

AIRPORT CASE STUDIES



A. THE NATIONAL PLAN OF INTEGRATED AIRPORT SYSTEMS

The NPIAS (National Plan of Integrated Airport Systems) is a report submitted by the Secretary of Transportation to Congress every two years that:

“Estimates the costs associated with establishing a system of airports that adequately meets the needs of civil aviation and supports the U.S. Department of Defense and the U.S. Postal Service.”

This is the mechanism for developing public-use airports in the U.S. and supports the U.S. Department of Transportation’s (DOT) and the Federal Aviation Administration’s goals of safety, infrastructure, innovation, and accountability as mandated by Title 49 USC, Section 47103.

On page 1 of the most recent Report to Congress (26 September 2018), the NPIAS listed eight attributes that were articulated more than 25 years ago and were reaffirmed by both the Federal Aviation Administration and the aviation industry in 2011. Of the eight attributes, #5 (shown in **bold** below) applies to how airport-area communities are to be addressed:

- 1) Airports should be safe and efficient, located where people will use them, and developed and maintained to appropriate standards.
- 2) Airports should be affordable to both users and the government, relying primarily on producing self-sustaining revenue and placing minimal burden on the general revenues of the local, state, and federal governments.
- 3) Airports should be flexible and expandable and able to meet increased demand and accommodate new aircraft types.
- 4) Airports should be permanent with assurance that they will remain open for aeronautical use over the long term.
- 5) Airports should be compatible with surrounding communities, maintaining a balance between the needs of aviation, the environment, and the requirements of residents.**
- 6) Airports should be developed in concert with improvements to the air traffic control system and technological advancement.
- 7) The airport system should support a variety of critical national objectives, such as defense, emergency readiness, law enforcement, and postal delivery.
- 8) The airport system should be extensive, providing as many people as possible with convenient access to air transportation, typically by having most of the population within 20 miles of an NPIAS airport.

These eight attributes apply to the 13,177 airports in the NPIAS database, including 4,815 public-use airports and 8,302 private airports. Those goals are supported by six topic areas in the NPIAS – Safety, Capacity, Environment, Pavement Condition, Surface Accessibility, and Financial Performance.

Figure 3.1
National Plan of Integrated Airport Systems



In addition to the NPIAS, Executive Order 12893 (31 January 1994) requires that:

“Federal investments should be cost beneficial.”

This executive order also detailed other key principles that the Federal Aviation Administration supports through its administration of the NPIAS, including:

- Support of state and local planning and information management systems
- Support for private sector participation
- Support for effective administration of grant programs like Airport Improvement Program (AIP).

Since every U.S. airport is required to abide by the attributes and guiding principles established in the NPIAS, other airports like Seattle-Tacoma International Airport have had to deal with similar issues of growth and community compatibility. To better understand how these challenges are dealt with, the 2020 study has selected three other U.S. airports with similar characteristics – airports with international passenger and cargo service located on an approximately 3,000-acre site surrounded by development (or a coastline).

B. BOSTON LOGAN INTERNATIONAL AIRPORT

Boston’s General Edward Lawrence Logan International Airport (BOS) is the largest airport in both the state of Massachusetts and the New England region.

BOS was opened in September 1923 as “Jeffrey Field”, initially for use by the Army Air Corps and the Massachusetts Air Guard. BOS is owned and managed by Massport (the Massachusetts Port Authority), which also owns and manages Hanscom Field and Worcester Regional Airports. Massport is an independent public authority that was funded in 1959 to replace the previous local port commission.

BOS is located on Apple Island, partially located in East Boston and Winthrop, immediately northeast of downtown Boston, and is bracketed by residential neighborhoods in Chelsea, Revere, Suffolk, South Boston, and other urban neighborhoods.

BOS is the 16th busiest U.S. airport and encompasses 1,700 acres, making it one of the small U.S. airports in the U.S. It operates 94 gates in four passenger terminals and has six runways:

- 4R/22L (10,008 feet)
- 15R/33L (10,083 feet)
- 4L/22R (7,861 feet)
- 9/27 (7001 feet)
- 14/32 (5,000 feet)
- 15L/33R (2,557 feet)

In 2018, BOS handled 40,941,925 passengers – its busiest year ever – along with 424,024 operations.

BOS is accessible by roadway and transit. Transit modes include a bus rapid shuttle that connects all terminals with South Station in Boston’s financial district. A shuttle bus also connects the terminals with the Blue Line rail (operated by the Massachusetts Bay Transportation Authority or MBTA). There is no direct rail service.

