GOING GREEN
MINIMIZING AVIATION’S ENVIRONMENTAL FOOTPRINT AT AIRPORTS
As air travel increases, despite significant progress in reducing impacts, aviation’s environmental footprint is also expected to grow. Airports recognize that proactive measures fostering environmental stewardship are needed now to further minimize those impacts while also responding to the growing international demands for air travel.

Although much of the environmental impact of air travel occurs during the flight and is outside an airport’s control, significant measures have been undertaken to better understand and reduce those impacts within airports’ responsibility. Airports also play an important role in facilitating minimization of environmental impacts by others within the aviation industry. Importantly, all parts of the industry – airports, airlines, aircraft and engine manufacturers, and air navigation services – are working together to address the environmental impacts of aircraft and airport operations.

Airports Council International-North America (ACI-NA) members are collaboratively working to influence international, federal, and state/local organizations, regulators, and standard-setting bodies to ensure the aviation industry better responds to environmental concerns. Through these proactive and cooperative measures, the aviation community can minimize its environmental footprint.
REGULATIONS

U.S. airports are subject to stringent environmental regulations set forth by federal, state, and local government agencies including the U.S. Federal Aviation Administration (FAA) and the U.S. Environmental Protection Agency (EPA). These regulations both require airports to affirmatively improve the environment and, at the same time, prohibit airports from regulating the operation of aircraft in flight. In Canada, Environment Canada and Transport Canada oversee environmental protection standards that airports must meet.

Airports must comply with regulations governing myriad environmental requirements, including air and water quality, solid waste and hazardous materials management, natural resources and endangered species. Additionally, the National Environmental Policy Act requires that virtually any development that occurs at an airport be evaluated to determine the project’s probable environmental impacts.

INTERNATIONAL STANDARDS

Airports cannot control the noise or air emissions from aircraft. Part of the United Nations, the International Civil Aviation Organization (ICAO), through its Committee on Aviation Environmental Protection (CAEP), is the international body that establishes noise and air emissions requirements for certification of new aircraft. Those requirements are, in turn, adopted and implemented by the ICAO member countries such as the United States and Canada. ACI represents the global airport industry as an observer to ICAO/CAEP. ACI has continuously called upon ICAO, recognizing its standard-setting role, to devise more stringent noise and emissions standards for aircraft.

INDUSTRY INITIATIVES

The Airport Cooperative Research Program (ACRP) is providing an invaluable resource to help airports better understand and address many of the environmental issues facing the industry. The ACRP undertakes applied research and other technical activities in a variety of airport subject areas such as environmental, design, construction, maintenance, operations, and planning. For example, ACRP is developing guidebooks for airports to use in inventorying their greenhouse gas emissions, managing runoff from deicing operations, and understanding community responses to aircraft noise. ACRP was authorized in December 2003 as part of the FAA’s Vision 100-Century of Aviation Reauthorization Act and is managed through the Transportation Research Board. Program oversight is provided by representatives of airport operating agencies.

On an industry level, ACI-NA works to promote and recognize environmental innovation across its member airports. For more than a decade, the ACI-NA Environmental Achievement Awards have acknowledged the many notable and innovative efforts undertaken by airports to develop and implement programs that protect the environment while keeping their airports’ projects on schedule, minimizing community and regulatory controversy and using creative means of maximizing overall cost-benefits.

ACI-NA provides venues for regular information sharing to help airport staff learn about the environmental programs and initiatives undertaken by their colleagues across the country. The ACI-NA Environmental Committee meets twice per year to discuss the latest regulations and trends in environmental management. In addition, special seminars are held when an environmental topic requires increased focus. Airport professionals also exchange views through a number of working groups on Air Quality; CAEP/International Issues; Waste Management; Land Use Compatibility; Natural Resource Management; NEPA/Planning; Noise Management; Sustainability; and Water Quality.

By sharing some of the airports’ environmental success stories here, ACI-NA hopes to better educate its members and the general public about minimizing aviation’s environmental footprint.
AIRPORT INITIATIVES

WATER QUALITY

Airports implement robust programs to protect water quality by addressing discharges from on-going industrial activities such as fueling, washing, maintenance, construction and deicing. Common practices include deicer-impacted runoff collection, storage and disposal or treatment; incorporation of detention basins during construction projects to detain runoff and reduce pollutant discharges; incorporation of dedicated washing facilities that drain to sanitary sewers and otherwise reducing adverse stormwater impacts.

