Announcement of Airport Research Projects
August 2013

The Vision 100—Century of Aviation Reauthorization Act established the Airport Cooperative Research Program (ACRP) and was reauthorized in the FAA Modernization and Reform Act of 2012. The ACRP undertakes research and other technical activities in response to the needs of airport operators on various airport issues involving administration, environment, legal, policy, planning, safety, security, human resources, design, construction, maintenance, and operations at airports.

The ACRP is sponsored by the Federal Aviation Administration (FAA) and managed by the National Academies, through the Transportation Research Board (TRB), in coordination with Airports Council International-North America, Airport Consultants Council, American Association of Airport Executives, National Association of State Aviation Officials, and Airlines for America.

The ACRP Oversight Committee (AOC), the governing board for the program, met on July 14 and 15, 2013, and selected projects for the Fiscal Year 2014 program. The purpose of this announcement is to inform the airport industry and research community of these projects.

This announcement contains excerpts from original problem statements, along with guidance from the AOC to introduce the selected projects to the airport industry and research community. Detailed project statements (e.g., requests for proposals) formally soliciting research proposals for these projects are expected to be released starting in November 2013.

ACRP project statements are available only on the World Wide Web. Each project statement will be announced by e-mail. A form to register for e-mail notification of project statements is available at ACRP’s website, http://www.trb.org/acrp. Research project statements will be posted at the same Internet address when they are active.

The ACRP is an applied, contract research program with the objective of developing near-term solutions to problems facing airport-operating agencies. Proposals should evidence strong capabilities gained through extensive, successful experiences. Any research agency interested in submitting a proposal should first make a frank and thorough self-appraisal to determine whether or not it possesses the capability and experience necessary to ensure successful completion of the project. The specifications for preparing proposals are set forth in a brochure, Information and Instructions for Preparing Proposals, available at the website referenced above. Proposals will be rejected if they are not prepared in strict conformance with the section entitled, “Instructions for Preparing and Submitting Proposals.”

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Summary of Approved Research Projects

**Project 01-26**  
*Improving Airport Customer Experiences*

Research Field: Administration  
Allocation: $400,000

Airports must strive for exceptional customer experience to claim complete success and grow. With load factors at all-time highs, inconsistent security wait times, and the financial realities for airlines, the “hassle factor” of traveling has become a risk to passenger satisfaction and growth. Travelers are choosing alternate modes of transportation, changing destinations within driving distance, utilizing other nearby airports, or canceling trips altogether if the airport they would normally use becomes less convenient. On the other hand, “delighted” customers tend to spend more money at airports. While data exist to help airports benchmark their customer service performance, notably the Airport Service Quality passenger satisfaction surveys, there is very little guidance available about how to improve the overall experience. Research is needed to detail practices and methodologies that airports can use to monitor and improve customer experience. Education and guidance could help airport executives in taking steps to improve the customer experience, monitor performance, and incentivize employees to provide outstanding customer service.

The objective of this research is to provide a guidebook on airport customer service, with an overview of best practices used by airports and others that have employed customer service practices in investment decision-making. In addition, the project would detail proven methods to engage airport stakeholders—including airlines, tenants, and governmental agencies—to work together to improve the passenger experience. The project would examine innovative technologies that can help improve the customer experience by providing up-to-date, pertinent information.

**Project 01-27**  
*NextGen—A Primer*

Research Field: Administration  
Allocation: $750,000

The Next Generation Air Transportation System (“NextGen”) is a pervasive and critical component of the future of the National Airspace System (NAS). Because of its technical nature, however, and the fact that much of the published material about NextGen is geared to industry experts and not to airport leadership and stakeholders, little is known about NextGen and how it would change aviation outside the FAA.

The objective of this research is to generate a document that presents the basic elements of NextGen, in terms and context that are relevant, familiar, and understandable to airport operators. This primer would include how existing FAA plans could potentially affect airports of all sizes and roles, the larger aviation industry, and the public. A timeline would be included that would highlight the FAA’s planned rollout of near and medium-term elements, and the long-range vision. A description of major components and a glossary of terms would also be provided to airport practitioners.

Three components of this research are envisioned: First, a “NextGen and Airports” general educational report suitable for community members, local leaders, and the public designed to raise awareness of NextGen and the role of airports. This component would focus on community impacts and how the roles of airports and other stakeholders may change as a function of changing economic conditions, changing airline industry characteristics, changing airport infrastructure, and other factors. A glossary of terms and frequently asked questions about NextGen would be included. Second, a “NextGen Resource Guide” that would provide a comprehensive list of NextGen technologies and initiatives categorized and described for airport practitioners. The audience for this document would be airport staff with a working knowledge of airports. Third, a “NextGen and Airports” overview guide targeting airport decision makers that would provide a high-level description of the NextGen initiative, including the benefits and costs to the airport and its various stakeholders. This document would be formulated to convey relevant information and technical guidance of importance to airports. It would also include planning guidance for airport directors, department heads, board members, and other senior policy interests within the airport organization.
Project 01-28  
*NextGen–Guidance for Engaging the Airport Community*

Research Field: Administration  
Allocation: $300,000

Communities are often brought into the planning process for airspace changes (e.g., related to NextGen) near the end of the process, when decisions have already tentatively been made. This engenders a narrow focus on the environmental issues of noise and emissions and misses the opportunity to engage and inform the overall community of the safety, capacity, and economic impact that such procedures offer. What is increasingly needed is a more inclusive approach that looks at the benefits of NextGen to the entire community and the goals it has for the airport. Therefore, efforts to adopt new airspace arrival and departure procedures at airports require new methods to engage surrounding communities successfully.