Figure 3.2
Boston Logan International Airport
(photo courtesy of Bing Maps)



Noise abatement

Due to the proximity of BOS to residential communities throughout the Greater Boston Metropolitan area, Massport has been continually working to minimize the effect of noise on the surrounding neighbors since 1975. BOS was one of the first airports in the nation to install a noise monitoring system in communities, which is now used to direct Massport's aggressive noise abatement efforts.

In 1986, Massport instituted noise abatement rules to reduce effect of noise from aircraft operations on neighboring communities. The *Boston Logan International Airport Noise Rules* included:

- Restrictions on certain runways
- Restrictions on some ground operations
- Prohibition of old, noisy engine technology called Stage 2 during the sensitive nighttime hours.

BOS operates flights 24 hours a day. The noise rules, however, restrict the type of aircraft that operate at night to only Stage 3 commercial jet aircraft or quieter.

For over a decade, late night Stage 2 flights have been banned. Older and noisier Stage 2 aircraft engines were partially prohibited from operation in the U.S. in 2000, with a complete ban by 2015. This has positively affected all U.S. airports, including BOS, which saw a steady drop in Stage 2 operations. Neighboring areas have benefited from the elimination of these Stage 2 engines as air carriers and cargo operators modernized their fleets in compliance with federal mandates.

Massport has taken numerous steps to proactively decrease noise in neighboring areas:

- **No “hush-kitted” Stage 3 aircraft**
Massport aggressively discouraged the use of Stage 3 “hush-kitted” aircraft, which barely made the federally mandated noise cut off. In 2011, 99% of commercial jet activity was “new” Stage 3 and 4 aircraft (the quietest jets), up from 75% in 2000. Some of this fleet improvement was due to Massport's proactive work with air carriers that replaced their noisier shuttle aircraft (about 22,000 flights per year before 2001) with newer Boeing 737-800 and Airbus 319/320 aircraft.
- **Noise abatement office**
Massport has operated a noise abatement office (NAO) since 1977 to ensure compliance with federal noise standards. In order to reduce aviation noise on residents, the NAO has worked with air carriers and the Federal Aviation Administration to analyze how noise affects neighboring communities. The NAO operates a 24-hour noise “hotline” so neighbors can report excessive noise.
- **Early soundproofing tests**
In 1981, BOS was the nation's first airport to use federal funds to test the benefits of soundproofing in public schools. East Boston High School was the first public soundproofed school under this pilot program, which led to a wider program two years later. Since then, more than \$170 million has been spent on over 11,000 dwelling units and 36 schools.
- **Exposed population census**
Massport follows the noise standards established by both the Federal Aviation Administration and the U.S. Department of Housing and Urban Development. Those agencies consider exposure levels higher than 65 DNL (day-night noise level) to be incompatible with residential land use. According to federal standards, areas below 65 DNL are considered compatible with residential use; areas at or above 65 DNL are designated “incompatible” with residential use. Massport reports population counts by 5-decibel increments of exposure each year by community to track BOS's noise environment to determine if it is changing over time and from neighborhood to neighborhood.

Effects on the community

Aside from noise, Massport and BOS make other efforts to be “good neighbors” in Boston:

- Massport owns, operates and maintains over 40 acres of parks and passive recreation land in the region.
- Being a good community partner is a main priority for Massport, and staff meets regularly to discuss concerns and projects with community members and elected officials.
- Massport paid almost \$20 million in 2018 in Payment In Lieu Of Taxes (PILOT) funds to area communities, gave more than \$43,000 in scholarships to local high school students, and provided over 300 Community Summer Jobs positions.
- BOS was one of the first airports in the country to incorporate climate change into a sustainability plan.
- Energy reduction is a priority. New construction and renovation projects focus on energy conservation efforts and the installation of renewable energy sources.
- All airport development must integrate Leadership in Energy and Environmental Design (LEED) standards, to provide a framework to create healthy, highly efficient, and cost-saving green buildings.
- Greenhouse gas emissions per passenger have decreased by 38.1% since 2002.
- BOS’s 30% high-occupancy vehicle (HOV) mode share ranks top in the country alongside San Francisco International Airport.

C. MIAMI INTERNATIONAL AIRPORT

Miami International Airport (MIA) is one of three airports serving South Florida and is the main airport for long-haul international flights. It is in an unincorporated portion of Miami-Dade County, located approximately 8 miles northwest of downtown Miami and is surrounded by Miami, Miami Springs, and Virginia Gardens.

MIA is owned by Miami-Dade County and operated by the Miami-Dade Aviation Department (MDAD), which also operates four other local airports:

- Miami Executive Airport
- Miami-Opa-Locka Executive Airport
- Miami Homestead General Aviation Airport
- Dade-Collier Training and Transition Airport.