While most airports with significant deicing activities have implemented programs to properly manage deicer-impacted discharges, the EPA is currently developing national standards to minimize the discharges of deicer-impacted stormwater. ACI-NA has been actively engaged with EPA through their rule development process to ensure the complexity of airport operations and safety considerations are balanced in establishing protective, economically feasible deicer discharge controls. Additionally, EPA’s spill prevention, control and countermeasure regulations continue to evolve and airports have been incorporating programs that meet those regulations and reduce the potential for fuel discharges to waters of the U.S.

CASE STUDIES

- The Denver International Airport was designed and constructed with a dedicated system for the capture, conveyance, treatment, and discharge of stormwater contaminated with aircraft deicing fluids (ADF). The system now includes seven dedicated deicing pads, five wastewater retention ponds, an onsite ADF recycling facility, and the associated infrastructure to convey and store the materials. The airport’s management of this complex infrastructure has resulted in a collection efficiency of approximately 70 percent of the ADF applied. www.flydenver.com

- The Seattle-Tacoma International Airport, working jointly with the cities of SeaTac and Des Moines, King County, and the Washington State Department of Transportation, developed a multi-million dollar drainage basin plan to address severe stormwater management and other environmental problems in the Des Moines Creek Basin. As a result, the urbanization impacts to the creek have been reversed and an economically viable stormwater management strategy was established for the basin. www.portseattle.org

- Winnipeg Airports Authority constructed a Centralized Deicing Facility to address community concerns regarding the impact of aircraft deicing activities on water quality. The airport conducted extensive soil studies and glycol deposition modeling prior to the design of the facility. Part of this effort included a unique wind dispersion model that was developed to estimate the amount of aircraft deicing fluid that becomes airborne during application and the drift pattern based on various wind velocities. Results of the model led to a design that maximized total recovery of deicing fluids, thereby reducing the environmental impacts from glycol, which landed outside the deicing pad. The centralized facility also allows for more efficient deicing operations and direct taxi to the departure runway and has significantly improved surface water quality and glycol recovery rates. www.waa.ca
The impact air travel has on local air quality is one of the most demanding environmental challenges airports face. Although airports cannot directly control many aviation-related emissions such as those from aircraft, they recognize that emission sources within airports’ responsibility and influence contribute to both local and global air quality and, as a result have taken steps to reduce those emissions.

Sources of aviation-related emissions include aircraft, ground support equipment (GSE), ground vehicles accessing the airport (GAV), power generation and maintenance and construction activities. Many airports have implemented actions tailored to address local air quality issues including conversion to and promotion of alternative fuel and low emission vehicles for GSE, GAV, maintenance and construction vehicles and rental car and hotel shuttle buses; promotion of high occupancy vehicle lanes and public transportation access; and installation of alternative fueled and more efficient central heating plants. The availability and use of 400 hertz power and preconditioned air units for aircraft parked at gates can also minimize emissions from aircraft auxiliary and ground power units (APUs and GPUs).

Some airports have set goals to limit airport-owned emissions. Others are considering emissions credit trading to offset future growth impacts and demand management strategies to reduce congestion and delay which result in higher emissions. Some airports also monitor hazardous air pollutant emissions and conduct emissions inventories to further complement air quality studies.

For example, Dallas-Fort Worth International Airport has converted 100 percent of the light and medium duty fleet, 72 percent of the heavy duty and off-road fleet, and 100 percent of the bus and shuttle van fleet to low emission or alternative fuel vehicles. Boston Logan International Airport recently completed its ten millionth all-CNG shuttle bus fleet mile and provides preferred parking for drivers of hybrid and alternative fuel vehicles. Sacramento International Airport installed a jet-fuel pipeline to eliminate emissions from fuel truck traffic. Denver International Airport replaced its natural gas fired chiller engines with electric motors.