The objective of this research is to develop a new and expanded model for engaging communities in airspace procedure development efforts (including planning, environmental, review, and design). This new and expanded approach would enable airports and the FAA to proactively inform the community about the benefits and costs of potential procedural changes as well as to take into account community opinions, which can be considered in making refinements to final procedure design. Such an approach would also consider the important balance between enhanced community engagement and efficient airspace procedures development (including managing procedure development schedule and costs) in order to expedite implementation of NextGen benefits. This report would provide an approach for community engagement that calls on lessons learned from airports that have successfully navigated the process of changing arrival and departure procedures. Research should include an examination of the FAA’s process for engaging airports and their communities on new arrival and departure procedures, including statutory, regulatory and policy requirements. To develop a new and expanded model for community engagement, the research would require the completion of several case studies, where the FAA and airport’s engagement with the community would be summarized in order to provide information on the practices that worked effectively and those that did not. The case studies would require consultation with the FAA, airport management, airline representatives, and, where appropriate, members of the community. The research would also require an analysis of how the community engagement process changed, if at all, the design of the arrival and departure procedures.

Project 02-47  
*Assessing Aircraft Noise Conditions Affecting Student Learning – Case Studies*

Research Field: Environment  
Allocation: $600,000

There is evidence that chronic exposure to noise is associated with reading deficits in children, and community concerns over the effects of noise on children’s learning often present potential challenges to airport expansion. Decisions to proceed with public school insulation projects are often based on a criterion of Day-Night Average Sound Level (DNL) 65dB in order to mitigate these effects; however, to date there are no data to determine whether this criterion is appropriate for identifying aircraft noise impacts on schools. In 2010, ACRP began research to assess whether the DNL 65dB criterion is appropriate for identifying noise impacts on schools. ACRP Project 02-26 is a nationwide macro-analysis of the relationship between noise exposure and student performance taking into account the effect of school sound insulation and other confounding factors. The ACRP Project 02-26 research relies on student test scores as a measure of performance. The research does not examine the effects of aircraft noise on student/teacher interactions. Classroom observations are needed to determine at what level noise events cause interruptions and how student and teacher communication and behavior are affected by aircraft noise. Such observations would enable a more refined approach to developing the most appropriate metric and criteria for determining the effect of aircraft noise on classroom learning.

The objectives of this research are to (1) develop a case study design for classroom observations to identify the most appropriate metric and criteria for determining the effect of aircraft noise on classroom learning, (2) conduct a pilot case study, and (3) integrate results with previous ACRP research on the topic. The research should differentiate between aircraft noise impacts and those related to other types of classroom noise.
Project 02-48
Assessing Annoyance of Helicopter Noise Compared with Jet Aircraft Noise

Research Field: Environment
Allocation: $700,000

Helicopter use has become more popular for commuting, law enforcement, medical response, and information gathering. These uses tend to take helicopter operations away from airport areas and over predominantly residential areas. Airports, hospitals, and government officials receive complaints about helicopter noise and are asked to control their operations. Helicopter noise is currently evaluated with the same land use compatibility guidelines used for other aircraft noise, with sound exposure levels at or above 65dB Day-Night Average Sound Level (DNL) judged as a significant impact. However, DNL values produced by helicopters are usually well below this level, even for relatively high levels of helicopter activity. ACRP research is already underway to update the noise dose-annoyance response relationship for jet aircraft operations (e.g., ACRP Project 02-35). However, the noise characteristics of fixed-wing aircraft and helicopters are very different: frequency content, altitudes and speeds flown, corridors used, schedules of operations, sound level onset and decay rates and detectability all differ between the two aircraft types. The most recent studies exploring the effects of helicopter noise were in the mid-1980s and were primarily done for military helicopters. In 2004, an FAA Report to Congress, “Nonmilitary Helicopter Urban Noise Study,” recommended that “additional development of models for characterizing the human response to helicopter noise should be pursued.” To date, no such work has been done.

The objective of this research is to develop and implement an approach to relate surveyed helicopter noise annoyance to modeled helicopter noise.

Project 02-49
Assessing Impacts from Severe Weather on Airport Infrastructure and Operations—Prevention Strategies

Research Field: Environment
Allocation: $550,000

Extreme weather conditions have presented significant challenges to airport infrastructure and operations. In 2005, Hurricanes Katrina and Rita brought widespread damage to the gulf coast. In 2012, super-storm Sandy damaged airport infrastructure along the East Coast, most intensely in the New York region, while a hailstorm disrupted airport and aircraft operations in the Dallas region and damaged aircraft. Extremely hot temperatures can cause jets to sink into the tarmac, while heavy snow, tremendous rain events, water inundation, and hail storms can cause damage to airport buildings, aircraft, and other airport infrastructure. Severe weather can produce a variety of impacts at airports, and the intensity of these impacts varies depending on the airport and its location. Heavy snow may not impact airports in northern states in the same way that it would impact airports in southern states, and coastal airports are affected differently by hurricanes and storm surges than inland airports.

It is important for airports to understand how infrastructure, safety, security, operations, and maintenance may be affected by severe weather conditions, to assess potential risk, and to effectively plan to minimize impacts.