Aviation has operated on the site since 1928 when it was initially known as Miami City Airport. Today, MIA covers 3,230 acres, has 131 gates and four runways:

- 9/27 (13,016 feet)
- 8R/26L (10,506 feet)
- 8L/26R (8,600 feet)
- 12/30 (9,355 feet).

In 2018, MIA handled 45,044,312 passengers and 416,032 operations. In addition to car access, it is accessible via the city’s Metrorail system, the Tri-County Rail system, and local and long-haul bus routes. It also has an on-site shuttle system to connect between terminal concourses and the consolidated rental car center.

Figure 3.3

Miami International Airport
(photo courtesy of Google Earth)



Previous environmental impact statement

In August 1992, southern Florida was hit by Hurricane Andrew – a devastating Category 5 hurricane. Andrew’s winds were responsible for almost all damage in southern Florida, which included destroying or damaging over 164,000 homes, many of which were located between MIA and Florida’s eastern coastline.

As part of the recovery effort, new building standards were established to minimize future storm-related damage. These require that new construction have insulated roof systems, concrete/masonry walls, air conditioning, triple-pane windows, and other measures to withstand hurricane-force straight-line winds. This also make the homes more noise resistant, with a 25 dB interior noise reduction as a result. MDAD has never needed to offer noise mitigation packages as a result.

In 1995 as the area was recovering, MDAD was also proposing a new fourth runway (Runway 8L/26R) and prepared an environmental impact statement. That study showed there would be a total of 165,000 people living within the 65 DNL contour (mostly east of MIA to the coast). However, because of the new building standards that also significantly reduced interior noise, no additional noise mitigation packages were required. Runway 8L/26R was approved and is currently in service.

Noise abatement

While the new hurricane building standards benefited the proposed expansion of MIA, MDAD took additional measures to be a “good neighbor” with its surrounding areas:

- **“Fly neighborly” policy**
MDAD’s “Fly Neighborly” policy constantly evaluates arrival and departure procedures to reduce noise exposure on residential areas, including moving aircraft off runways as quickly as possible to minimize delay and to direct aircraft over points that minimize overflight of residential areas.
- **Restricted nighttime operations**
MDAD restricts nighttime operations when it closes two runways (Runways 8L/26R and 12/30) between 10 p.m. and 7 a.m. During nighttime operations, there are roughly 100 to 120 air carrier and cargo operations. Maintenance run-ups are also restricted to daylight hours only and must be performed at a mid-field location shielded by a blast fence.
- **Noise monitors**
MDAD previously operated a network of 20 noise monitors (known as remote monitoring stations) strategically distributed throughout the communities surrounding MIA. Locations were generally within the 65 DNL contour and were subject to political consideration before installed. Over time, all but six of these monitors were eventually removed because they were showing ongoing compliance with the current DNL contours. MIA’s actual flight experience has matched or has not exceeded the projected noise contours.
- **Noise hotline**
The airport operates a noise hotline monitored by MDAD staff between 6 a.m. and 9 p.m. (calls before and after those hours are recorded for follow up). There is also an email address for online noise complaints. Staff follow up on every call and identify each aircraft that may be violating the adopted flight paths or noise abatement procedures and sends a follow-up letter to each person making a noise complaint, with a copy to the Federal Aviation Administration. (Since the Federal Aviation Administration maintains radar data for only 30 days, any noise complaints received 30 days after the incident cannot be followed-up.) MDAD staff also meets with homeowner associations and other local groups on-demand to review comments and concerns.

- **Noise barrier wall**
A noise barrier wall was constructed by MDAD along the NW 36th Street edge of MIA to reduce taxiway noise in the adjacent neighborhoods. MDAD reports that aircraft noise has been decreased by 10 decibels within 500 feet of the barrier. The barrier was designed by internationally-renowned landscape architect Martha Schwartz as part of the airport’s “Art in Public Places” program.

- **NextGen procedures**
The airport has not yet enacted its NextGen procedures but anticipates these will be implemented by 2021 and will further reduce noise concerns. MIA requires that all glide-slopes be no less than 3 degrees to maximize the vertical distance between aircraft and land uses.

Figure 3.4
NW 36th Street Noise Abatement Wall
(courtesy of Miami International Airport)



Effects on the community

An active community outreach program engages the surrounding communities through a variety of efforts – public meetings, presentations, media, and a noise abatement task force. The task force meets monthly to review noise-related issues and concerns to ensure MDAD addresses them in a timely manner by. A noise abatement van has portable noise monitors that can be deployed throughout the area to record aircraft noise levels. MDAD staff also meets with residents or homeowner groups that have questions or concerns regarding MIA.

