to substantive comments in the final EIS, FAA efforts met CEQ procedural regulations and FAA Order 1050.1E. While there is no set process for addressing public participation requirements, in our view, FAA adequately addressed the issue consistent with NEPA regulatory requirements.

5. Did FAA reasonably consider environmental justice issues in its environmental review process?

As discussed below, in its EIS review process for the New York/New Jersey/Philadelphia Airspace Redesign, FAA satisfied the key environmental justice directives contained in Executive Order 12898, CEQ guidance documents, and DOT Orders. FAA prepared an analysis that identified minority and low-income populations significantly impacted by the proposed redesign and determined whether the impact on these populations was disproportionate. FAA also involved these individuals throughout the environmental review process. In addition, FAA mitigated these impacts through alteration of the preferred alternative, which included reducing the number of departure dispersal headings, shifting certain departure routes, and changing certain arrival altitudes.

⁵³See final EIS, appendices N and Q.

Executive Order 12898 and Other Requirements

Executive Order 12898, "Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations," provides that "...each Federal agency shall make achieving environmental justice part of its mission by identifying and addressing . . . disproportionately high and adverse human health or environmental effects of its programs, policies, and activities on minority populations and low-income populations...." *Id.* Sec. 1-101. The Presidential memorandum accompanying issuance of the Executive Order emphasized the importance of considering these effects when an environmental analysis is required under NEPA. *See* "Memorandum For the Heads of All Departments and Agencies, Re: Executive Order on Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations," Comprehensive Presidential Documents No. 279 (Feb. 11, 1994). CEQ, which oversees federal agency compliance with Executive Order 12898, has developed guidance to assist agencies in meeting their responsibilities under the order. *See Environmental Justice: Guidance Under the National Environmental Policy Act* (Dec. 10, 1997) (hereafter, CEQ Guidance). DOT also has issued an order to guide implementation of the Executive Order, which sets broad environmental goals.⁵⁴

By their terms, the Executive Order and implementing documents provide agencies with considerable flexibility in seeking to achieve these environmental justice goals. The Executive Order, for example, states that agencies shall make environmental justice part of their missions "[t]o the greatest extent practicable and permitted by law...[and]...as appropriate . . ." The CEQ Guidance describes its terms as flexible and serving as "...a point of departure, rather than a conclusive direction in applying the terms of the executive order,⁵⁵ and recognizes "there is [no] standard formula for how environmental justice issues should be identified or addressed."⁵⁶ There also is not a particular formula by which to address these in an EIS; agencies simply must present such concerns in a manner that is "...clear, concise, and comprehensible...."⁵⁷

⁵⁴DOT Order 5610.2; 62 Fed. Reg. 18377 (Apr. 15, 1997).

⁵⁵CEQ Guidance, p. 5.

⁵⁶CEQ Guidance, p. 8.

⁵⁷CEQ Guidance, p. 10.

Against this backdrop of flexibility, Executive Order 12898 and these related documents direct agencies to make efforts to ensure the involvement of low-income and minority populations as part of the agency's consideration of the environmental impacts of its actions. The CEQ Guidance, for example, states that "...agencies should assure meaningful community representation . . . [and] endeavor to have complete representation of the community as a whole . . . as early as possible if it is to be meaningful."⁵⁸ To this end, an agency should "...provide opportunities for effective community participation in the NEPA process, including . . . improving the accessibility of public meetings, crucial documents, and notices"⁵⁹ and "develop effective public participation strategies, . . . acknowledge and seek to overcome linguistic, cultural, institutional, geographic, and other barriers to meaningful participation, and should incorporate active outreach to affected groups."⁶⁰

The CEQ Guidance recommends consideration of these impacts at various stages of the environmental review process. In the scoping process, the CEQ Guidance suggests an agency "seek input from low income populations [and] minority populations . . . as early in the process as information becomes available"⁶¹ by use of "...local resources, community and other non-governmental organizations, and locally targeted media."⁶² The following are cited as examples of ways to help inform the public during the scoping process: providing "a description of the proposed action," "maps, drawings, and other appropriate material or references," "an agency point of contact," and "timely notice of locations where comments will be received or public meetings held."⁶³

Further, to solicit public participation, the CEQ Guidance recommends "...adaptive or innovative approaches to overcome linguistic, institutional, cultural, economic, historical, or other potential barriers to effective

⁵⁸CEQ Guidance, p. 9.

⁵⁹Presidential Memorandum, p. 1.

