The National Academies of
SCIENCES • ENGINEERING • MEDICINE

TRANSPORTATION RESEARCH BOARD

NextGen for Airports - Introduction and Overview

Monday, May 22, 2017
2:00pm to 3:30pm ET

Purpose

Discuss research about the Next Generation Air Transportation System (NextGen).

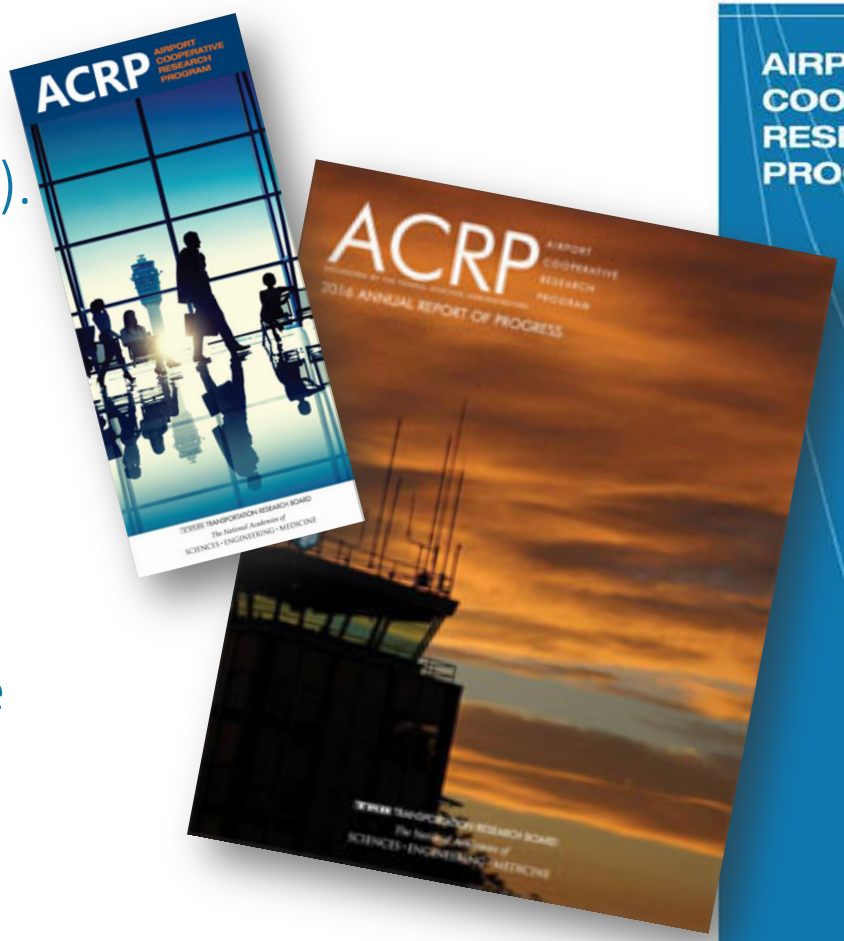
Learning Objectives

At the end of this webinar, you will be able to:

- Discuss the NextGen program
- Identify how the NextGen program can impact airports
- Discuss NextGen spatial data's benefits and the data's financial and legal considerations

ACRP is an Industry-Driven Program

- Managed by TRB and sponsored by the Federal Aviation Administration (FAA).
- Seeks out the latest issues facing the airport industry.
- Conducts research to find solutions.
- Publishes and disseminates research results through free publications and webinars.



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Opportunities to Get Involved!

- ACRP's Champion program is designed to help early- to mid-career, young professionals grow and excel within the airport industry.
- Airport industry executives sponsor promising young professionals within their organizations to become ACRP Champions.
- Visit ACRP's website to learn more.

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Upcoming ACRP Webinars

May 24th

NextGen for Airports – Resources and Guidebooks

June 12th

Information Technology Systems at Airports

June 20th

Business Continuity Planning
for Disruptions at Airports

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Additional ACRP Publications Available on this Topic

Report 150: NextGen for Airports, Volume 1: Understanding the Airport's Role in Performance-Based Navigation: Resource Guide

ACRP Report 150: NextGen for Airports, Volume 2: Engaging Airport Stakeholders: Guidebook

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Today's Speakers

NextGen for Airports

Robert Hemm and Virginia Stouffer, Logistics Management Institute

Presenting: Report 150, Volume 3 – Resources for Airports

Mark Ricketson, Woolpert, Inc.

Presenting: Report 150, Volume 4 - Leveraging NextGen Spatial Data to Benefit Airports: Guidebook

William Dunlay, LeighFisher

Presenting: Report 150, Volume 5 - Airport Planning and Development

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ACRP Report 150
NextGen for Airports – A Primer
ACRP NextGen Initiative Webinar

LMI

in association with

LeighFisher Inc.

RFMarchi Aviation Consulting, Inc.

Sharp & Company

Virginia Stouffer, LMI, Task Lead

Bob Hemm, LMI, Principal Investigator

May 22, 2017

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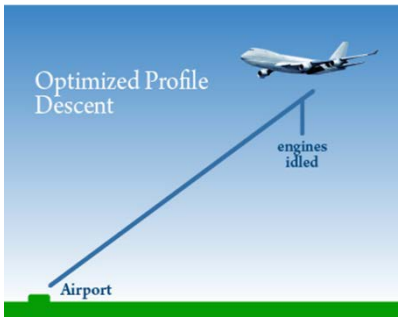
Outline

- Problem Statement
  - What is NextGen?
  - Why is “NextGen for Airports” Needed?
- Summary Contents of ACRP Report 150
  - A Primer, plus Five volumes
- LMI Team Products
  - A Primer
  - Volume 3: Resources for Airports
  - Public Information Toolkit



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What is NextGen and What is its Status?

NextGen is a set of evolving technologies intended to provide more efficient and predictable communications, navigation, and surveillance in the National Airspace System (NAS)

- Voice communications being replaced by digital (data-link) communications
- Point-to-point navigation using ground-based NAVAIDS being replaced by performance-based navigation using GPS waypoints
- GPS-based Automatic Dependent Surveillance-Broadcast (ADS-B) is becoming the primary means of surveillance

The goals of NextGen are to

- modernize air traffic control equipment and procedures
- increase air traffic capacity
- increase flight predictability and reliability
- make flights more efficient, reducing fuel burn and emissions

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Why is “NextGen for Airports” Needed?

NextGen Issue	Report Goal
NextGen is massive, complicated, technical and confusing	Explain NextGen in simple terms; history, changes, impacts
NextGen has some bad press: “NextGen = noise”	Recognize the gap between FAA and airports in community involvement and outreach
“I’ll learn about it when it gets here”	Parts are here now: • Parallel runway operations, GBAS and MLAT approaches enable curved and/or spiral approaches, without ILS in bad weather • GIS mapping required for AIP • Increases in peak capacity require forward planning

GBAS: Ground-based Augmentation System
MLAT: Multilateration
ILS: Instrument Landing System
GIS: Geographic Information System
AIP: Airport Improvement Program

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Complete Set: ACRP Report 150: *NextGen for Airports*

Executive Primer: "A Primer" provides an overview of NextGen elements and airport impacts, benefits, and issues, plus highlights of the five volumes.

Volume 1: "Understanding the Airport's Role in Performance-Based Navigation (PBN): Resource Guide" provides a deep exploration of the transformations for airports and operators from PBN.

Volume 2: "Engaging Airport Stakeholders: Guidebook" helps explain NextGen issues to an airport's local business and political leaders, community members, the press and other interested parties.

Volume 3: "Resources for Airports" (companion report to the ***Primer***) provides, for airport planners, engineers, operations staff, and others with day-to-day responsibility for running airports, succinct summaries of 27 NextGen programs with links to FAA NextGen-related websites.