**Case Studies**

- **The Los Angeles World Airports (LAWA),** operators of Los Angeles International Airport, constructed the first hydrogen fueling and generation station. Hydrogen fuel cell vehicles are zero-emission vehicles that eliminate all pollutant emissions. The station generates hydrogen by using electrolysis technology that separates water into hydrogen and oxygen. The hydrogen fueling facility demonstrates a comprehensive alternative fueled vehicle program could be incorporated into daily airport operations both on and off the airfield. [WWW.LAWA.ORG](http://WWW.LAWA.ORG)

- **Detroit Metropolitan Wayne County Airport** was awarded a $5.1 million Voluntary Airport Low Emissions (VALE) grant from FAA to fund the airport’s emissions reduction plan for its new North Terminal. With the grant, DTW’s North Terminal, now under construction, will include a new hydrant fueling system to eliminate the need for mobile fuel trucks and their associated emissions, preconditioned air and 400 hertz electrical power units to reduce the reliance on APUs and GPUs, thus reducing fuel consumption and associated emissions. [WWW.WCAA.US](http://WWW.WCAA.US)

**Commercial Aviation Alternative Fuels Initiative (CAAFI)**

Airports, airlines, manufacturers, and the FAA are working jointly to identify and encourage alternative aviation fuel sources through the Commercial Aviation Alternative Fuels Initiative (CAAFI). With the potential for new fuels to enter the marketplace as soon as this year, airports are focused on the potential for reduced landing-takeoff cycle emissions, thus improving the local air quality.

Members of CAAFI, in close coordination with the U.S. Air Force and other government entities, exchange information about the current status of alternative aviation fuels and outline plans for their future development and introduction into service as supplements or substitutes for traditional petroleum-based Jet-A. CAAFI members also work to identify related research needs to be funded by FAA, ACRP, or other appropriate entities. An ACRP project will also result in the development of a handbook for airport operators to use in conducting a cost-benefit analysis in considering the use of alternative fuels.
Climate Change

While not regulated in the United States, many airport operators are proactively addressing greenhouse gas emissions (such as carbon dioxide) associated with airport operations. The United Nations Intergovernmental Panel on Climate Change (IPCC) estimates that aviation contributes about two to three percent of greenhouse gas emissions globally. While the industry’s contribution is relatively small, forecasts predict continued growth in aviation. The IPCC estimates aviation’s contribution could increase to five percent or more in 2050. The industry’s main contribution to global warming – emissions from the operation of aircraft – is outside the control of any individual airport, but ACI-NA member airports are doing their part to reduce those emissions associated with airport operations on an individual airport basis in order to meet the capacity needs of the global aviation system.

Many of the strategies employed to improve local air quality such as acquisition of lower emission technologies and green power also have greenhouse gas emission reduction benefits. Greenhouse gas emission reductions are also being achieved through initiatives such as improving the operational efficiency of the airfield and landside systems, and recycling building and construction materials, waste and water, and reducing energy use.

Several airports, including Portland, Seattle-Tacoma, and Denver have conducted inventories to determine their contribution to greenhouse gas emissions.

Case Studies

The Greater Toronto Airports Authority constructed a three-turbine cogeneration plant at Toronto Pearson International Airport for simultaneous production of electrical power and thermal energy from natural gas. The plant is the first in a series of natural gas turbine facilities built to meet Ontario’s pursuit for alternative clean electrical generation. The Airport Authority worked closely with both federal and provincial governments to develop an Environmental Assessment process satisfactory to both levels of government. Using natural gas instead of coal results in reduced greenhouse gas, particulate, and sulfur dioxide emissions. WWW.GTAA.COM

In March 2007, San Francisco International Airport worked jointly with Virgin Atlantic, Boeing, and FAA to conduct the first aircraft towing trial in North America. In the trial, an aircraft was towed from the gate closer to the runway, reducing the time the aircraft engines were running on the taxiway. Preliminary calculations showed that 595 pounds of jet fuel were saved and 1,709 pounds of carbon dioxide emissions were prevented without causing delays or congestion. While further study is required, if only 30% of departing flights use this protocol at SFO, 16,000 tons of carbon dioxide emissions could potentially be eliminated each year. WWW.FLYSFA.COM

WWW.ENVIRO.AERO

This website is part of a global cross-industry initiative that is supported and financed by the commercial aviation industry. Its purpose is to provide clear information on the many industry measures underway to limit the impact of aviation on the environment.

The initiative was developed under the umbrella of the Air Transport Action Group (ATAG). ATAG is the only global industry association that brings together airlines, airports, manufacturers, air navigation services providers and companies throughout the air transport chain that are committed to achieving infrastructure improvements and addressing the environmental challenges facing the industry. The website includes the latest news and information about how the aviation industry is working to offset negative environmental impacts.
NOISE AND LAND USE COMPATIBILITY

For decades, aircraft noise and land use conflicts have been a primary airport community concern. Over the last three decades, aircraft have become quieter, yet noise continues to be an issue in airport communities.