MDAD is also taking steps to improve its overall effect on the community:

- **Economic benefits**
In its 2017 annual report, MIA reported that it had an “annual financial impact on local tourism, cruise operations, international banking, trade and commerce of \$33.7 billion.” MIA and its aviation-related industries were estimated to contribute to 282,724 jobs (directly and indirectly), responsible for one out of every four jobs in south Florida.
- **PFC-Funded improvements**
In 1994, the Federal Aviation Administration authorized MDAD to impose a passenger facility charge (PFC) of \$3 per passenger, revised to \$4.50 effective January 2002. PFC revenues are authorized to pay debt service related to approved capital projects and related financing costs. The PFC authorization is expected to expire in October 2037. From 1994 through 2017, PFCs yielded \$1.34 billion (including accrued interest), with an unspent balance of \$227.4 million.
- **ISO 14001 certification**
MIA was the first U.S. airport to be ISO 14001 certified. To receive this certification, written procedures must be developed for all operational areas that are likely to handle potential pollutants, and employees must be trained accordingly. Those procedures must be reviewed and approved by an authorized ISO 14001 certification firm.
- **Reduction of diesel fuel and CO2 emissions**
Diesel-fueled ground support equipment (GSE) has been replaced with power and pre-conditioned air from airport facilities, reducing CO₂ emissions and reducing the use of diesel fuel by 131,400 gallons of diesel per year

D. PHOENIX SKY HARBOR INTERNATIONAL AIRPORT

Phoenix Sky Harbor International Airport (PHX) is the largest and busiest airport in the state of Arizona. Unlike BOS and MIA, PHX serves both civilian and military aircraft (it serves the Arizona National Guard's 161st Air Refueling Wing).

PHX is approximately 3 miles east of downtown Phoenix and has been in operation at this site continuously since 1928, when it had a single runway. It was initially developed by a private owner who gave it the name "Sky Harbor" (the reason for the name was never given since the airport did not operate as a "harbor" in 1928).

The city of Phoenix purchased Sky Harbor in 1935 and still owns and manages it (as the Phoenix Airport System). Today, PHX covers 3,400 acres, has 116 gates in three terminals, and is served by three runways:

- 8/26 (11,489 feet)
- 7L/25R (10,300 feet)
- 7R/25L (7,800 feet).

PHX has been a home base or major hub for several airlines including America West, US Airways, and most recently American Airlines (after its merger with US Airways in 2013). In 2018, PHX handled 44,943,686 passengers and 434,252 operations.

In addition to roadway and bus transit, users can access PHX using the Valley Metro light rail system. While it is not a direct light rail connection, it does have pedestrian bridge access to the PHX SkyTrain, which connects with the main terminal.

Noise abatement

In 2014, the Federal Aviation Administration mandated new flight tracks at PHX based on the NextGen satellite-based navigation procedures. This resulted in thousands of noise complaints from residential areas neighborhoods northwest and southwest of downtown Phoenix.

According to the Federal Aviation Administration, the NextGen system is:

"A modernization of America's air transportation system to make flying even safer, more efficient, and more predictable."

The intent is to make the U.S. airspace safer and more resilient for an estimated 2.7 million passengers and over 44,000 flights every day. At PHX, the NextGen procedures had unintended consequences of overflights in some residential areas increasing because ground-based navigation systems were no longer used.

By 2015, the new procedures were enough of a community concern that the city and the neighborhoods considered legal action against the Federal Aviation Administration. By 2018, after nearly four years of negotiating, appeals and further problems, the U.S. Circuit Court of Appeals (Washington D.C.) closed the lawsuit and mandated that the approach/departure paths revert to the routes in effect before September 2014 (those prior to the initiation of NextGen). The court's decision mandates that the Federal Aviation

Figure 3.5
Phoenix Sky Harbor International Airport
(photo courtesy of Google Earth)



Administration participate in Step 2 with the city, which entails further community workshops and alternate procedures to avoid further noise complaints.