Volume 4: "Leveraging NextGen Spatial Data for Airports: Guidebook" looks at new geographic information system requirements for airports, and how those requirements can be turned into long term airport assets.

Volume 5: "Airport Planning and Development" provides guidance to the airport planning practitioner on the impacts of NextGen projects and programs on an airport's planning and development programs.

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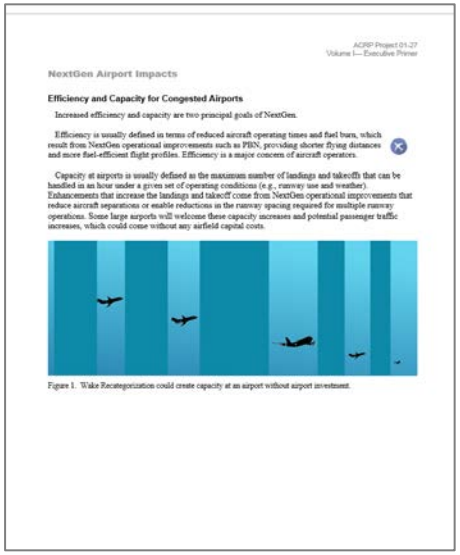
The Three LMI Team Products:
Audiences and Content

The Executive Primer

Senior airport decision makers

Directors, Presidents, Chief Executive/Financial Officers, Airport Board



ACRP Project 01-27
Volume I— Executive Primer

NextGen Airport Impacts

Efficiency and Capacity for Congested Airports

Increased efficiency and capacity are two principal goals of NextGen.

Efficiency is usually defined in terms of reduced aircraft operating times and fuel burn, which result from NextGen operational improvements such as PBN, providing shorter flying distances and more fuel-efficient flight profiles. Efficiency is a major concern of aircraft operators.

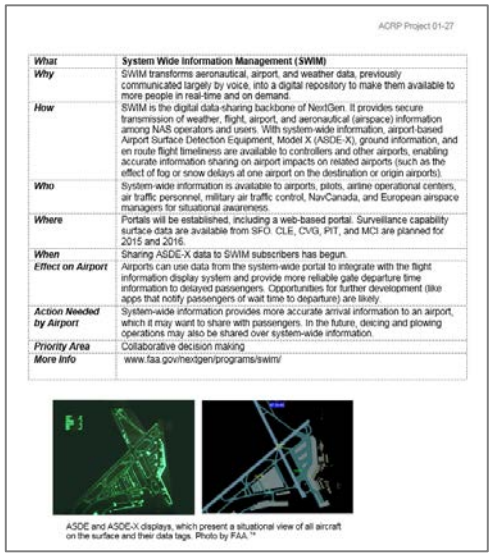
Capacity at airports is usually defined as the maximum number of landings and takeoffs that can be handled in an hour under a given set of operating conditions (e.g., runway use and weather). Enhancements that increase the landings and takeoff come from NextGen operational improvements that reduce aircraft separations or enable reductions in the runway spacing required for multiple runway operations. Some large airports will welcome these capacity increases and potential passenger traffic increases, which could come without any airfield capital costs.

Figure 1. Wake Recategorization could create capacity at an airport without airport investment.

Describe broadly what to expect from NextGen and its programs

ACRP 150 Volume 3: Resources for Airports

Airport professional staff members and consultants



ACRP Project 01-27

What	**System Wide Information Management (SWIM)**
Why	SWIM transforms aeronautical, airport, and weather data, previously communicated largely by voice, into a digital repository to make them available to more people in real-time and on demand.
How	SWIM is the digital data-sharing backbone of NextGen. It provides secure transmission of weather, flight, airport, and aeronautical (airspace) information among NAS operators and users. With system-wide information, airport-based Airport Surface Detection Equipment, Model X (ASDE-X), ground information, and en route flight timeliness are available to controllers and other airports, enabling accurate information sharing on airport impacts on related airports (such as the effect of fog or snow delays at one airport on the destination or origin airports).
Who	System-wide information is available to airports, pilots, airline operational centers, air traffic personnel, military air traffic control, NavCanada, and European airspace managers for situational awareness.
Where	Portals will be established, including a web-based portal. Surveillance capability surface data are available from SFO, CLE, CVG, PIT, and MCI are planned for 2015 and 2016.
When	Sharing ASDE-X data to SWIM subscribers has begun.
Effect on Airport	Airports can use data from the system-wide portal to integrate with the flight information display system and provide more reliable gate departure time information to delayed passengers. Opportunities for further development (like apps that notify passengers of wait time to departure) are likely.
Action Needed by Airport	System-wide information provides more accurate arrival information to an airport, which it may want to share with passengers. In the future, deicing and plowing operations may also be shared over system-wide information.
Priority Area	Collaborative decision making
More Info	www.faa.gov/nextgen/programs/swim/

ASDE and ASDE-X displays, which present a situational view of all aircraft on the surface and their data tags. Photo by FAA.[14]

Details of NextGen programs, where to go for more education and involvement

The Public Information Toolkit

External stakeholders

Local politicians, Business leaders, Surrounding community, Environmental advocates, Local pilot community, and others

NextGen Is Changing Air Travel

NextGen, the Next Generation Air Transportation System, is a set of programs being implemented by the Federal Aviation Administration (FAA) over the next several years. It's comprised of a number of efforts that will advance air travel safety, efficiency, and environmental impact.

NextGen replaces ground-based tracking systems with satellite-based Global Positioning Systems (GPS). This change allows more precise, accurate routing and tracking of aircraft, on the ground and in the air.

AIRPORT OPERATIONS WILL IMPROVE

Implementing NextGen will bring three major changes to airport operations:

- New technologies will change flight procedures, enabling aircraft to fly much more precise routes and reduce weather-related delays.
- Automated tracking technologies will pinpoint aircraft in the air and on the ground, allowing for better aircraft management and reducing fuel waste.
- More sophisticated data collection and sharing will provide air traffic controllers with a better picture of aircraft operations and enable better system-wide planning.

NextGen Pinpoints Aircraft Locations

State-of-the-art technology is projected to create greater safety and increased efficiencies

Just one change—reducing air travel delays caused by weather—will have a significant impact on the air travel system. Delays at large airports cause ripple effects throughout the system, impacting airports of every size. NextGen technology addresses this by pinpointing aircraft position relative to weather systems and precisely rerouting travel to avoid weather problems.

AIRCRAFT POSITIONING UPDATE FREQUENCY

Radar-based — NextGen-based

NEXTGEN REDUCES DELAYS

Delays occurring in radar-based systems have a ripple effect, creating more delays

SMALLER AIRPORTS WILL ALSO BENEFIT

NextGen improvements will be seen in smaller and general aviation airports, too. The same technology enhancements happening at large metroplex airports will mean better instrument approaches and safer air travel. General aviation pilots who install an Automatic Dependent Surveillance-Broadcast (ADS-B) unit in their aircraft will receive the same precise weather and other flight information – including notification of nearby aircraft – right to their cockpit. It's already helping ADS-B-equipped pilots at Charles M. Schulz in Sonoma County, California land their aircraft when the approach is covered in fog.

NEXTGEN SUPPORTS ENVIRONMENTALLY HEALTHY GROWTH

With NextGen, airport takeoffs and landings follow more precise noise abatement flight tracks. Continuous descent reduces nitrous oxide emissions. Along with better management of airplanes on the ground, this means less fuel burned and lower exposure to noise from gate to gate.

