NextGen for Airports, Volume 4: Leveraging NextGen Spatial Data to Benefit Airports: Guidebook

DETAILS

104 pages | 8.5 x 11 | PAPERBACK
ISBN 978-0-309-44596-2 | DOI 10.17226/24604

AUTHORS

Mark Ricketson; Airport Cooperative Research Program; Transportation Research Board; National Academies of Sciences, Engineering, and Medicine

C Interviews and Case Studies

To better understand how programs that are relevant to this study were utilizing or creating spatial data within a particular area tied to NextGen, a series of interviews were conducted with both public- and private-sector agencies. Many of the findings from these interviews have been incorporated into ACRP Project 09-12, as they were a key source of information used to develop the research team's findings and suggested actions for airports. The organizations interviewed via telephone are documented in Table C-1. Longer telephone interviews were conducted with a sampling of airports, and in-person interviews were conducted with two state aviation agencies. These more-detailed interviews were expanded to create the case studies and interview summary presented in this appendix. These case studies and interview summary document what is known about NextGen at these airports or agencies, how spatial data has helped to support the implementation of a particular NextGen program(s) at that airport or agency, and what the current status is of the use of spatial data at the airport or agency.

In July 2014, three major airports and one state agency were interviewed in order to better understand what these airports knew about the requirements of NextGen as it relates to spatial data, how they were learning what these requirements are, and whether they had ever developed and/or received spatial data (knowingly or not) tied to a NextGen program. These organizations included San Francisco International Airport (SFO), Portland International Airport (PDX), Seattle Tacoma International Airport (SEA), and Washington State Department of Transportation Aviation Division (Washington State DOT). These four organizations were chosen because they are considered sophisticated GIS users and implementers, GIS is employed in much of their daily business processes, and has been so for several years. In addition, two of these airports have completed a full Airports Geographic Information System (AGIS)–compliant airfield mapping project and submitted it to the FAA. As part of its upcoming State System Plan, Washington DOT will oversee the collection and conversion of AGIS data at a minimum of four airports within the Puget Sound area in 2015 and 2016, and potentially others in the coming years. These initial interviews were followed up by additional interviews with Dallas/Fort Worth International Airport (DFW)—one of the very first AGIS airports—and with the Texas Department of Transportation (Texas DOT).

In addition to these agencies, interviews were conducted with individuals whose work in some key way touches a particular NextGen program. A goal of this study was to restrain the research to NextGen programs that have or potentially could have a direct impact on airport operations, and of these programs, to focus on those that either have a need for or potentially could produce spatial data. The guidebook discusses how these specific NextGen programs were selected. In accordance with the project goals, the researchers limited the interview pool to agencies that have ties to the selected programs. In general, NextGen programs such as multiple runway operations (MRO), Performance-Based Navigation (PBN), and Surface Operations and Data Sharing all have a need for or produce spatial data, and were the focus

Table C-1. Interviews and webinar overview.

Agency	Date of Interview	NextGen Program
FAA Flight Procedures – Southern Region	August 31, 2015	• PBN/Flight Procedures • AGIS
FAA Office of Airports/AGIS	January 2016	• AGIS
Private Sector Aviation Firm	November 5, 2015	• NavLean SME/Past FAA NavLean Specialist
JetBlue	September 14, 2015	• PBN/Flight Procedures – airline perspective. • Surface operations • Cockpit avionics – moving map
American Airlines	September 9, 2015	• PBN/Flight Procedures – airline perspective. • Surface operations • Cockpit avionics – moving map
RTCA	June 1, 2015	• Multiple NextGen • DO 272
FAA – Office of the Assistant Administrator for NextGen	June 3, 2015	• Multiple NextGen • DO 272
Webinar	January 19, 2016	
In addition to the project team, webinar participants included airline and airport staff, FAA HQ and Southern Region representatives, a state DOT representative, and NextGen consultants.		

of these interviews. Because PBN has the most direct need for spatial data, multiple interviews were conducted about PBN with FAA staff, private-sector contractors, and the airlines.