⁶⁰CEQ Guidance, p. 9.

⁶¹CEQ Guidance, pp. 10-11.

⁶²CEQ Guidance, p. 11. Examples of how agencies should enhance their outreach include the use of religious organizations, newspapers, radio, and other media, civic associations, community and social service organizations, labor organizations, and the internet and other electronic media.

⁶³CEQ Guidance p. 12.

participation . . .”⁶⁴ Suggestions for developing a public participation strategy include: “translation of major documents...”;⁶⁵ “...opportunities for limited-English speaking members of the affected public to provide comments throughout the NEPA process;”⁶⁶ use of different media (e.g., size, formats);⁶⁷ and “use of locations and facilities that are local, convenient, and accessible to . . . low-income and minority communities . . .”⁶⁸ Finally, when analyzing alternatives, the CEQ Guidance suggests an agency consider “...the views it has received from the affected communities, . . . the magnitude of environmental impacts associated with alternatives that have a less disproportionate and adverse effect on low-income populations [and] minority populations” and “...community views in developing and implementing mitigation strategies.”⁶⁹

FAA Actions

Throughout its environmental review process for the New York/New Jersey/Philadelphia Airspace Redesign, FAA sought to ensure the involvement of low-income and minority populations who would be significantly affected by the redesign. FAA conducted an environmental justice assessment to identify where those populations were located,⁷⁰ and determined that minority populations near LaGuardia, Newark, and Philadelphia would experience significant noise impacts under what

⁶⁴CEQ Guidance, p. 13.

⁶⁵CEQ Guidance, p. 13.

⁶⁶CEQ Guidance, p. 13.

⁶⁷CEQ Guidance, p. 13.

⁶⁸CEQ Guidance, p. 13.

⁶⁹ CEQ Guidance, pp. 15-16.

⁷⁰FAA first identified the census blocks significantly impacted by aircraft-related noise and determined the minority composition and median income of those census blocks based on prospective census data for 2011. *See* final EIS, tables 3.8, 3.9, showing minority populations in the study area and poverty population statistics. To determine whether there would be a high and adverse impact to a low-income community, the median income of the significantly impacted census blocks was compared to the poverty-level income. Additionally, FAA used CEQ’s definition of a minority population. FAA then determined whether a low-income or minority community subjected to a high and adverse human health or environmental impact was disproportionately affected, deemed to occur when an environmental impact is either predominantly borne by a low-income or minority population or is more severe in magnitude than the impact on the non-low-income or nonminority populations. *See* final EIS, pp. 4-43, 4-44.

ultimately became the preferred alternative. Beginning in the prescoping phase, therefore, and continuing through the noise-mitigation report phase, FAA held public meetings about the redesign in areas accessible by public transit and in low-income and minority communities, such as Newark, N.J., with disproportionately high and adverse noise impacts. FAA provided translators at these meetings to facilitate communication about the project and used different forms of media—maps, printouts, and video presentations, in addition to live speakers—to convey the elements and effects of the project. The meetings were publicized by advertisements in multiple publications, including local foreign language media, and by outreach to church leaders and community organizations. The public could submit comments to FAA at these targeted meetings. All of these measures were in addition to FAA’s general public information and public comment opportunities for the redesign, as discussed in section 4 above.

FAA concluded that there would be a disproportionate impact on minority populations near LaGuardia and Newark; however, with mitigation measures, these impacts would be eliminated. In addition, FAA concluded that there would be significant (though not disproportionate) impacts on minority populations near Philadelphia, but these would be eliminated once the redesign was fully implemented by 2012.⁷¹ FAA also considered another alternative—the Ocean Routing Alternative—that would have eliminated noise impacts on these populations altogether but, as noted, that alternative was not selected because it did not meet the redesign’s purpose and need.

Analysis

FAA satisfied the environmental justice requirements of Executive Order 12898 and the related CEQ and FAA regulations and guidance. As described in the final EIS, FAA conducted an assessment to identify minority and low-income populations that would be significantly affected by the redesign, determined whether the impact on these populations was disproportionate, and involved those populations throughout the environmental review process with sensitivity to issues that could affect their level of participation. As Executive Order 12898 and CEQ guidance require, FAA engaged in reasonable initiatives to ensure these populations had the chance to participate in the review process, for example, by holding meetings in areas accessible by public transit and in those

⁷¹See final EIS, Chapter 4 and Appendix I.

communities most significantly affected by the project. FAA also adhered to directives to overcome cultural and linguistic barriers and involve community and nongovernmental organizations in the notification process, by publicizing public meetings in various publications in both English and foreign language formats. When conducting these meetings, FAA heeded the directive to convey project information in various formats, by using maps, printouts, video, and speakers, as well as the Internet. These efforts generated a large number of comments from the affected populations, and FAA adequately responded to each substantive comment in the final EIS.