In Seattle, NextGen improved the environment:

-3.1 million gallons of fuel used
-22 tons of nitrogen oxide emissions
-4.7 minutes average taxi-out time
750,000 people exposed to noise reduced

NEXTGEN ALSO RAISES SOME CONCERNS

The NextGen system isn't perfect. In order to make the entire system more environmentally positive, some individuals and communities will notice increased noise as air traffic is concentrated along a narrower path. Our airport will work closely with the FAA as they develop NextGen procedures for our airport to maximize the environmental benefit and avoid negative impacts.

FIND OUT MORE

Here's where a resource, if available, will be listed for people to review.

AIRPORT LOGO CAN BE PLACED HERE

70%

PERCENTAGE OF DELAYS THAT ARE ATTRIBUTABLE TO WEATHER

Weather has often been a major factor in flight delays. According to the FAA, 70% of flight delays can be attributed to weather. Now, with NextGen, airplanes can share exact weather data with controllers and reroute around weather systems. In terminal areas, NextGen technologies allow increased runway capacity during inclement weather. With NextGen, it is possible to have safe arrival and departure windows that would previously have been closed due to weather.

KNOWING nextgen

Page 1 of 2 — https://www.faa.gov/nextgen/

Page 2 of 2 — https://www.faa.gov/nextgen/

Lay-level information for airports to use with public outreach

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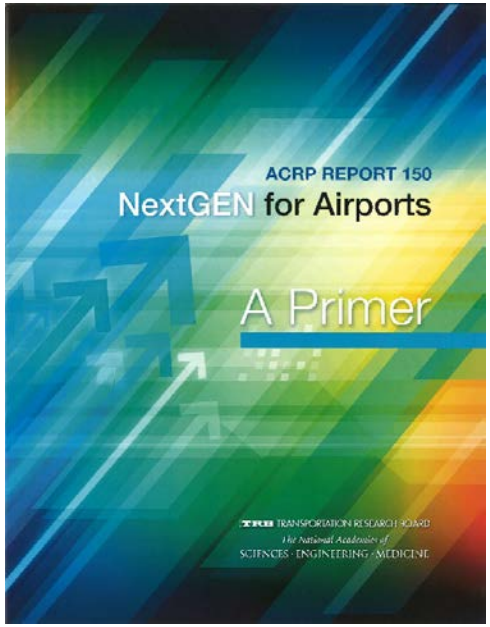

Executive Primer

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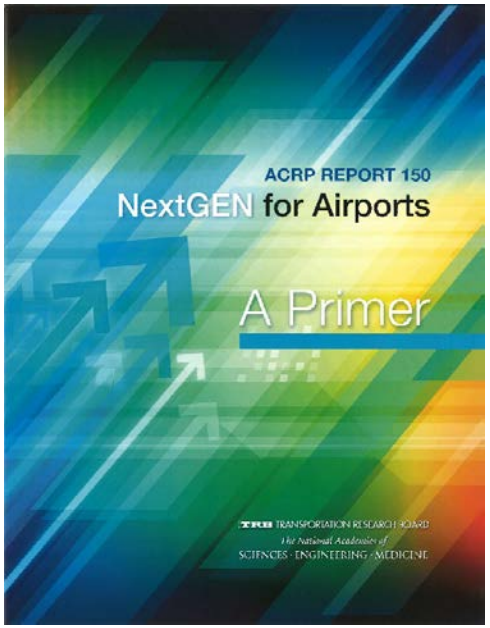
Executive Primer, “A Primer”

- Concise information!
- Topics
  - What is NextGen
    - and why should you care, in 20 pages
  - NextGen Airport Impacts
    - Efficiency and Capacity for Congested Airports
    - Benefits for Uncongested Airports
    - Environmental Issues
    - Environmental Review Process
    - Financial Issues
    - Infrastructure and Capital Planning
  - NextGen Capabilities for Airports
    - Safety Improvement from Vehicle Tracking
    - Surface Operations Improvement from Collaboration
    - Improved Capability for Multiple Runway Operations
    - Increased Capacity during Instrument Conditions
    - Flight Time Fuel Savings with Performance-Based Navigation (PBN)
    - Improved Data Availability with System-Wide Information Management (SWIM)
  - Highlights of the Five Companion Reports



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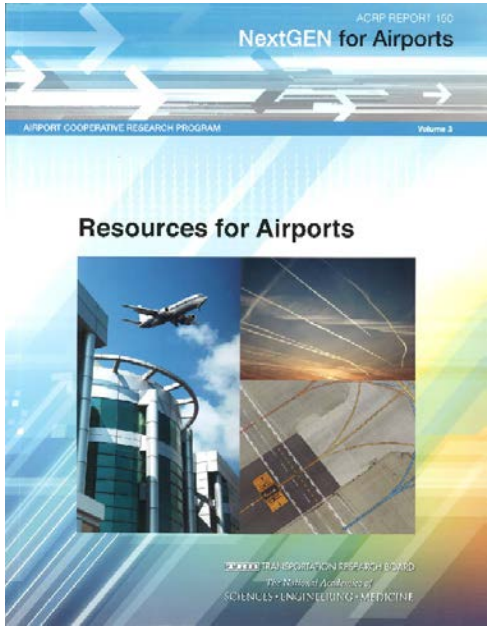

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Volume 3: *Resources for Airports*

Volume 3: "Resources for Airports" Contents

1. **Introduction: What is NextGen and its Impact on Airports?**
2. **NextGen Architecture and Major Programs**

   Top 4 priorities (FAA-Industry prioritization process)*
   - Changes in surface operation & information (Surface Operations)
   - Use of GPS to enable more efficient and predictable aircraft routings, with redistributive noise impacts (PBN)
   - Improved communications of complex messages with greater efficiency and fewer errors (Data Comm)
   - Efficiencies in Multiple Runway Operations
3. **One-Page Summaries of 27 NextGen-related Programs**
4. **Airport Specific Considerations**
5. **Working with the FAA**

Abbreviations

Glossary

***** Source: FAA NextGen Priorities Joint Implementation Plan, October 2014.

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One-Page Summaries

NextGen Programs

- ADS-B Out
- Data Comm
- En Route Automation Modernization (ERAM)
- Terminal Automation Modernization and Replacement (TAMR)
- System-Wide Information Management (SWIM)
- NAS Voice System (NVS)

NextGen-related Technologies

- Cockpit Display of Traffic Information (CDTI)
- Wide Area Augmentation System (WAAS)
- Ground-Based Augmentation System (GBAS)
- Wide-Area Multilateration (WAM)
- Flight Deck Interval Management (FIM)
- Surface Management

NextGen Portfolios

- Improved Surface Operations
- Improved Approaches and Low-Visibility Operations
- Improved Multiple Runway Operations
  - Closely Spaced Parallel Runways Procedures
  - Wake Turbulence Mitigations
- Performance-Based Navigation (PBN)
- Time-Based Flow Management (TBFM)
- Collaborative Air Traffic Management
- Separation Management
  - Wake RECAT
  - Oceanic In-Trail Procedure
- On-Demand NAS Information
- Environment and Energy
- System Safety Management
- NAS Infrastructure

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Sample One-Page Summary

What	**System Wide Information Management (SWIM)**
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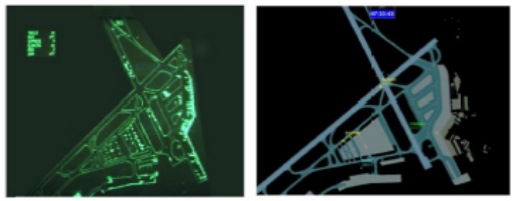
Who	System wide information is available to airports, pilots, airline operational centers, air traffic personnel, military ATC, NAV CANADA, and European airspace managers for situational awareness.
Where	Portals will be established, including a web-based portal. Surveillance capability surface data are available from SFO. CLE, CVG, PIT, and MCI are planned for 2015 and 2016.
When	Sharing ASDE-X data to SWIM subscribers has begun.
Effect on Airport	Airports can use data from the system wide portal to integrate with the flight information display system and provide more reliable gate departure time information to delayed passengers. Opportunities for further development (like apps that notify passengers of wait time to departure) are likely.
Action Needed by Airport	Airports need to investigate access to SWIM data and be cognizant of airport CDM data requirements.
Priority Area	CDM
More Info	NextGen_SWIM (http://www.faa.gov/nextgen/programs/swim/) FAA_SWIM_Products (https://www.faa.gov/nextgen/programs/swim/products/)



ASDE and ASDE-X displays, which present a situational view of all aircraft on the surface and their data tags. Photo by FAA.[30]

[30] http://lessonslearned.faa.gov/ll_main.cfm?TabID=1&LLID=55&LLTypeID=10. Accessed April 15, 2015.