In January 2016, a webinar was planned that included both follow-up contact with some of the participants who had previously been interviewed and other key stakeholders who in some way have an impact on or utilize spatial data for NextGen programs. The webinar included a briefing by the ACRP Project 09-12 team on the findings of the study and an open discussion with the group on the information presented as well as key issues that each of the participants felt were important to review.

Interview Summaries/Case Studies

The information in this section is current as of publication of *ACRP Report 150, Volume 4.* Airports documented here, such as San Francisco and Seattle Tacoma International, have realized direct benefit from NextGen, in particular PBN. Although the Greener Skies Initiative at Seattle is discussed in these case studies, the situation is still in flux. The same is true for San Francisco.

Washington State Department of Transportation, Aviation Division (Washington State DOT)

When: July 10, 2014

In May 2013 The Puget Sound Regional Council (PSRC) published a study titled, "Preparing Busy General Aviation Airports for Next Generation Technologies." This study "presents a regional/system planning approach to identifying the general aviation (GA) benefits that can be realized through the deployment and implementation of the Federal Aviation Administration's NextGen program" (PSRC 2013, p. 6). [Editor's note: for convenience, all author date references that appear in the Appendices are cited in the guidebook's References and Bibliography section.] In this study, 13 busy airports within the Puget Sound Region were identified that could benefit tremendously through the application and implementation of NextGen technologies. In order to benefit from these technologies—particularly through the implementation of new flight procedures (i.e., PBN)—it was recommend that one of the major elements that each of these airports undertake is the development of new AGIS-compliant spatial data.

While a few of these airports, such as Boeing Field and Renton, would apply for and receive FAA funding and be managed and implemented as individual projects, other airports in this study would be funded by a portion of federal dollars and state funding and managed by Washington State DOT as part of the State Aviation System Plan. The Aviation Division of Washington State DOT has managed a statewide GIS program of aviation and airport-specific information that is used for a variety of reasons, including land use compatibility, basic airspace analysis, and airport demographics, and to provide approved users with specific data sets of airports across the state of Washington.

It is now part of Washington State DOT's plans to oversee the development of new AGIS data at four airports initially in order to support the development of new performance-based procedures at these airports. The goal for these busy airports is to be able to continue or enhance their ability to efficiently operate in the Puget Sound airspace while supporting larger private aircraft as well as operations by Boeing at their facilities throughout Puget Sound.

Seattle-Tacoma International Airport (SEA)

When: July 10, 2014

Seattle-Tacoma International Airport (SEA) has been utilizing GIS technologies and developing spatial data for several years. The airport's GIS is integrated with other business systems and used by most departments/divisions at SEA. SEA has developed a full AGIS-compliant data set and had it approved by the FAA. However, they still utilize their own data developed by SEA staff for all of their airfield needs; that is, they have complied with the standards but have chosen to not to use the data for their everyday needs.