The objectives of this research are to (1) review the impact of recent significant weather events in terms of their effect on airport infrastructure, safety, security, operations, and maintenance; (2) develop a risk assessment tool to help airports quantify the future risk of these significant weather events; and (3) develop impact prevention and mitigation strategies for their airport.

Project 02-50
Energy and Environmental Benefits of Electrified Aircraft Taxi Operations

Research Field: Environment
Allocation: $300,000

As demand for air travel continues to grow, airports are facing increased pressure to reduce their contribution to local air emissions and noise. Electrified taxi options may provide an overall net energy and environmental benefits to an airport by removing the need for aircraft main engines to be operating during the majority of the taxi phase of operation. Several concepts for non-engine powered taxi have recently been developed by industry and government research organizations, including an electric motor permanently fixed to the aircraft, or an electric tug. While these options may provide energy and environmental benefits, their use may introduce potential challenges to aircraft operators.
and air traffic control. There is therefore a need to evaluate the potential net energy and environmental benefits of electrified taxi options through the consideration of fuel burn, emissions, and noise effects, and to consider the potential challenges of implementing this technology.

The objective of this research is to identify the potential energy and environmental benefits of electrified aircraft taxi operations, describe potential challenges to their use, and to develop a set of evaluation factors to help the aviation community determine whether the technologies would be beneficial and implementable at the airport.

■ Project 02-51
*Evaluating Noise Level Reduction Test Methods for Dwellings*

Research Field: Environment
Allocation: $300,000

Since the early 1980s, the FAA has funded voluntary noise compatibility projects under the Federal Aviation Regulation Part 150 Noise Compatibility Program. Funded projects include soundproofing homes and public buildings, acquiring noise-sensitive properties and relocating their uses, implementing noise abatement procedures, and encouraging compatible zoning. The availability of funding for eligible programs through the Airport Improvement Program (AIP) has allowed many airports to implement sound insulation programs. The goal of residential sound insulation programs is to modify construction elements to provide an interior noise environment of 45dB Day-Night Average Sound Level “DNL” (CNEL in California) due to aircraft noise, while achieving a minimum 5dB reduction in the interior noise level. Eligible sound insulation projects usually are located in areas where the DNL is 65dB or greater, and AIP funding is available for the implementation of dwelling modifications plus “before-and-after” noise testing. Although the criterion for the design of dwelling modifications is fairly well-defined, there is no standard procedure specified for the measurement of the “before-and-after” noise reduction to confirm a dwelling’s eligibility and the resulting benefit from the implemented building modifications.

The objective of this research it to evaluate current and proposed noise level reduction test methods for dwellings and develop guidance for selecting the most appropriate testing method.

■ Project 02-52
*Hard and Soft Ground Sound Absorption Methodology*

Research Field: Environment
Allocation: $250,000

When conducting a FAR Part 150 noise analysis, airports are required to use FAA’s Integrated Noise Model (INM), soon to be replaced with the Aviation Environmental Design Tool (AEDT). INM and AEDT use the same methodology for modeling noise in the vicinity of airports; this method assumes “soft” ground sound absorption in the calculation of lateral attenuation, based on SAE-AIR-5662, Method for Predicting Lateral Attenuation of Airplane Noise (2012). In reality, areas around airports are often covered with a variety of ground types, including “hard” or reflective ground (such as large areas of pavement or water). Hard ground can have a significant effect on the noise level around an airport due to a decrease in ground absorption effects. By ignoring hard ground effects and effects from multiple ground types, noise analyses may under-predict the noise due to aircraft operations in the vicinity of airports.

The objective of this research is to develop an improved method for modeling hard and soft ground absorption of aircraft noise effects in AEDT/INM. Having this method would help analysts more accurately model aircraft noise levels in the vicinity of airports.

■ Project 02-53
*Interpreting Airport Water Monitoring Results*

Research Field: Environment
Allocation: $250,000

Airport environmental staff have occasion to review and interpret the results of various types of water monitoring and analytical tests, typically in the context of regulatory compliance or liability. Their interpretation often leads to important and sometimes costly conclusions regarding environmental and human health risks, regulatory compliance, reporting and response obligations, potential sources, responsibilities, effectiveness of existing controls, and appropriate mitigation actions. Typically, most airports with environmental responsibilities have a basic understanding of the water quality parameters required for routine
compliance monitoring, but, with few exceptions, they generally have a limited understanding of water quality parameters that are not so commonly encountered, such as total organic carbon, nitrate, naphthalene, zinc, acetate, and whole effluent toxicity (WET). Airports do not have an industry-specific standard reference to help interpret monitoring results of these less common parameters. Instead, they must research the parameters through web search with results that may not be specific to the airport context, contact their peers at other airports who may have relevant experience, or hire an outside consultant. Not understanding water quality results can lead to poor decisions, an inability to accurately identify sources, a reliance on outside contractors, and a general increase in risk. Having a sound fundamental understanding of the parameter(s) of interest in the airport context would lead to reduced risk of misinterpretation and better decision making.

The objective of this research is to develop a guidebook for the diagnostic interpretation of water quality monitoring results at airports. The target audience would be airport operators and their consultants. The guidance would address methods used in measuring water quality constituents, quality assurance/quality control methods and interpretation, regulatory and other criteria for evaluating concentrations of different constituents in different types of samples, implications for human and ecological health, and possible sources. The guidebook would be organized to facilitate its use in interpreting and acting upon monitoring results, as well as for selecting water quality parameters for monitoring to address specific objectives and questions.