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NextGen: An Overview

NextGen, the Next Generation Air Transportation System, is a set of programs being implemented by the Federal Aviation Administration (FAA) over the next several years. This modernization program is a complex undertaking that the FAA believes will lead to more efficient and accurate flight trajectories that will benefit travelers and airlines.

SOME BACKGROUND

Since the 1950s, airplanes have been guided by radar systems. While there have been steady improvements to the technology, satellite based Global Positioning Systems (GPS) can deliver more precise position information. For example, due to radar tracking's limitations, planes maintain a 5-mile buffer in the air and a 3-mile one on landings.

NextGen Updates Positions Much More Frequently

Radar

NextGen

Radar-based systems update positions once every 6–12 seconds. As a result, NextGen-based systems update every second, making flying safer.

GPS and digital weather images will change that. They provide the precise position of an airplane, whether over land or water, in a matter of seconds and other aircraft within 150 miles. GPS also updates the aircraft's position every second, which is more frequently than the six to 12 seconds with radar.

ADVANCING AIR SAFETY

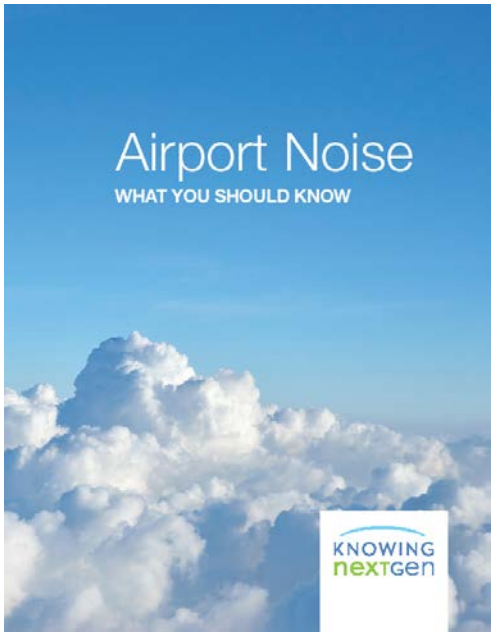
The new navigation procedures enabled by NextGen will improve the management of air traffic, making our already safe skies even safer. NextGen also enables shorter and more direct flight paths. These, too, increase system safety.

BOOSTING EFFICIENCY

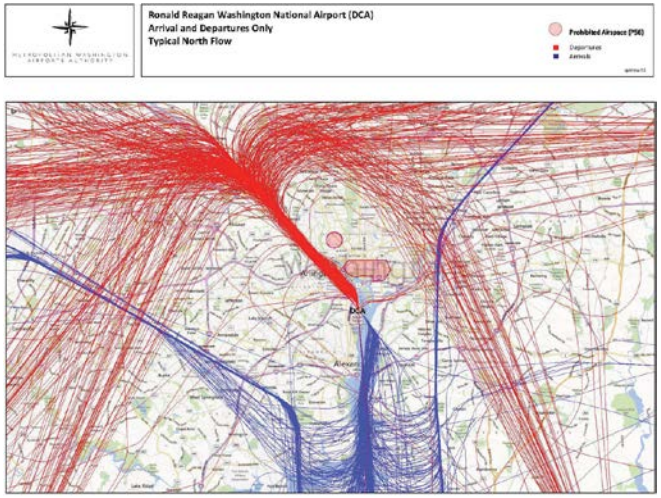
Weather has often been a major factor in flight delays. With GPS systems, airports can now support take offs and landings when low clouds would have limited or prevented aircraft from flying or landing.

NextGen affects every aspect of the air travel experience, from departure gate to arrival gate. Knowing the exact position of aircraft on the ground

Page 1 of 2



Public Toolkit



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Public Toolkit Content

Fact Sheets

- NextGen Overview
- NextGen Air Safety
- NextGen Community Impact
- NextGen Operational Impact
- NextGen Environment
  - with comment on concentrated and new noise exposure

Prezi Animation

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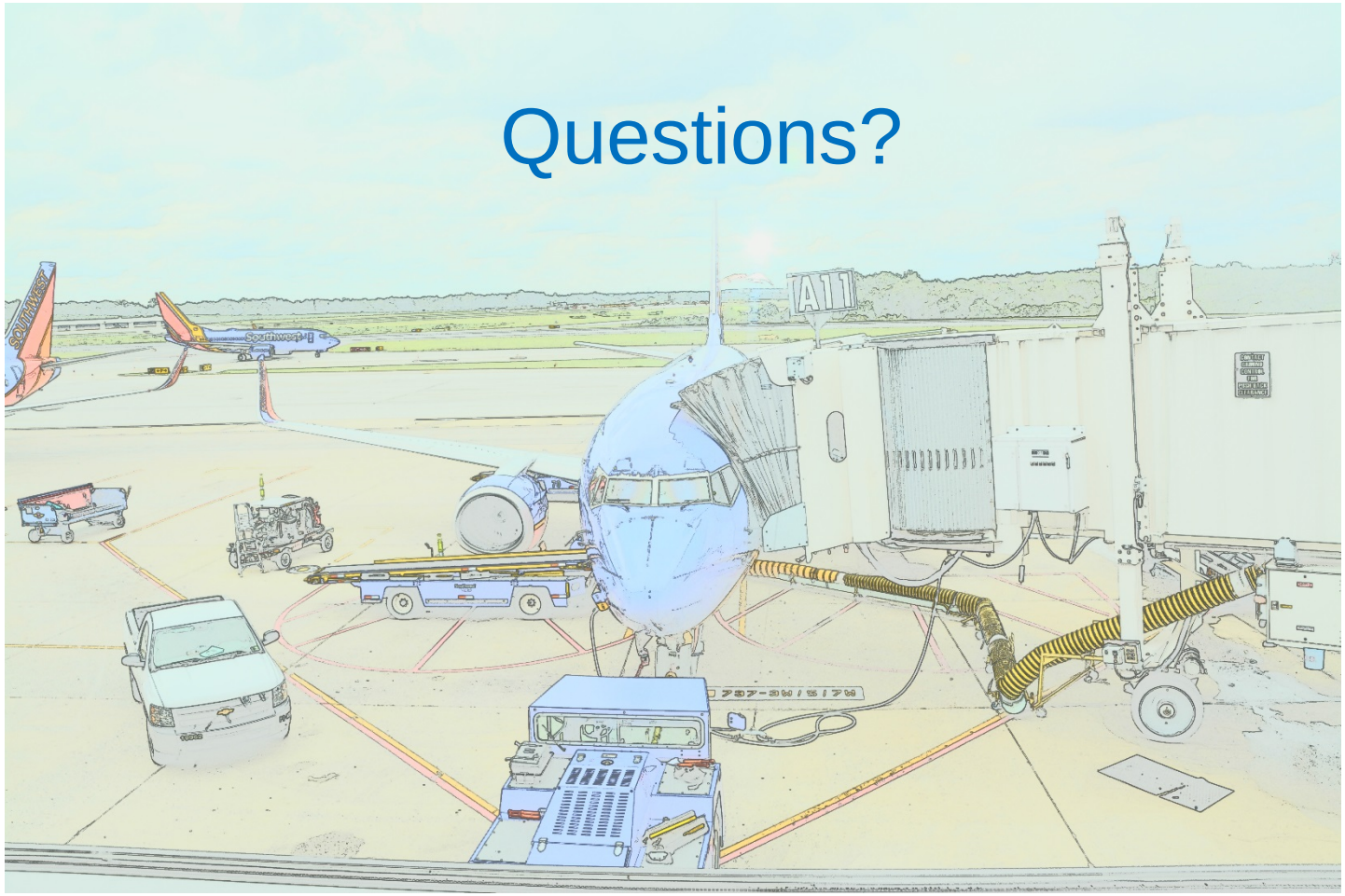
Questions?