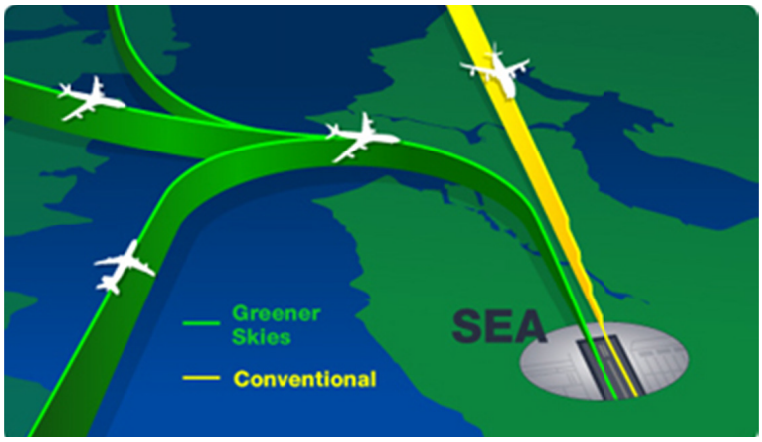

Figure C-1. *Greener Skies Over Seattle Initiative (FAA NextGen Snapshots).*

SEA is the 16th busiest airport in North America in terms of passenger traffic. Several NextGen capabilities have been implemented, including Airport Surface Detection Equipment, Model X (ASDE-X), PBN procedures (as part of the Greener Skies initiative—see Figure C-1), Optimized Profile Descent (OPD), and Time-Based Flow Management (TBFM). All of these NextGen capabilities either require or enable the use of spatial data that could benefit the airport. In addition, spatial data already generated by the airport could support any one of these NextGen capabilities or technologies.

The AGIS data that was submitted by SEA was used at least partially in the development of their PBN-based flight procedures. Interviews with flight procedures specialists from Ricondo, the Southern Region of the FAA, and others confirmed that certain features from AGIS are used in developing many of these new flight procedures at many airports around the country although it is nearly impossible to determine specifically which features are used for flight procedures design. What features are used is not publicized, and there is no public standard used as a guideline. In the case of several airports that now have new PBN-based procedures or simultaneous departures (e.g., Hartsfield-Jackson Atlanta International Airport), it is difficult to trace back directly to the spatial data source of the new procedures.

Portland International Airport (PDX)

When: July 9, 2014

Portland International Airport (PDX) is another sophisticated GIS user in the airports community. PDX has been using GIS for several years, with a focus on the airport's buildings and facilities. While PDX has airfield base map information, they have not currently completed a full AGIS-compliant project or submittal to the FAA. The airport does have plans for completing such a project in the next 1–3 years. PDX is an interesting case study because the staff possesses a very high level of technical skill in administering, developing, and customizing their GIS and require very little consulting help. They do utilize outside help from consultants when there is a need for additional resources to focus on a specific need.

PDX is part of the FAA's Northwest Mountain Region, a region that has been more apt to enforce the AGIS standards than other FAA regions. Considering their high level of GIS sophistication, the fact that the airport has not yet completed a full AGIS-compliant data set is noteworthy. Through questions that were raised during the interviews, it was generally stated that PDX just hasn't seen a strong need for

AGIS-compliant data yet. They understand the benefits of complying with a standard and developing the data to certain levels of accuracies and completeness; however, having data that is out of compliance has not yet had an adverse impact on the airport.

San Francisco International Airport (SFO)

When: July 8, 2014

An interview was conducted with some of the key management team that is responsible for all spatial data that is developed by SFO staff or developed by consultants and contractors and then utilized by SFO. The intent of this interview was to inquire about the use of the spatial data in support of their daily operations, how it is or potentially could be used to support NextGen-related programs that are either in place at SFO or somehow impact its operations, as well as to document the state of the airport's AGIS program and how and if any of that data has been provided to NextGen program work.

Several NextGen capabilities have been implemented at SFO, including PBN procedures and high-altitude PBN routes, tailored arrivals, TBFM, and Wake Turbulence Mitigation for Departures (WTMD), among others.

SFO completed one of the first AGIS-compliant projects in the country as part of the second phase of the FAA's pilot program. They have been using GIS for the past several years to support utilities management, airfield changes, providing accurate base map information to different divisions, and for specific project support across the airport. At the same time as the AGIS project was getting underway, SFO was also beginning the design and construction of seven runway safety areas (RSAs) and the shifting of one runway. The airport also had other major capital projects either in final stages (e.g., Terminal 2) or in the very early stages (e.g., Terminal 1 and the new FAA tower). One of the RSA projects had a critical deadline to achieve so that the airspace analysis and new flight procedures could be created to reflect the change in the runway end configuration, thresholds, and so forth. The AGIS project made this the high priority area for the initial deliverables. By having the new imagery, obstructions identification, and the new runway ends surveyed, the RSA could proceed with design and ultimately break ground for construction on time. At the same time, because SFO has a lot of terrain around the west side of the airport, the airspace analysis was also a critical need in the schedule. Over 35,000 obstacles were reviewed and mapped, and determinations on impacts to the airspace, climb gradients for certain types of aircraft, threshold placements, and other items all were analyzed. As the data conversion neared completion, it was immediately apparent that due to the many changes to the airfield and the areas around the terminals, the data that was created and utilized throughout the 2+ years of its conversion needed to be updated. Most of the airfield had not changed, so the original AGIS data set was still applicable; however, certain large areas had changed and needed to be reacquired, surveyed, and converted. Given the many issues of airfield changes, the multiple RSAs, and the fact that SFO is a major component of the Metroplex in the San Francisco Bay Area, having up-to-date and accurate AGIS data in the FAA's database has been essential.