In the U.S., while the federal government controls aircraft noise certification standards and flight tracks, airport operators have taken steps to reduce the noise impacting nearby communities and encouraged the FAA to institute programs tailored to the unique noise concerns at each airport.

Common noise-related actions include FAA-directed noise abatement runway use and flight tracks, programs for ground run-ups, noise management programs (that monitor runway use and flight tracks, as well as track noise complaints), airport-sponsored pilot awareness/fly quiet programs and local land use actions.

A significant number of U.S. airports also participate in FAA’s Part 150 program which helps airports identify measures for making the surrounding communities more compatible with airport noise by reducing noise impacts to residential and other noise-sensitive areas. Through a Part 150 program, airports develop noise exposure maps which contain detailed information on existing and 5-year future airport/aircraft noise exposure patterns. A noise compatibility plan is then developed and implemented which includes an evaluation of noise abatement and noise mitigation options applicable to the airport.

Airports seldom have control over adjacent land use and often work with surrounding communities by acquiring or sound insulating homes most severely affected by noise and developing land use and zoning programs to encourage compatible development. ACI-NA is also working at the international level to promote more stringent noise certification regulations for new aircraft and the development of safe, but quieter aircraft operational procedures.

CASE STUDIES

As part of the City of San Jose’s corporate priority of Neighborhood-Focused Service Delivery, the Mineta San Jose International Airport established the Acoustical Treatment Program. The program identifies residences and other sensitive living areas within the 65 and 60 decibels California Noise Exposure Level contours where interior noise exposure is at or above 45 decibels CNEL. At those locations, sound insulation improvements are installed at no cost to the property owner. Aspects of the program include allowing the property owners to review the improvement specifications and a field office and showroom. The program, which should be complete by 2008, has committed over $90 million for treating structures within the 65 decibels contour and will fund $100 million for other structures that have historical significance. WWW.SJC.ORG

Louisville Regional Airport Authority was host to the first-ever test of the Continuous Descent Arrivals (CDA), an innovative aircraft noise-reducing flight procedure. The CDA test results offered the potential for a reduction in aircraft noise for residents living 10 to 30 miles off the end of the airport’s runways. WWW.FLYLOUISVILLE.COM

Extensive scrub plantings help discourage waterfowl at the Regional Detention Facility near Sea-Tac Airport.
Many airports have implemented waste management programs either voluntarily or to meet rigorous state and local waste reduction and recycling requirements. Key measures of such programs include recycling, reduced paper use, food composting and hazardous waste management. Waste management programs for airport construction and demolition projects have also resulted in significant waste diversion.

Extensive waste management programs at airports such as San Diego, San Francisco, Seattle-Tacoma, Fort Lauderdale, and Baltimore/Washington airports include recycling, reusing and source reduction components that eliminate the need to dispose of everything from coffee grinds to newspapers to construction debris.

CASE STUDIES

- **Oakland International Airport** and **Hartsfield-Jackson Atlanta International Airport** developed innovative programs to handle and process demolition waste for reuse in airport construction projects. At Oakland, waste materials from airport projects are stockpiled, crushed, and blended to make FAA specified aggregate base for reuse in other airport projects. In Atlanta, the airport turned to a state-of-the-art, overland belt conveyor system that transported 93 percent of the 21.5 million cubic yards of fill necessary for the runway’s construction. Both programs resulted in reduced truck trips on local roads, elimination of truck-generated air emissions, and diversion of a significant amount of construction material waste from landfills.

  WWW.FLYOAKLAND.COM • WWW.ATLANTA-AIRPORT.COM

- The waste management program at **Portland International Airport**, which thrives through partnerships with passengers, airlines, tenants, and neighbors, resulted in 770 tons of recycled materials being diverted from landfills in 2006 alone. The airport recycled 98 tons of paper, plastic, and glass and composted 157 tons of coffee and food waste. Through an innovative food grease recycling program, kitchen waste oils are collected and sent offsite for processing into biodiesel. Foreign language periodicals are also distributed for reuse at local schools.