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ACRP Project 01-27 — Project Panel

Chair

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Observer

Kent Duffy
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ACRP Report 150, Volume 5
NextGen—Airport Planning & Development

ACRP NextGen Initiative Webinar

LeighFisher Inc.

in association with

Ricondo & Associates, Inc.

RFMarchi Aviation Consulting, Inc.

GSS Creative

Bill Dunlay, LeighFisher
Principal Investigator

May 22, 2017

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Objectives of this Presentation

Provide an overview of:

- Background and need for research
- Research process
- Research results

Summarize how Guidebook will help airport planners incorporate NextGen into their airport planning and development programs

- Large and small airports
- Various types of airport planning
- Role of airports in NextGen implementation

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Background and Need for Research

While many airports could benefit from incorporating NextGen capabilities, there has been limited information and guidance on how to incorporate them into their planning process

- NextGen capabilities are complex and continue to mature
- There is uncertainty regarding industry priorities and the timing of potential initiatives

Research was needed to provide guidance for airport industry practitioners to incorporate NextGen capabilities into their planning and development process

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Research Process

The research featured extensive collaboration with the other ACRP NextGen initiative projects

A key element of was case studies of airports where various NextGen initiatives have been implemented

The team developed a preliminary draft of the guidebook based on their findings and expertise

To ensure the guidebook would be practical and easy to use, the team vetted the preliminary draft with airport industry practitioners

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Research Results

The Airport Planning and Development guidebook will help airport planning practitioners:

- Determine which NextGen capabilities are applicable for their particular planning project
- Identify the steps and roles of stakeholders needed for accommodating and implementing NextGen-related initiatives
- Determine the likelihood and timing of NextGen capabilities
- Provide planning flexibility to account for the risk and uncertainty associated with NextGen capabilities
- Identify opportunities for airport participation in NextGen implementation
- Identify strategies for engaging with FAA and other stakeholders, including the community, in various NextGen capabilities
- Integrate airport layout plans, GIS, online mapping, FAA data resources, and other “big data” tools into the planning process

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Research Results

The guidebook provides specific guidance for large, medium, and small airports

The guidebook also contains appendices that provide lessons learned from case studies as well as a summary of NextGen resources.

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Chapter 1—Introduction and Background

Objectives

Relationship to Other ACRP NextGen Initiative Projects

NextGen Background and Why This Guidebook Is Needed

Who Should Use This Guidebook

What Existing Guidance on NextGen at Airports Is Available?

Organization of This Guidebook:

- Chapter 2—NextGen Technologies & Operational Improvements
- Chapter 3—Incorporating NextGen into Airport Planning
- Chapter 4—Applicability of NextGen to Medium &Large Airports
- Chapter 5—Applicability of NextGen to Small Airports
- Chapter 6—Role of Airports in NextGen Implementation
- Appendices

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Chapter 2 — NextGen Technologies and Operational Improvements

Near-Term Capabilities That Are Enablers of the NextGen Capabilities

- Automatic Dependent Surveillance-Broadcast (ADS-B)
- Data Communications (Data Comm)
- System Wide Information Management (SWIM)
- NextGen Weather: The 4D Weather Cube
- En Route Automation Modernization (ERAM)

Existing and Emerging NextGen Technologies

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Chapter 2 — Existing and Emerging NextGen Technologies

Table 2-1. NextGen capabilities related to airports.

FUNCTION	CAPABILITY	TIME FRAME
Multiple Runway Operations (MRO)-Independent Runways	Wake Turbulence Recategorization (Wake RECAT)	NM
	Phase I (Aircraft Grouping Reclassification)	NM
	Phase II (Aircraft specific)	NM
MRO-Dependent Runways	Wake Turbulence Avoidance Procedures	NM
	Wake Turbulence for Parallel Runways (<2,500′ spacing—small/large leading)	NM
	Wake Turbulence Mitigation for Arrivals-Procedures (<2,500′ spacing—B757/heavy leading)	NM
	Wake Turbulence Mitigation for Departures (WTMD) (Upwind runways)	NM
MRO-Closely Spaced Parallel Operations	Dual Independent Parallel Operations (>3,600′ spacing)	NM
	Dual Dependent Parallel Operations (2,500′–3,600′ spacing)	NM
	Triple Dependent Parallel Operations (>3,900′ spacing)	NM
	Dual Independent Parallel Operations with Offset (>3,000′ spacing)	NM
	Dependent Parallel Operations (>4,300′ spacing)	NM
	RNP Parallel Approaches with Transition (RPAT)	L
	Paired Approaches	L
Performance-Based Navigation (Terminal Area)	Lateral Navigation (LNAV)	NM
	LNAV/Vertical Navigation (VNAV)	NM
	RNP	NM
Surface Operations & Data Sharing	Collaborative Decision Making/Terminal Flight Data Management (TFDM)	NM
	SWIM	NM

Table 2-1. Continued

FUNCTION	CAPABILITY	TIME FRAME
Improved Landing Systems	LPV (Localizer Performance with Vertical Guidance)	NM
	LP (Localizer Performance)	NM
	LNAV	NM
	LNAV/VNAV	NM
	GBAS	NM
	CAT I Approaches (multiple runway ends)*	NM
	CAT II/III Approaches (multiple runway ends)	NM
Separation Management	Advanced Technologies and Oceanic Procedures (ATOP)	NM
	Terminal Automation Modernization and Replacement (TAMR)	NM
	ERAM	NM
	Established on RNP (EoR)	NM
	Equivalent Lateral Spacing Operations (ELSO) National Standard (reduced divergence angle)	NM
	Unified Departure Operational Spacing (UDOS)	NM
	CDTI Based Separation	L
Multilateration (Surveillance)	Wide Area Multilateration (WAM)—En Route and Terminal Airspace	NM
	Airport Surveillance Detection Equipment-Model X (ASDE-X), ASDE-3/Airport Movement Area Safety System (AMASS), Airport Surface Surveillance Capability (ASSC)	NM
ADS-B (Surveillance)	Traffic Information Services Broadcast (TIS-B)	NM
	Automatic Dependent Surveillance-Rebroadcast (ADS-R)	NM
	Flight Information Services Broadcast (FIS-B)	NM
	CDTI	L

Chapter 2 — NextGen Technologies and Operational Improvements

Near-and Mid-Term NextGen Capabilities with Benefits for Airports

- Wake Turbulence Recategorization
- Closely Spaced Parallel Runways
- PBN
- Surface Operations and Data Sharing/Collaborative Decision-Making/SWIM
- Improved NextGen Landing Systems
- Separation Management
- Multilateration

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Chapter 2 — NextGen Technologies and Operational Improvements

Longer-Term NextGen Programs

- Multiple Runway Operations/Closely Spaced Parallel Operations—Paired Approaches
- Automatic Dependent Surveillance-Broadcast In (ADSB-In)
- Cockpit Display of Traffic Information (CDTI)