**Project 02-54**  
*Measuring Aircraft Emissions at Regional Airports*

Research Field: Environment  
Allocation: $500,000

To determine the impact of aircraft engine emissions on local air quality (LAQ) at airports, calculations are performed using the Federal Aviation Administration’s (FAA’s) Emissions and Dispersion Modeling System (EDMS), soon to be replaced with the Aviation Environmental Design Tool (AEDT). EDMS/AEDT use data from the International Civil Aviation Organization (ICAO) engine exhaust emissions database, vehicle emissions from the Environmental Protection Agency’s (EPA’s) MOBILE6 model, criteria pollutant emissions data, organic gas emission data, and dispersion algorithms to predict LAQ. Emissions for larger aircraft engines can easily be found in the ICAO engine exhaust emission database; however, accurate emissions of smaller aircraft engines (<26.7 kN maximum thrust) are not regulated, and emission data are not as readily available. Additionally, while many small GA aircraft consume less fuel than commercial jets, their engines have emissions indices (fuel-based emission factor) for carbon monoxide and total hydrocarbons that range from 10 to over 1,000 times that of commercial jet engines. Since the majority of air traffic at many regional and GA airports consists of aircraft with smaller engines, uncertainty is added to the EDMS/AEDT results by lack of a small engine emissions database. Therefore, data to obtain an accurate prediction of LAQ at regional and GA airports are currently unavailable. Further aggravating this problem, many regional and GA airports exist in areas where ambient levels exceed the National Air Quality Standards for particulate matter (PM). Any changes to airport operations at such sites may be limited by the ability to assess existing emissions. Methodologies for the characterization of PM emissions beyond PM2.5 and PM10 have only recently matured and have not yet been applied consistently to small aircraft engines. Current small engine databases are populated by data from engine manufacturers using various measurement methodologies and therefore lack consistency. In-use measurements of actual emissions at GA and regional airports using established, consistent procedures, including PM from various engines, would likely result in more accurate estimates of airport emissions impacts.

The objective of this research is to obtain aircraft in-use/runway measurements of gaseous and PM emissions of GA aircraft to develop more accurate GA aircraft emission factors that can be used in EDMS/AEDT.

**Project 02-55**  
*Modeling Noise for Non-standard Aircraft Profiles*

Research Field: Environment  
Allocation: $350,000

Models used to estimate the environmental impacts of airport activity continue to improve. The new Aviation Environmental Design Tool (AEDT) features improvements including changes in acoustic, emissions, and performance modeling
capabilities, as well as improvements to noise-power-distance curves, lateral attenuation algorithms, and relative-humidity absorption. Continual modeling improvement saw the introduction of procedure step profile capability, which allows for performance-based profile computation within prescribed limits for nonstandard airport environmental conditions. Additionally, the associated aircraft-specific coefficient database has also been expanded. Yet, other improvements in the modeling capabilities of the current tools are still needed, especially for the more accurate representation of aircraft climb and descent profiles. The AEDT contains "standard" departure and approach profiles for every aircraft type in its database. The standard profiles and the associated aircraft performance data have been developed by the FAA in collaboration with the aircraft manufacturers to ensure valid three-dimensional flight trajectories that lie within the aircraft performance envelope. For departures, the standard profiles and AEDT modeling “procedure step” process do not account for the variations in thrust settings utilized at the majority of airports for the vast majority of aircraft operations. For arrivals, the standard approach profile in AEDT is modeled as a continuous glide slope, yet the modernization of the National Airspace System would accelerate the use of non-standard profiles.

The objective of this research is to develop technical guidance to identify situations when airports conducting environmental studies should use alternate performance modeling techniques in their analyses and to provide guidance on the specific modeling techniques and practices to carry out the modeling of customized profiles, with the ultimate goal of identifying potential improvements to future versions of AEDT.

■ Project 02-56
Planning Compatible Renewable Energy Opportunities that Maximize Benefits for Airports

Research Field: Environment
Allocation: $300,000

Renewable energy can provide financial and public policy benefits to airports if appropriately planned. Projects must be sited to maximize the energy technology’s efficiency, integrate logically with existing electrical infrastructure, and avoid negative impacts on airport activities and airspace. In current practice, airports are typically presented with an opportunity to pursue a renewable energy project based on the availability of a grant funding program or an inquiry from a private entity. In such circumstances, it may not be possible for the airport to engage in a thorough investigation of the alternatives to the proposed approach and reach an informed decision that maximizes the airport’s financial benefits. More airports are embarking on sustainability master plans with funding support from the FAA to advance future airport planning that targets both economic and environmental objectives. With the broad universe of sustainable measures that can be undertaken, renewable energy planning has not been a meaningful part of these activities to date despite being the only concrete measure available to achieve a carbon-free future.

The objective of this research is to develop guidance for airports to support their planning for renewable energy opportunities and fill a gap in the existing sustainability master planning process.