Dallas/Fort Worth International Airport (DFW)

When: January 23, 2015

In 1999, Dallas/Fort Worth International Airport (DFW) was one of six airports in the FAA Southwest Region to participate in the FAA's National Phase I program to roll out the AGIS program. FAA's Phase I program included large and small airports. Some airports, such as DFW, had significant experience with GIS while other airports did not utilize the technology as part of their routine airport manage-

ment. DFW completed the AGIS Phase I project in 2011 and has been utilizing the data since that time.

Several NextGen capabilities have been implemented at DFW, including ASDE-X, PBN procedures, basic rerouting, and TBFM.

DFW has a small but focused professional staff that has successfully integrated GIS technology into the organization. There are approximately 40–60 internal web-based GIS users throughout all organizational units. Management is keenly aware that the technology greatly improves collaboration and reduces costs/time to make important business decisions. A prime and oft-cited example is the GIS-based analysis that was conducted when a major air carrier was considering requesting fuel-saving modified flight routes for arrivals and departures that would expose non-compatible residential homes to overflights and materially increased noise exposure. GIS was used to quickly estimate the areas impacted by the proposed flight tracks, the number of residences within the associated noise contours, and the appraised values of the homes, supporting an estimate of the potential mitigation cost. As a result of the rapid analysis, a joint decision was made not to further pursue the flight path modifications.

During scoping of DFW's Phase I pilot program, the airport worked closely with the FAA and a consultant to determine imagery resolution, feature classes (layers) to be included, and the attributes to be collected. The decision was made to increase the imagery resolution above the minimum required to meet the Advisory Circular (AC) requirements for obstacle accuracy. Most feature classes were collected as part of the project, including generating 1 ft. ground contours. While all participants were aware that the higher resolution imagery and 1 ft. contours would increase cost, it was believed the costs were justified: the additional data layers would support upcoming engineering design projects. The higher resolution aerial photography was envisioned to:

- Support the asset capital maintenance program,
- Assist in justifying FAA grant program requests,
- Generate a terrain model, and
- Integrate with the work-order management system.

DFW believed the AGIS Phase I initiative would increase the essence of their "C3" partnering (communication, collaboration, and coordination). There was significant overlap of GIS data layers between DFW's existing database and those required by AGIS. The AGIS initiative increased the number of feature classes (GIS layers) by 40 (to 190 GIS layers). DFW uses 4–6 person-months per year to maintain GIS map layers.

DFW leveraged AGIS Data to improve C3 partnering and reduce costs/time in the following areas:

- Collecting AGIS-required layers, according to FAA criteria, when existing airport data layers were in the dataset, forced a detailed data reconciliation to ensure data integrity for accurate decision making.
- The high resolution imagery allowed DFW to separately map individual runway, taxiway, and apron panels. Combined with other data including pavement age, pavement distress, daily inspections, repair history, and airfield operations, the airport was able to reveal patterns in pavement condition to guide capital renewal decision and maintenance activities. The airport also mapped pavement with additional polygons to support Notices to Airmen (NOTAMs) and areas closed to operations.
- Collecting robust flora, fauna, and wetlands/hydrology data layers and combining them with bird strike events, avian radar data, and mowing areas, the airport was guided in assessing wildlife activity patterns to improve their wildlife management program.