Other NextGen Technologies and Capabilities for Airports

- Surface Operations and Data Sharing
- Improved Landing Systems

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Chapter 2 — NextGen Technologies and Operational Improvements

Longer-Term NextGen Programs

- Multiple Runway Operations/Closely Spaced Parallel Operations—Paired Approaches
- Automatic Dependent Surveillance-Broadcast In (ADSB-In)
- Cockpit Display of Traffic Information (CDTI)

Other NextGen Technologies and Capabilities for Airports

- Surface Operations and Data Sharing
- Improved Landing Systems

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Describes how each NextGen capability / program can affect key airport planning tasks:

- **Demand/Capacity Analysis**
- **Facility Requirements**
- **Alternatives Evaluation**
- **Implementation and Timing**
- **Economic and Financial analysis**

Chapter 3 — Incorporating NextGen into Airport Planning & Development

Effects of NextGen on Airport Planning Criteria and Guidelines

- Airport Master Planning
- Airport Environmental Planning
- State and Regional/Metropolitan Airport System Planning
- Airspace Redesign Studies (e.g., OAPM or Metroplex)
- Airport Financial and Strategic Planning Issues

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Chapter 3 — Incorporating NextGen into Airport Planning & Development

Discussion Topics (All Types of Airport Planning)

- FAA-estimated airport capacity improvements from NextGen projects
- Maximizing opportunities for Airport-led vs. FAA-led and Airline-led NextGen initiatives
- Required airport infrastructure for maximizing NextGen capabilities
- Planning flexibility to account for NextGen risk and uncertainty
- Potential effects of NextGen capabilities on the environmental planning process and criteria
- Risk-adjusted strategies to guide airport development plans
- ALP, AGIS, online mapping, FAA data, and "big data" tools

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Chapter 3 — Incorporating NextGen into Airport Planning & Development

Discussion Topics (All Types of Airport Planning)

- FAA-estimated airport capacity improvements from NextGen projects
- Maximizing opportunities for Airport-led vs. FAA-led and Airline-led NextGen initiatives
- Required airport infrastructure f[illegible]ximizing NextGen capabilities
- Planning flexibility to account for N[illegible]
- Potential effects of NextGen capab[illegible] planning process and criteria
- Risk-adjusted strategies to guide a[illegible]
- ALP, AGIS, online mapping, FAA c[illegible]

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Emphasis on the potential environmental planning implications of the following types of NextGen projects:

- **Projects that affect capacity**
- **Projects that reduce aircraft delays/fuel consumption**
- **Projects that improve reliability**
- **Project affecting facility requirements**
- **Environmental review of NextGen projects**

Chapter 4 — Applicability of NextGen to Medium and Large Airport Planning

Definition of Medium and Large Airports

FAA NextGen Technologies and Initiatives Applicable to Medium and Large Airports

- PBN and Improved Landing Systems
- Surface Operations and Data Sharing
- Wake Turbulence Recategorization
- Closely Spaced Parallel Runway Operations
- Multilateration
- ADS-B In and Cockpit Display of Traffic Information (CDTI)

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Chapter 4 — Applicability of NextGen to Medium and Large Airport Planning

Definition of Medium and Large Airports

FAA NextGen Technologies and Initiatives Applicable to Medium and Large Airport

- PBN and Improved Landin
- Surface Operations and D
- Wake Turbulence Recateg
- Closely Spaced Parallel R
- Multilateration
- ADS-B In and Cockpit Disp

Table 4-1. FAA airport classifications.

Categories of Airport Activities

Airport Classifications		Hub Type: Percentage of Annual Passenger Boardings	Common Name	
Commercial Service: Publicly owned airports that have *at least* 2,500 passenger boardings each calendar year and receive scheduled passenger service §47102(7)	**Primary:** Have *more than* 10,000 passenger boardings each year §47102(16)	**Large:** 1% or more	**Large Hub**	Medium and Large Airports[1/]
		Medium: At least 0.25%, but less than 1%	**Medium Hub**	
		Small: At least 0.05%, but less than 0.25%	**Small Hub**	Small Airports[1/]
		Nonhub: More than 10,000, but less than 0.05%	**Nonhub Primary**	
	Nonprimary	**Nonhub:** At least 2,500 and no more than 10,000	**Nonprimary Commercial Service**	
Nonprimary (Except Commercial Service)		Not Applicable	**Reliever** §(47102(23)) **General Aviation** (47102(8))	

Chapter 5 — Applicability of NextGen to Small Airport Planning & Development

Definition of Small Airports

FAA NextGen Technologies and Initiatives Applicable to Small Airports

- Improved Landing Systems
- Airspace Routing with Performance-Based Navigation
- Multilateration
- Surface Operations and Data Sharing
- Wake Turbulence Recategorization—Single Runway Operations
- Dependent Runway Operations
- ADS-B In

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Chapter 5 — Applicability of NextGen to Small Airport Planning & Development

Definition of Small Airports

FAA NextGen Technologies and Initiatives Applicable to Small Airports

- Improved Landing Systems
- Airspace Routing with Performanc[illegible]ed Navigation
- Multilateration
- Surface Operations and Data Sharing
- Wake Turbulence Recategorization—Operations
- Dependent Runway Operations
- ADS-B In

(1) **Non-hub Primary Commercial (10,000 – approximately 400,000 annual enplanements),**

(2) **Non-primary commercial service airports (<10,000 enplanements), and**

(3) **General aviation/reliever airports, per the NPIAS airport classification criteria**

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Chapter 5 — Applicability of NextGen to Small Airport Planning & Development

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Definition of Small Airports

FAA NextGen Technologies and Initiatives Applicable to Small Airports

- Improved Landing Systems
- Airspace Routing with Perfo
- Multilateration
- Surface Operations and Da
- Wake Turbulence Recategc Operations
- Dependent Runway Operat
- ADS-B In

Table 5-2. Subcategorization of small airports for NextGen opportunities.

SUBCATEGORY	NPIAS CRITERIA	TYPICAL AIRCRAFT FLEET MIX COMPOSITION
Limited Commercial Service		
Nonhub Primary Commercial Service	10,000 Annual Passenger Boardings—<0.25% of Total U.S. Passenger Boardings	Air Carrier and Business Jets.
Non-primary Commercial Service	2,500–10,000 Annual Passenger Boardings	Limited Air Carrier and Business Jets.
GA		
National	No Scheduled Service or <2,500 Annual Passenger Boardings	Very High Levels of Activity with Many Jets and Multiengine Propeller Aircraft; Averaging About 200 Based Aircraft, Including 30 Jets.
Regional	No Scheduled Service or <2,500 Annual Passenger Boardings	High Levels of Activity with Some Jets and Multiengine Propeller Aircraft; Averaging About 90 Based Aircraft, Including Three Jets.
Local	No Scheduled Service or <2,500 Annual Passenger Boardings	Moderate Levels of Activity with Some Multiengine Propeller Aircraft; Averaging About 33 Based Propeller-Driven Aircraft and No Jets.
Basic	No Scheduled Service or <2,500 Annual Passenger Boardings	Moderate to Low Levels of Activity; Averaging About 10 Propeller-Driven Based Aircraft and No Jets.

Sources: NPIAS, Federal Aviation Administration; General Aviation Airports: A National Asset, Federal Aviation Administration, May 2012.

Chapter 5 — Applicability of NextGen to Small Airport Planning & Development

Table 5-4. Improved landing systems application—small airport planning considerations.