■ Project 02-57
Understanding Lead Emission Reductions at Airports

Research Field: Environment
Allocation: $200,000

Many aircraft in the general aviation (GA) fleet require high octane fuels to avoid engine knock and subsequent damage during their operation. Leaded avgas, 100LL, contains tetraethyl lead (TEL) to boost octane for the safe operation of piston engine aircraft. While not all piston engine aircraft are required to run on 100LL avgas, airports and the avgas market supply 100LL almost exclusively to the GA piston engine fleet because it meets the needs of the majority of the GA fleet. In 2008, the U.S. Environmental Protection Agency (EPA) lowered the National Ambient Air Quality Standards (NAAQS) for lead from 1.5ug/m3 to 0.15ug/m3 to reduce lead emission impacts on human health and the environment. During the regulatory process, EPA identified sources of lead emissions and estimated that 50% of national emissions come from GA aircraft due to the combustion of avgas with TEL. Initial monitoring for lead at airports indicates that the latest NAAQS may be exceeded at some airports. The FAA and industry continue to explore alternatives to avgas with TEL additive, but no alternative fuel formulation has yet been found that would meet the demands of the majority of the GA fleet for safe flight operation. In the meantime, there
may be practices and procedures that can reduce the impact of lead emissions at airports.

The objective of this research is to develop a guidebook that identifies practices that can be implemented to reduce the impact of lead emissions at airports where leaded fuel is currently being used.

■ Project 02-58
*Understanding Potential Benefits of Time-varying Atmospheric Dispersion Models to Airports*

Research Field: Environment
Allocation: $400,000

Airports and consultants currently employ the Emissions and Dispersion Modeling System (EDMS), soon to be incorporated into the Aviation Environmental Design Tool (AEDT), for modeling local air quality (ambient concentrations). Although most regulatory studies have relied on emissions inventories, more airport studies, especially those involving health impacts, have required the use of atmospheric dispersion modeling. While emissions inventories may provide indications of the strength of pollutant emissions contributions, they do not provide the “full picture” of the impacts on nearby populations. This is because an emissions inventory does not take into account the dispersion due to the wind, nor the distance to the public (receptors).

Currently, EDMS employs the Environmental Protection Agency’s (EPA’s) AERMOD dispersion model, a static Gaussian plume model (concentrations are typically 1-hour averages). AERMOD is EPA’s next-generation model, which has typically been used to model dispersion from point and area sources (e.g., power plants, industrial activities). Although the use of AERMOD in EDMS is well-established and has EPA’s approval, there has been a growing need to use other dispersion models with capabilities beyond those of AERMOD. In particular, there is a need for time-varying dispersion modeling involving the prediction of high-resolution concentrations (e.g., minute-by-minute, second-by-second) to help better explain the local air quality impacts from airport activities.

Typically, Gaussian “puff” models (e.g., CALPUFF, SCIPUFF/SCICHEM, LASAT) can be used to conduct such assessments. In order to better understand health impacts, most public health researchers point to the need for higher resolution, time-varying modeling capabilities. In addition to their higher resolution, these puff models can also provide additional chemical transformation mechanisms not included in AERMOD. As airports and the public continue to increase their understanding of airport emissions, other dispersion models besides AERMOD will need to be employed to provide the aviation community with alternative modeling capabilities that can be used to explain health-related impacts in greater detail. While all of these puff models have been used to model various sources, they have not been used with airport-specific sources and scenarios.

The objectives of this research are to confirm whether Gaussian puff models would provide more accurate emissions results for airports, to understand these models and airport air quality contributions, to develop a method for employing these models at airports, and to recommend a process for using these models at airports.

■ Project 02-59
*Water Conservation Strategies for Airports*

Research Field: Environment
Allocation: $450,000

Large amounts of water are consumed at airports during the course of daily operations to support basic terminal amenities, such as restrooms and air conditioning; services such as deicing, construction, and firefighting; and maintenance activities such as cleaning aircraft and landscaping. These operations can lead to millions of gallons of water used per year. These numbers can be staggering when one considers that water supplies may be limited and subject to drought conditions in various parts of the country. Further, water consumption at airports is only expected to increase with growing air travel demand, accentuating the need for effective conservation strategies. In addition, a large amount of energy is expended in water treatment, water distribution, water heating, wastewater collection, and wastewater treatment. In total, water-related energy use consumes about 13 percent of the nation’s electric power production. To alleviate these concerns, some airports have implemented common water conservation measures, such as installing water-efficient fixtures, collecting rainwater, and recycling wastewater to generate a water supply for operations that do not require potable water. Nevertheless, the nature of airport facilities and activity provides both opportunities for and challenges to implementing water conservation practices, and water conservation strategies may be hampered due to a lack of awareness or a lack of
guidance in terms of identifying, evaluating, selecting, and implementing the most appropriate practices.

The objectives of this research are to identify and evaluate the most appropriate water conservation strategies for airports and to provide guidance to airports for selecting and implementing those best suited to their unique conditions.