Finally, FAA considered these populations in developing its alternatives, as the CEQ Guidance requires, by considering potential noise impacts on these communities and considering the Ocean Routing Alternative that would have eliminated disproportionately high and adverse noise impacts. FAA also mitigated the preferred alternative, thereby eliminating significant noise impacts no later than full implementation, in compliance with the CEQ Guidance requiring consideration of community views in developing and implementing mitigation strategies. These efforts and activities met the requirements of Executive Order 12898, CEQ Guidance, and the other directives “[t]o the greatest extent practicable and permitted by law...” and “as appropriate....”

Appendix III: Operational Comparison of Alternatives

Purpose and Need Evaluation Criteria	How Measured	Alternative				
		Future No Action	Modifications to Existing Airspace	Ocean Routing Airspace	Integrated Airspace without ICC	Integrated Airspace with ICC
Reduce complexity	Jet route delays + time below 18,000 feet (minutes)	12	12	12	11	10
	Arrival distance below 18,000 ft (nautical miles)	96	95	99	96	102
Reduce voice communications	Max interfacility hand-offs per hour	525	525	521	529	382
Reduce delay	Traffic weighted arrival delay 2011 (minutes)	22.9	22.6	23.6	22.8	19.9
	Traffic weighted departure delay 2011 (minutes)	23.3	20.9	29.5	20.8	19.2
Balance controller workload	Equity of west gate fix traffic counts	0.37	0.37	0.37	0.34	0.30
Meet system demands and improve user access to system	End of day's last arrival push (time)	23:54	23:54	23:54	23:54	23:00
Expedite arrival and departures	Time below 18,000 ft (minutes)	18.5	18.2	18.8	18.2	18.6
	Change in route length per flight (nautical miles) ^a	0.0	0.0	4.5	-1.2	3.7
	Change in block time (minutes per flight) ^a	0.0	-0.9	3.9	-1.0	-1.4
Flexibility in routing	Delay saved per flight per day	0.0	0.0	0.0	0.0	12.6
Maintain airport throughput	Arrival max sustainable throughputs	223	223	223	223	238
	Departure max sustainable throughputs	238	239	221	240	245

Source: FAA.

^aA negative value indicates a new decrease in the category.

Appendix IV: Summary of the Integrated Airspace Alternative with ICC

Airport	Changes from the Future No Action Alternative
JFK	North departure gate shifted 15 miles northeast
	New distant procedures for aircraft heading to the North departure gate
	West departure gate extended to the north and to the south
	New procedures for aircraft heading to the West departure gate
	Future No Action Ocean departure gate split into Ocean and South departure gates
	New distant procedures for aircraft heading to the Ocean departure gate
	New procedures for aircraft heading to the South departure gate
	North arrival post shifted 5 miles southeast
	New distant procedures for aircraft arriving from the North arrival post
	East arrival post shifted northwest
	New procedures for aircraft arriving from the East arrival post
	South arrival post shifted to the northeast
	New procedures for aircraft arriving from the South arrival post
	LaGuardia
North departure gate shifted 15 miles northeast	
New procedures for aircraft heading to the North departure gate	
West departure gate extended to the north and to the south	
New procedures for aircraft heading to the West departure gate	
South departure gate shifted to the northwest	
New procedures for aircraft heading to the South departure gate	
North arrival post shifted 30 miles east	
New procedures for aircraft arriving from the North arrival post	
West arrival posts shifts to coincide with Future No Action South arrival post	
New procedures for aircraft arriving from the west to coincide with the South arrival post	
West arrival flow split into two arrival flows, one to the north and one to the south	
New departure headings for aircraft departing Runway 4 to the North departure gate	
New departure headings for aircraft departing Runway 4 to the East departure gate	
Newark	New departure headings for all runways and all gates
	East departure gate shifted to the east
	New procedures for aircraft heading to East departure gate
	North departure gate shifted to the northeast
	New procedures for aircraft heading to the North departure gate
	West departure gate expanded to the north and south
	New procedures for aircraft heading to the West departure gate
	South departure gate shifted to the southwest