  WWW.FLYPDX.COM

Douglas Herman and Richard Sinkoff of Oakland International Airport speak to crushing contractor in front of crushing equipment at the MMS.
W I L D L I F E

Wildlife management programs, particularly the elimination of hazardous wildlife attractions and habitat, is a safety concern for every airport. As a result, airports have implemented wildlife management programs designed to reduce aircraft and wildlife conflicts which are unique to each airport setting. Programs often include relocating wildlife habitats, hazing to discourage wildlife and preventing property uses that attract wildlife near airports (such as landfills).

CASE STUDIES

- **Southwest Florida International Airport** Mitigation Park was established to offset environmental impacts associated with the long-term development of the airport. The park is 7,000-acre preserve owned by the Lee County Port Authority that will be managed for the long-term by Florida Wildlife. Enhancement activities to be completed in the park will improve the quality of the natural environment and result in a net benefit to the region. Establishment of the park has led to streamlined permitting of airport development at Southwest Florida International Airport. [WWW.FLYLCPA.COM](http://WWW.FLYLCPA.COM)

- **Detroit Metropolitan Wayne County Airport** received an award for a newly created wetlands area. Due to increased air traffic demand, expansion at the airport resulted in impacts to over three hundred acres of wetlands. The airport purchased land twelve miles southwest of the airport to create new wetlands (referred to as Crosswinds Marsh) to compensate for the losses due to expansion. Crosswinds Marsh, the largest wetland site in Michigan and the Midwest, provides sanctuary to wildlife while also providing outdoor activities enjoyed by members of the Detroit community. [WWW.WCAA.US](http://WWW.WCAA.US)

**This Page** Detroit Metropolitan Wayne County Airport’s Crosswinds Marsh is home to a variety of flora and fauna.

**Opposite Page** Terminal A at Boston Logan International Airport is Leadership in Energy and Environmental Design certified.
Sustainability has been described as a holistic strategy that strives to balance the needs of the present without compromising the ability of future generations to meet their own needs. Within the airport context, sustainability has broad implications throughout the entire system, including energy consumption, environmental impacts and overall facility lifecycle costs.

Sustainability Programs and Environmental Management Systems (EMSs) are becoming increasingly widespread at airports across the U.S. as mechanisms to minimize their environmental footprint. Sustainability is becoming a way of doing business at airports such as Portland, San Francisco, and O’Hare. Several airports, including Miami-Dade County, Dallas/Fort Worth, Westchester County and Denver International, have also implemented EMSs – a set of processes and practices that enable an organization to reduce its environmental impacts and increase its operating efficiency.

Environmental management and energy savings are also achieved through green building initiatives. Several airports have achieved or are currently working toward Leadership in Energy and Environmental Design (LEED) certification by the U.S. Green Building Council for terminal and other airport building projects, including Boston, Indianapolis, Toronto, Winnipeg and Oakland.

**CASE STUDIES**

- **The City of Chicago’s O’Hare International Airport Modernization Program** will reconfigure O’Hare’s intersecting airfield layout, reducing delays and increasing capacity at the airport. O’Hare developed a Sustainable Design Manual to achieve environmental improvements while providing long-term sustainability, economic benefits and improved quality of life for Chicago’s citizens and businesses. The Sustainable Design Manual addresses issues such as brownfield development, water efficiency, optimizing energy performance, recycling, indoor environmental quality, air quality, and construction practices.
  
- **The Massachusetts Port Authority and Delta Airlines opened the new Terminal A at Boston Logan International Airport** in 2005. The Terminal was the first in the country to be certified by the Leadership in Energy and Environmental Design (LEED) rating system and the U.S. Green Building Council. The project included such elements of sustainable design as alternative transportation options, a special storm water filtration device, a heat island membrane, mechanisms to enhance water efficiency, daylighting for energy efficiency, use of sustainable materials, and measures to enhance indoor air quality. The airport has realized 12 percent energy savings, equating to almost $300,000 annually, and 36 percent water savings (or 1.7 million gallons per year).

**Working together with its industry, government and community partners, airports in North America are having a tremendous positive impact on the environment by promoting green practices across the aviation industry. Through these partnerships, and creative strategies going above and beyond regulatory standards, airports are continuously striving to meet the needs of the traveling public while minimizing environmental impacts to the local and global community. ACI-NA will continue to recognize airports’ best practices and exchange information about the most effective ways to minimize aviation’s environmental footprint and incorporate positive ways of serving employees and customers in an environmentally sustainable manner.**

www.flychicago.com

www.massport.com

www.aci-na.org
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