■ Project 03-31
*Aligning Community Expectations with Airport Roles*

Research Field: Policy and Planning
Allocation: $500,000

The role each community’s airport plays in the National Aviation System (NAS) is something the public, including community leaders, often does not fully understand. In recent years, the alignment between airport realities (as faced by management) and community expectations for air service, or other economic benefits provided by the airport, have grown farther apart. Loss of air service in many communities has exacerbated this adverse situation, especially in areas where smaller airports have experienced passenger losses that may have exceeded 25%. The problem can be worsened with a reduction in general aviation traffic as airline consolidation, high fuel prices, and effects of slow or stagnant economic growth take their toll. Local communities do not always understand that slow or declining growth in commercial aviation traffic system-wide often obscures significant changes that are occurring in the patterns of air service distributed across the nation’s airports. While many larger airports continue to experience moderate growth in passenger activity, many smaller airports have suffered significant declines in air service. As a result of airline consolidation that has already occurred and may continue to occur, many analysts believe that most airports would be fortunate if they can retain the air service they have let alone attract new air service. As local communities and airport management recognize the larger picture, they may be able to identify new management strategies to help maintain existing service, and, where possible, attract new air service. These strategies may include airline incentives, re-evaluating the ways in which they charge airlines for services, and performing ground-handling and other functions traditionally the responsibility of airlines. While some attention has been given to traditional strategies to maintain existing service as well as possibly attract new air service—including landing fee waivers, marketing assistance, and travel banks—there is little information on new strategies being pursued by many smaller and medium-sized airports. These strategies may help to reduce start-up costs of commercial airlines entering new markets while lowering the cost of services provided by incumbent carriers. For example, some operators have provided a wide variety of traditional airline services, including refueling, baggage handling, staffing ticket counters, and other “below the wing” operations. By offering these services on a fee-for-service basis, airports may be able to reduce the airline or contract staff required at the airport.

The objective of this research is to provide guidance on how airports can communicate with the community and its leaders on how to align expectations about the airport’s place in the NAS and the type of commercial air service and general aviation activity they may expect. The research would also provide both a process for improving local community understanding of changing air service conditions as well as options for maintaining existing service and, if feasible, attracting new service.

■ Project 03-32
*Guidance for Preparing Airport Planning Day Schedules*

Research Field: Policy and Planning
Allocation: $400,000

Many airport planning tools require as input detailed aircraft schedules describing minute-by-minute airport activity at some future planning horizon. These “nominal” schedules must be built up so as to align with planning year annual, planning peak day, and planning peak-hour forecast data and account for some level of uncertainty in future scenarios. The required inputs for developing these schedules must coordinate planning strategies, forecasting methods, and risk analysis to estimate potential variations in costs and benefits linked to implementing alternative strategies. Given how these schedules can influence the outcome of analytic studies (particularly discrete event digital simulation models), it is imperative that they be done well and that the many assumptions used be well understood by those relying on the analysis to make investment decisions. Given the uncertainty of these schedules (i.e., there are many ways that basic
constraints can be met), it is also important that a range of schedules be developed for analysis that embraces the likely range of possible future conditions the airport might face.

The objective of this research is to develop a guidebook to assist airport planners in the preparation of planning day (nominal) schedules, including the inputs that are required, analytical methods necessary, principles of underlying uncertainty, and the range of outputs that can result. This research should provide a step-by-step approach to assist planners in developing consistent and defensible schedules and/or be able to critique such schedules when developed by others.

**Project 03-33**  
*NextGen–Airport Planning*

Research Field: Policy and Planning  
Allocation: $500,000

Because many airports have the perception that NextGen is far off in the future, airport planners may neglect or put on hold future NextGen-related projects that offer potential benefits (e.g., improved safety, efficiency, and environmental performance). Research is needed to identify practical strategies for identifying airport-relevant NextGen elements and incorporating them into new or ongoing airport operations, planning, and environmental initiatives. As such, dependencies between airport operations and infrastructure and various NextGen technologies and procedures would be evaluated from the perspective of integrating both into airport development plans.

The objective of this research is to identify potential risks and uncertainties, roles and responsibilities, and other factors so that technological capability and stakeholder implementation (i.e., innovative technology, aircraft operator plans for avionics equipage, delays with deployment, etc.) can be accounted for in airport development. The research would discuss how NextGen technologies and procedures might lead to better design so as to improve safety, efficiency, and environmental performance, and reduce long-term cost. The target audience for this research would be airport planning directors and would focus on near to medium-term initiatives (i.e., expected implementation in the NAS within the next 10 years). In addition, potential long-term future concepts would be identified, along with corresponding implementation uncertainties and risks.

The research could include several components: (1) a baseline of near, medium, and long-term planning needs for airports; (2) thorough background research into the various sources of information on NextGen, including the FAA, the Joint Program and Development Office, and industry trade associations (e.g., Air Traffic Control Association and Airports Council International-North America) and FAA published documents such as Appendix B of the NextGen Implementation Plan; (3) an identification of appropriate FAA and industry contacts to ensure the research has produced a comprehensive inventory of airport planning needs and elements of NextGen that would be important over the next 10 years and beyond; and (4) a vetting workshop in cooperation with FAA and industry representatives at an appropriate industry forum.

**Project 03-34**  
*NextGen–Understanding Optimal-Efficient Procedure Changes for Aircraft and Airspace*

Research Field: Policy and Planning  
Allocation: $500,000

Design and implementation of Performance Based Navigation (PBN) is the near-term element of NextGen with significance for airports of all sizes and missions. Development of PBN procedures is currently underway, or will be underway shortly, in a number of communities, especially at those airports and metropolitan areas identified in the FAA’s Optimization of the Airspace and Procedures in the Metroplex (OAPM) program. Involvement by airports in PBN implementation is essential for success; potential opportunities exist for benefits to over-flight patterns as well as improvements to safety, reliability, and efficiencies of air services to the community. With their participation, airport operators need to have an understanding of the FAA design and implementation process and have the means to monitor metrics of the benefits and usage of these procedures to report back to their communities. Research is needed to provide an overview of existing PBN developments and future capabilities and detail how these near-term improvements would increase the efficiency of operations, including fuel savings, more direct aircraft routings, potentially decoupled airspace at closely-spaced airports (increasing airspace
capacity), improved airfield efficiency and safety, and other possible benefits.