**Appendix IV: Summary of the Integrated
Airspace Alternative with ICC**

Airport	Changes from the Future No Action Alternative
	<p>New procedures for aircraft heading to the South departure gate</p> <p>New Ocean departure gate</p> <p>New procedures for aircraft heading to the Ocean departure gate</p> <p>North arrival post moved to 50 miles north of Newark airport</p> <p>New procedures for aircraft arriving from the North arrival post</p> <p>West arrival post shifted to be near Greenville, New York</p> <p>West arrival flow split into two arrival flows, one to the north and one to the south</p> <p>New procedures for aircraft arriving from the South arrival post</p> <p>Use of both parallel runways for arrivals</p>
Teterboro	<p>Departure gates match those of Newark Integrated Airspace with ICC</p> <p>New distant procedures for aircraft heading to the North departure gate</p> <p>New distant procedures for aircraft heading to the West departure gate</p> <p>New distant procedures for aircraft heading to the South departure gate</p> <p>West arrival post shifted 15 miles south</p> <p>New procedures for aircraft arriving from the West arrival post</p> <p>New procedures for aircraft arriving from the West arrival post from the vicinity of Yardley, Pennsylvania</p>
Westchester County Airport	<p>North departure gate shifted 15 miles northeast</p> <p>New distant procedures for aircraft heading to the North departure gate</p> <p>West departure gates extended to the north and to the south</p> <p>New procedures for aircraft heading to the West departure gate</p> <p>South departure gate shifted to the west</p> <p>New departure procedures for aircraft departing to the South gate</p> <p>North arrival post shifted to the east</p> <p>New distant procedures for aircraft arriving from the North gate</p> <p>New distant procedures for aircraft arriving from the south</p>
Philadelphia	<p>West departure gate expanded to the northwest</p> <p>New procedures for aircraft heading to the West departure gate</p> <p>East departure gate is shifted to the east</p> <p>New procedures for aircraft heading to the East departure gate</p> <p>West arrival post shifts to the northeast</p> <p>New distant procedures for aircraft arriving from the West arrival post</p> <p>New departure headings for aircraft heading to the North, East, West, Southwest, and South departure gates</p> <p>Additional route added to North arrival post</p>

Source: FAA.

Appendix V: Comments from the Department of Transportation



**U.S. Department of
Transportation**
Office of the Secretary
of Transportation

Assistant Secretary
for Administration

1200 New Jersey Avenue, SE
Washington, DC 20590

June 19, 2008

Ms. Susan Fleming
Director, Physical Infrastructure Issues
U.S. Government Accountability Office
441 G Street, NW
Washington, DC 20458

Dear Ms. Fleming,

Representatives from the Federal Aviation Administration (FAA) and the Office of the Secretary have reviewed the GAO draft report, "*FAA Airspace Redesign: An Analysis of the New York/New Jersey/Philadelphia Project*." While we are pleased to see that the GAO review concluded the actions taken by FAA with regard to the National Environmental Policy Act were reasonable, the Department does not necessarily agree with everything in the draft report. However, we are constrained from offering a detailed analysis of the draft report at this time, as the matters it covers are the subject of pending litigation. Specifically, there are currently 12 consolidated lawsuits before the U.S. Court of Appeals for the District of Columbia Circuit that challenge one or more aspects of the airspace redesign project.

Neither the 73 Petitioners, nor the Federal Respondents, have yet submitted briefs on the merits. Therefore substantive comments with regard to the GAO draft report could potentially prejudice our ability to defend this project in litigation.

We appreciate the opportunity to review the draft report. Please contact Mr. Martin Gertel, Director of Audit Relations, on (202) 366-5145 with any questions.

Sincerely,

A handwritten signature in black ink that reads "Linda J. Washington".

Linda J. Washington

Appendix VI: GAO Contacts and Staff Acknowledgments

GAO Contacts

Susan A. Fleming, (202) 512-2834, flemings@gao.gov
Susan D. Sawtelle, (202) 512-6417, sawtelles@gao.gov

Staff Acknowledgments

In addition to the individuals named above, Paul Aussendorf, Assistant Director; Lauren Calhoun; Heather Dowey; Tim Guinane; David Hooper; Delwen Jones; Maureen Luna-Long; Sara Ann Moessbauer; Tim Schindler; and Gretchen Snoey made key contributions to this report. Also contributing to the report were Richard Johnson and Josh Ormond.

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