Effects on the community

The NextGen noise lawsuit was one of the most visible issues regarding community compatibility. Other community effects include:

- **Economic benefit**
According to the city of Phoenix, PHX is directly responsible for \$12.3 billion in economic benefit and has 57,432 jobs at PHX. Regionally and indirectly, the economic benefits increase to over \$38 billion, 269,000 jobs, and \$13 billion in annual payroll.
- **Metropolitan growth**
The city of Phoenix has noted that PHX and other local airports contribute to the growth of the region. Phoenix projects it will be the fifth largest metropolitan region in the U.S. and considers airport access to be an important component to this growth.
- **Land use reinvestment strategy**
The city of Phoenix is in the process of a reinvestment and redevelopment strategy for those properties that were acquired west of PHX. This process is community-driven and is scheduled for implementation beginning in 2020, when requests for proposals will be advertised for “catalytic redevelopment sites.” This means the city will acquire land for compatible reinvestment and redevelopment by the public and private sectors.
- **Light rail extension**
The Valley Metro’s light rail line was extended to PHX, helping to reduce traffic congestion, reliance on cars and trucks, and a reduction in vehicular-related air pollution.

E. SUMMARY

Of the airports considered – Seattle, Boston, Miami and Phoenix – Seattle-Tacoma International Airport was the second smallest site with the fewest number of gates. Yet, it has the highest annual passenger count and annual number of operations of all four airports. Figure 3.6 lists the various attributes of the four airports, with the largest (or oldest) metrics shown in **bold**:

Figure 3.6
Airport Comparisons

Attribute	Seattle-Tacoma	BOS	MIA	PHX
Year Opened	1944	1923	1928	1928
Size (acres)	2,500 acres	1,700 acres	3,230 acres	3,400 acres
# of runways	3 runways	6 runways	4 runways	3 runways
# of terminals	3 terminals	4 terminals	4 terminals	3 terminals
# of gates	80 gates	103 gates	131 gates	116 gates
Passengers (2018)	49,849,520	40,941,925	45,044,312	44,943,686
Operations (2018)	438,391	424,024	416,032	434,252
Efficiency ratios (2018):				
▪ Annual passengers per operation	113.7	96.6	108.3	103.5
▪ Annual passengers per gate	623,119.0	397,494.4	343,849.7	387,445.6
▪ Daily passengers per gate	1,707.2	1,089.0	942.0	1,061.5

Source: Port of Seattle, Massport, Miami-Dade Aviation Department, and City of Phoenix

The following summarizes some of the highlights of the comparison Seattle-Tacoma International Airport with the BOS, MIA, and PHX:

- **Performance**
Seattle-Tacoma International Airport is an extremely efficient facility. It has the highest ratio of passengers per operation, but the number of annual passengers per gate far exceeds that of the other three airports. On a daily basis, Seattle-Tacoma International Airport is currently handling over 1,700 passengers per gate per day every day (annual average). Seattle-Tacoma International Airport has successfully leveraged a relatively small and landlocked site into a Top 10 performing airport (the eighth largest by passenger count).
- **Effect of NextGen procedures**
The experience of PHX with the NextGen procedures is similar to that experienced in the study area cities. The concerns of study area residents, particularly in Burien, Des Moines, Federal Way, and Normandy Park, is that while NextGen procedures reduced the overall size of the noise contours, it also concentrated flight paths in a narrower track directly over residential areas.
- **Legal challenges**
PHX's NextGen lawsuit and Burien's challenge of the 250-degree heading demonstrate there may be successful challenges to Federal Aviation Administration policies and procedures.
- **Noise sbatement**
MIA's various outreach programs, including a van equipped with mobile noise monitors, was the most far-reaching effort of the airports studied. The designed "art noise wall" may not be a perfect solution, but it is an indicator of Massport's interest in providing some measure of abatement approaches that are sensitive to its surroundings.
- **Community outreach**
MIA and BOS appear to have the most extensive outreach efforts of the case study airports. From jobs to art to park programs, the efforts of Miami's MDAD and Boston's Massport are worth further studying to see how they may be applied in the study area cities.
- **Environmental concerns**
MIA and BOS seemed to do more when it comes to policies and procedures designed to protect the environment, from ISO certification to LEED building practices to how aircraft are powered and cooled while parked at the gate.
- **Reinvestment**
The land use redevelopment strategy at PHX could be thought of as "mitigation plus." It is not enough just to acquire parcels that are affected by noise. Phoenix is working with the community to return these parcels to active development, perhaps adding jobs and revenue back into the region, rather than leaving them undeveloped and empty.

While this series of case studies does not cover every comparable U.S. airport to Seattle-Tacoma International Airport, it does point to some areas where comparable airports are doing as much or more to address community concerns. This should not be interpreted as a critique or condemnation of the efforts to-date by the Port of Seattle. It does indicate what comparably sized landlocked airports with similar annual passenger and operation performance are doing to address community concerns regarding their facilities. To get a more complete picture of how U.S. airports comparable to Seattle-Tacoma International Airport address their community compatibility issues, funding of a more extensive survey is recommended.

F. REFERENCES

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