DESCRIPTION	AIRFIELD/AIRSPACE CAPACITY/ACCESS ENHANCEMENTS	OBSTACLE EVALUATION/ OBSTRUCTION MITIGATION PROGRAMS	ENVIRONMENTAL (NOISE & AIR QUALITY)	AIRPORT CAPITAL PLANNING
LPV Approach	X	X	X	
LP Approach	X	X	X	
LNAV/VNAV Approach	X	X	X	
RNP Approaches	X		X	
LED Approach Lighting Systems	X		X	X
LED PAPI				X
GBAS	Not Applicable to Small Airports			

Table 5-10. Surface operations and data sharing application—small airport planning considerations.

DESCRIPTION	VEHICULAR OPERATIONAL MONITORING AND DATA ANALYSIS	FACILITY PLANNING (TRAFFIC STUDIES AND VEHICLE STORAGE)	ENVIRONMENTAL ASSESSMENTS (AIR QUALITY/ NOISE ASSESSMENT)	AIRPORT CAPITAL, OPERATING, AND MAINTENANCE BUDGET PLANNING
LED Lighting Technology				X
Ground Vehicle Tracking	X	X	X	X
Traffic Display and Analysis Systems	X	X	X	X
SWIM	X	X	X	
Collaborative Decision Making	Not Applicable to Small Airports			
Intelligent Routing and Guidance Systems	Not Applicable to Small Airports			
Automated Docking Systems	Not Applicable to Small Airports			

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Chapter 6 — Role of Airport in NextGen Implementation & Community Acceptance

NAS-Wide vs. Local NextGen Programs

- NAS-Wide NextGen Programs
- Terminal Airspace/Airport NextGen Programs

Airports, Stakeholders, and Their Roles in NextGen/PBN Implementation

- Airports
- Community/Public
- Community Groups and NGOs
- Local, State, and Federal Governments, and Elected Officials

Outreach Guidance

- Why Community Outreach Is Needed
- Preliminary Findings from ACRP Project 01-28
- Key Enabler of NextGen Implementation—Airports GIS
- Local Partnerships with ATC, Airlines, and Community Leaders

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Chapter 6 — Role of Airport in NextGen Implementation & Community Acceptance

Recommended actions and coordination with other ACRP NextGen initiative projects:

- Educate managements, boards, and communities (ACRP Report 150, Volume 3)
- Engage with FAA and stakeholders (ACRP Report 150, Volume 2)
- Conduct required surveys and establish Airport GIS (ACRP Report 150, Volume 4)
- Engage with industry organizations (e.g., RTCA, ACI-NA, AAAE, and TRB) on NextGen developments and priorities
- Stay informed of local and regional airspace redesign or Metroplex proposals
- Maximize opportunities for Airport-led NextGen initiatives vs. FAA-led and Airline-led NextGen initiatives

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Case Studies:

1. Colorado Wide Area Multilateration (WAM) Implementation
2. Friedman Memorial Airport – RNP Approach Implementation
3. John F. Kennedy International Airport – Surface Operations and Data Sharing
4. Newark Liberty International Airport – Ground Based Augmentation System (GBAS)
5. San Francisco International Airport – Simultaneous Offset Instrument Approach (SOIA)
6. The Puget Sound Regional Council – Preparing Busy Airports for NextGen Technology

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Appendices:

A. ACRP NextGen Initiative Projects
B. Best Practices and Lessons Learned from Airport Case Studies
C. NextGen Elements and Applicability by Airport Sizes and Issues
D. NextGen Resources, Organizations, and Contacts
E. Relevant Airport Planning and NextGen References and Guidance Documents
F. NextGen—Airport Planning and Development List of Acronyms

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For additional information:

ACRP Report 150, Vol. 5

NextGen — Airport Planning & Development

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http://www.trb.org/main/blurbs/176008.aspx

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ACRP 09-12
ACRP Report 150
Leveraging NextGen Spatial Data to Benefit Airports

Mark Ricketson
Aviation Program Director
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Mark Ricketson
Principal Investigator

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- Co-Chair of TRB Airport GIS Subcommittee
- 20+ Years in Aviation
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Kevin Carlson, AECOM, Chicago, IL

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Marci A. Greenberger, ACRP Senior Program Officer

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ACRP NextGen Projects

09-12 is one of five concurrent ACRP projects focused on NextGen, which are concluding in Spring 2017

01-27, A Primer

01-28, Guidance for Engaging Airport Stakeholders

03-33, Airport Planning and Development

03-34, Understanding the Airport's Role in PBN

09-12, Leveraging NextGen Spatial Data to Benefit Airports

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09-12 Objectives

What are the benefits that can be derived from spatial data that is to be collected in support of the FAA's NextGen effort?

How do NextGen programs use this data?

- *Which programs use spatial data*
- *What are the sources?*
- *How could it be improved?*

How can airports maximize the use of this data?

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Our Team

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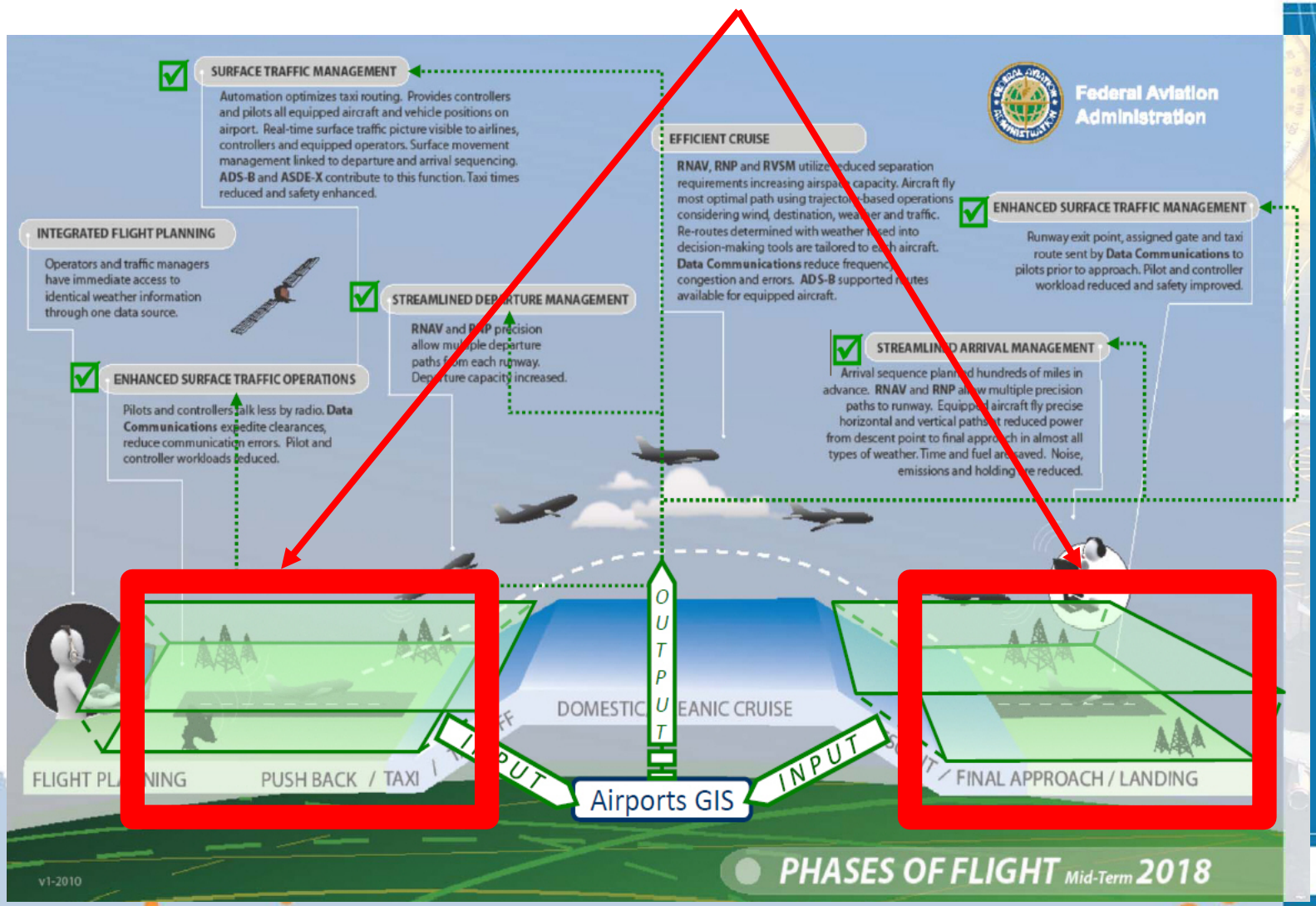
Study Focus Area