The objective of this research is to describe how airports can engage with the FAA, their aircraft users, and their surrounding communities on PBN deployment, including the airport’s role in the study and design phases of OAPM initiatives. Research could also provide suggested guidance on measures and metrics to allow airport operators to assess “success factors” regarding effects (both positive and negative) on their communities.

The research could encompass several components: (1) background research into PBN procedures and implementation, including the OAPM program as well as the potential benefits to other airports and communities; (2) a survey of existing research and FAA information about the safety, capacity, environmental, and cost-saving benefits provided by PBM developments both currently and projected for the future; and (3) case studies of PBN implementation to document best practices of FAA, airline, and airport collaboration and to determine, where possible, if the potential benefits of PBN procedures are being realized.

- **Project 03-35**

  *Improving Airport Services for International Customers*

Research Field: Policy and Planning
Allocation: $600,000

The number of international passengers traveling through U.S. airports continues to increase. New air service agreements, longer-range aircraft, expanding global alliances, and emergence of the middle class from developing nations are just some of the factors driving the increase. Much of the passenger growth is occurring from non-European nations, presenting formidable cultural and language challenges to arriving passengers and to the airports serving the passengers. Experience at U.S. airports has shown that many international travelers have difficulty moving around in what are generally unfamiliar environments. The U.S. has different processes for arriving and departing passengers than many other nations. Airport way-finding, signage and symbols, and even levels and locations of automation vary among countries and among U.S. airports. Often, the final destination connections are not the critical issues—understanding and responding to procedures is often more important. For example, where and how to retrieve baggage and the need for rechecking is significantly different from procedures in place at other nations’ international gateways. Getting around and access to town are always sources of confusion. Other issues include developing level of service metrics for passenger processing, based upon internationally acceptable wait times, to aid airports in coordinating staffing of agencies designed to deliver services, including Customs and Border Protection. What are the best international practices and can these apply to U.S. gateway airports? How long should it take to get through lines? What is the baseline level of acceptable hospitality? There are two fundamental areas of research that need to be addressed: (1) the process of navigating through the airport and improving overall communication with foreign travelers, and (2) identifying service levels and acceptable delay for international passenger processing. More attention should be paid to making passage more comfortable and information more accessible. This research should address these human issues and concerns. The benefits of this research would be an enhanced understanding of international customers and their needs and strategies airports and other stakeholders could employ to meet those needs.

The product of this research would be an evaluation of current U.S. international airport arrival and departure services and service parameters and development of reasonable strategies for improving services to international airport travelers. This research should document profiles of passengers connecting through and arriving at U.S. airports, and it should include an assessment of traveler needs for way-finding, signage and symbols, and arrivals and departures processing levels of service. The output of this research should help airport staff and other front-line employees to be more responsive when carrying out their responsibilities. Current practices of other international gateway airports would be analyzed to help airports prioritize the most suitable investments (e.g., signage in multiple languages) as well as how to serve the passengers using volunteers, additional trained airport staff, and other resources that might be available. The output of this research should also present methods for analyzing the return on investment for improving services by measuring increased international travelers and resulting economic benefits in light of additional costs.
Project 04-18
Risk Assessment for Runway Protection Zones

Research Field: Safety
Allocation: $400,000

A Runway Protection Zone (RPZ) is designed to enhance the safety and protection of people and property on the ground near the end of a runway by limiting the types of activities and development that can occur within its boundaries. The ability to control development and activity is most easily accomplished when airports own the land within the RPZ; however, the size of RPZs, the level of existing development and activity within some RPZs, as well as limited funding, often result in significant challenges to this goal. Additionally, the analysis used to establish the current dimensional standards for RPZs was based on operational and safety data that may not be representative of current conditions. Since the financial resources required for property acquisition must be balanced carefully with the need for a safe airport environment, the industry would benefit from an assessment of risk within RPZs using the latest available data.

The objective of this research is to develop a baseline of RPZ risks for Part 139 certificated airports and provide a tool to estimate the risk of existing or proposed activities that may occur within the RPZ.

Project 07-13
Developing an Airport Wayfinding System for the Elderly and Persons with Disabilities

Research Field: Design
Allocation: $450,000

Independent travel in airports for senior/elderly passengers who may have disabilities such as visual impairment, mobility limitations, or problems with short-term memory presents complex navigational challenges that are not met by standard approaches to way-finding and signage. While adequate illumination and ADA compliant signage as recommended in ACRP Report 52: Wayfinding and Signing Guidelines for Airport Terminals and Landside may provide some benefit, additional efforts are needed to enable airports to help more passengers to travel independently and with dignity in airport environments. Meeting the way-finding needs of these travelers is often accomplished by the costly provision of verbal or physical assistance with way-finding (a guide).

No currently available accessible wayfinding system, and none that are known to be under development, are able to provide information that is optimized for wayfinding and travel by people with diverse perceptual, physical, and cognitive challenges in complex indoor environments such as airports. Current development in the field is centered on development of indoor position-sensing technologies and on delivery of wayfinding information using speech output from a smart phone. Therefore, there is an urgent need for a system to provide on-airport wayfinding information that is user-friendly and cost-effective for travelers as well as for airports.

The objective of this research would be to produce a handbook for airport planners to help to provide the elderly and persons with disabilities with wayfinding information they need, in language that they can see, understand, and use to travel independently within airports.