- DFW sees value in the 3-D data model versus their legacy 2-D model; however, the value has not been exploited at this time.
- The ground contour data has been utilized substantially since being available to the airport.
- Utilizing the terrain and contour data, a hydrological model was developed that was the foundation for a hydraulic planning study.
- To support drilling 25 gas wells on the airport, the airport and the proponent utilized the 1 ft. AGIS contours to determine ground elevations exceeding FAA's highest level of survey accuracy (1A = +20 ft. horizontal, +3 ft. vertical). The FAA agreed to a certification from the proponent/airport that the remote sensing criteria exceeded these limits, thereby reducing the cost/time for a ground survey to be conducted and checked for each of the proposed drill sites.
- Dallas Area Rapid Transit (DART) and TEX Rail utilized the ground contours while planning rail service to the airport, thus reducing their time and costs.
- In 2013, the airport conducted a North and South Taxiway Crossover Study evaluating options for end-around taxiways and additional taxiway bridges over International Parkway. Again, the ground contour data from the AGIS initiative was utilized in the evaluations, eliminating the time and cost to conduct a ground-based survey.
- In 2014, DFW conducted a follow-on taxiway centerline profile feasibility study to refine the analysis for the most promising crossover and end-around taxiways. Again, the 1 ft. contour data was utilized.
- DFW is in a non-attainment area, and implementation of PBN, combined with the FAA's Optimization of Airspace & Procedures Modernization initiative, has reduced carbon emissions, providing improved air quality for the local community and benefits to the State Implementation Plan (SIP). With the tighter PBN flight paths and smaller noise contours, the opportunity exists to utilize undeveloped land for otherwise non-compatible development.

Texas Department of Transportation, Aviation Division (Texas DOT)

When: February 23, 2015

Texas is a block grant state, which means the Texas DOT functions very much like an FAA ADO in that the agency oversees multiple airports and their funding, including planning, programming, and providing grant money for improvement projects. Texas DOT does operate a significant GIS program at the agency level that provides some support to the Aviation Division. The agency enforces its own computer-aided design (CAD) standards for Airport Layout Plan (ALP) submissions from GA airports. The only GA airport in the Texas DOT system to have done a full AGIS-compliant data set is Fort Worth Meacham International Airport (FTW), which submitted its data to the FAA in 2014.

Texas DOT does not yet consider it cost effective to develop full AGIS-compliant data sets and is waiting for the FAA's system to mature to the point where the agency can see value provided back to Texas DOT airports. Texas DOT is enforcing the obstruction surveys needed at their GA airports in compliance with AC 150/5300-18B. The only NextGen program that the agency has had experience with is Area Navigation (RNAV) and related approach procedures.

According to Texas DOT, they frequently add additional scope to the remote sensing projects (imagery collection) to provide line work required for ALP updates. Texas DOT believes this is very cost-effective, as the imagery has been collected and is also being utilized for obstacle analysis. Because the resulting product is geospatially referenced, it is efficient and cost-effective to update existing ALP layers for the airport with the newly surveyed information.

The "18B" obstruction surveys (see FAA AC 150/5300-18B) have led to interesting challenges. In one situation, the survey allowed the airport to have ¾ mi. minima. This caused the approach runway protection zone (RPZ) outer width to increase from 700 ft. to 1,510 ft. As a result, nine non-compatible land use residences were included in the RPZ, and it was considered financially and politically expensive to acquire the homes to remove the non-compatible land use. An analysis of weather data indicated that visibility minimums were between ¾ mi. and 1 mi. only 0.27% of the time. As a result, a decision was made to increase the published approach minima to not less than 1 mi., allowing the airport to utilize the smaller approach RPZ and eliminating non-compatible land use.

It was noted by Texas DOT that the higher quality data acquired in the 18B-compliant obstruction surveys identified critical obstacles not previously identified on airports' radar screens. This led to additional obstacle removal, lighting, or loss of instrument approaches.