Project 09-11
Field Performance of Asphalt Pavement Preservation Treatments at General Aviation Airports

Research Field: Maintenance
Allocation: $350,000

In this fiscally challenging environment, general aviation (GA) airport infrastructure management requires the use of innovative, efficient, proven maintenance techniques that both positively impact pavement life and are cost-effective. Before any project to replace or reconstruct pavement is approved, the sponsor must provide assurances to the FAA that the sponsor has implemented an effective pavement maintenance management program. The focus of spending has therefore shifted to maintaining and preserving existing airport pavement infrastructure. Since pavements attract more than two-thirds of the GA airport apportionment from FAA, a need exists to develop guidance for airports to evaluate different pavement preservation treatments before selecting the most suitable pavements for their specific requirements.

The objective of this project is to document the pros and cons of the various pavement preservation
treatments that can be used by airports to evaluate those most suited for their specific needs.

**Project 09-12**

*NextGen–Information Sharing and GIS Workshop*

Research Field: Maintenance  
Allocation: $200,000

The amount of data generated by airports, airline/aircraft operators, and the FAA is becoming both immense and of high quality. This information can provide all of these parties a number of safety, efficiency, and decision-making benefits. In particular, Geographic Information Systems (GIS) data, a key element of FAA’s NextGen Program, is becoming a required element for airport inclusion in the FAA Airports GIS database. In addition, the NavLean Program would enhance geospatial data collect for all airports by 2015 (the effort may be called Airports GIS and Survey 2.0). Airports leverage the GIS data collected to support a number of applications and tools, including facility management and maintenance, Part 139 airfield inspections and compliance, safety risk management, property management, and airspace obstruction analysis. Beyond GIS, the information contained in a number of other databases generated by FAA, airlines/aircraft operators, and airports could potentially be leveraged to better decision-making, increase efficiencies, and improve the balancing of risks and benefits. Lastly, to capture these benefits, issues of data security and proprietary use must be resolved.

The objective of this project is to develop guidance and evaluate practices for airports in using GIS and Survey 2.0 data by conducting a workshop with all the relevant stakeholders to simultaneously collect and disseminate such practices to practitioners.

**Project 10-21**

*Meeting Regulatory Requirements–An Integrated Approach*

Research Field: Operations  
Allocation: $350,000

Airports are often required to create and maintain a number of plans in order to maintain their operating status with the FAA. This can be especially challenging for smaller airports with limited staff. For larger airports, while they may have more staff to work on required plans, departments tend to work independently on their own specific documents, missing an opportunity to synchronize their respective plans with each other. While these plans carry a distinct function for the FAA and other agencies, airports would benefit from a comprehensive perspective of the plans, thus allowing them to coordinate requirements expected of them. The coordination of the plans provides a benefit to smaller airports by streamlining the work to be carried out by their staff. For larger airports, the coordination of the plans yields a synchronized and synergistic work product that cuts across the various operating areas of the airport environment and produces an opportunity for stronger brand identification for the airport facility. Additionally, there is a need for a structured and layered methodology for cost effectiveness–allowing the airport sponsor to do more with less. This is especially true with the call for sequestration across many facets of the industry.

The objective of this research is to develop guidance to assist airport sponsors in generating the required plans and accomplish the task efficiently and succinctly.

**Project 10-22**

*Responding to Aircraft Emergencies–A Regional Initiative toward Stakeholder Cooperation*

Research Field: Operations  
Allocation: $500,000

The time to learn how to coordinate emergency responses to aircraft accidents among multi-entity response teams, the broader community, and a variety of service providers (stakeholders) is not in the midst of the emergency. Several large-hub airports have learned through painful experience that considerable advance work to prepare for such emergencies can yield significant results in efficiency and effectiveness when the fateful time to use the lessons learned arrives. For example, a two-day workshop at DFW with tenant airlines and NTSB helped the airport and all participants coordinate their respective responses to emergencies and pass along needed resources and information to others before it was actually needed. Research is needed to help all stakeholders understand what is required by law; develop guidance to collaborate with and among all stakeholders, including a series of training videos for a joint airport disaster plan using modules and lessons learned already developed by the NTSB; and develop a plan and
budget (not-funded) to conduct a series of regional workshops to support the dissemination of the results of this research.

■ Project 10-23

*Stakeholder Integration and Coordination While Implementing IROPS Contingency Plans*

Research Field: Operations  
Allocation: $400,000

Process recommendations for airports to coordinate their IROPS contingency plans with airlines have been developed as part of the recent ACRP Project 10-10 (*ACRP Report 65: Guidebook for Airport Irregular Operations (IROPS) Contingency Planning*). Follow-up regional discussions hosted by the DOT, FAA, and ACRP have helped many airports in coordinating contingency plans with other stakeholders. While both U.S. airports and airlines have filed their Tarmac Delay Contingency Plans with the DOT, most of these plans have not been coordinated between the two parties at all of the required 390 U.S. airports. The primary reason for this is that parties do not have a common understanding of the desired extent of this coordinated planning or recognize where to start.

The objective of this research is to develop implementation guidance for airports and airlines, which is based upon the steps detailed in *ACRP Report 65*. This can lead to more efficient and timely integrated and coordinated planning for cooperative responses to IROPS events. Such guidance would support the U.S. aviation community in better meeting the intent of Congress and the DOT and would help reduce unwanted impacts on the traveling public during periods of severe weather and other potential IROPS events.