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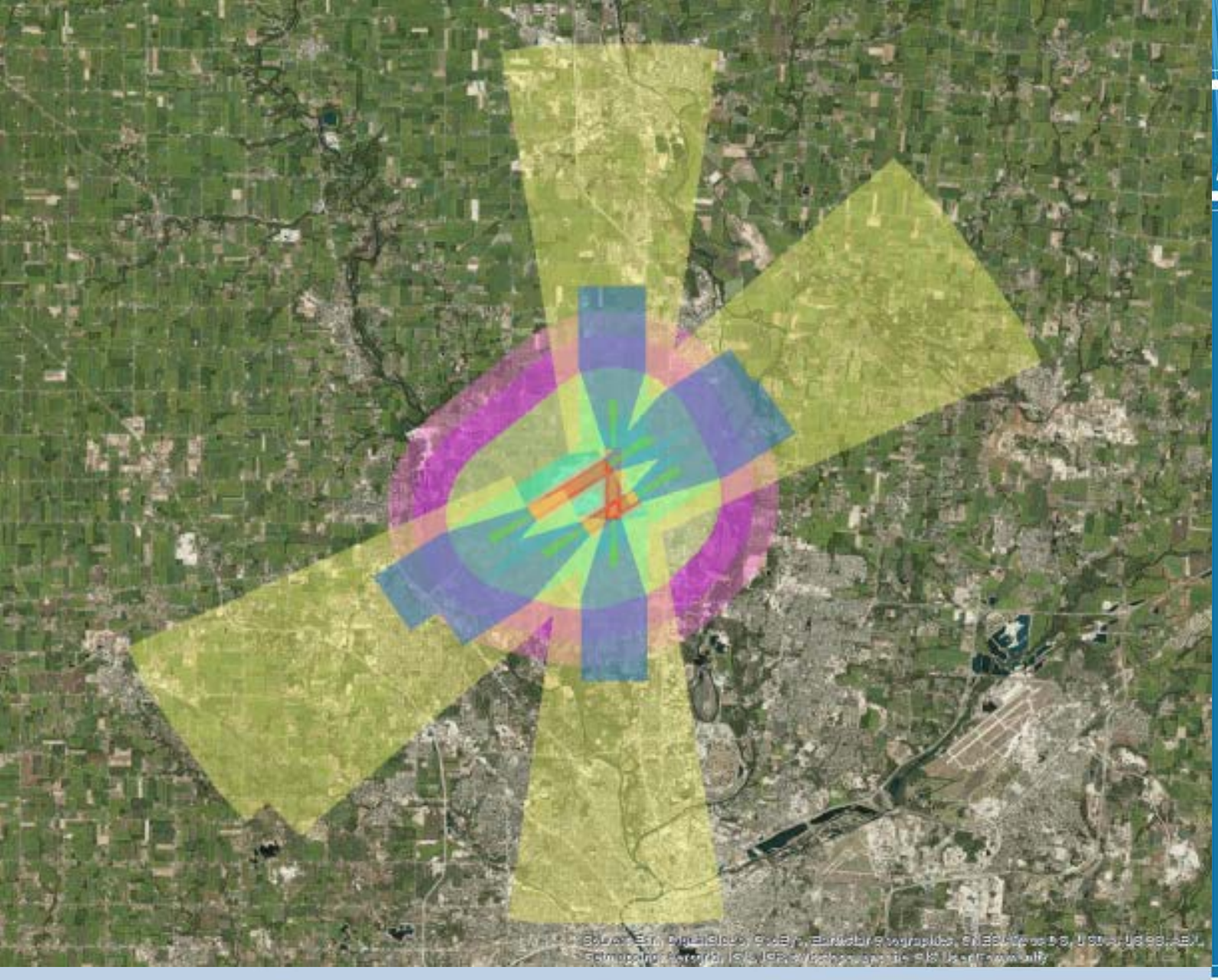

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Define NextGen

NextGen is the modernization of the air transportation system

- Improvements to air traffic management (ATM) technologies and procedures
- Airport infrastructure
- Includes environmental, safety and security-related enhancements

(Source: FAA - The Business Case for the Next Generation Air Transportation System; FY 2014)

NextGen consists of many different programs with multiple priorities and requirements

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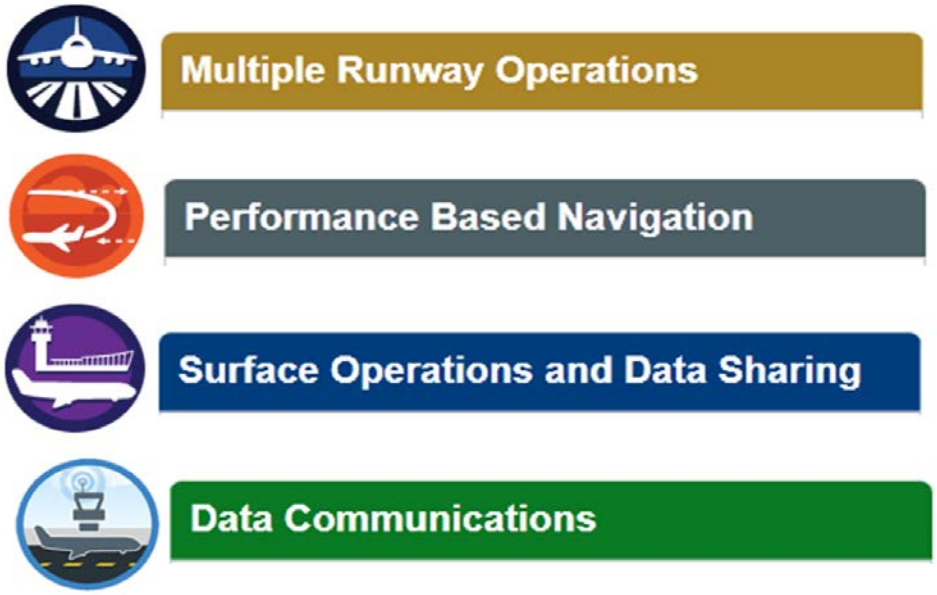
NextGen Priorities

In 2015 four NextGen Priorities were identified

- Focus on those programs that will have the greatest impact to the air transportation system in the near term



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NextGen and Spatial Data

- Some programs in NextGen have a need for spatial data
- The sources for this spatial data can come from multiple organizations
- Airports create spatial data through AGIS and other means
- NextGen also creates spatial data
- Airports receive direct benefits from the use of their spatial data in NextGen programs
- Airports also receive direct benefits from NextGen programs that use third party or FAA legacy data sets

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AGIS/FAA Standards

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AC 150/5300-16A

U.S. Department of Transportation
Federal Aviation Administration

Advisory Circular

Subject: General Guidance and Specifications for Aeronautical Surveys: Establishment of Geodetic Control and Submission to the National Geodetic Survey

Date: 9/15/2007 **AC No:** 150/5300-16A
Initiated by: AAS-100 **Change:**

a. Purpose of this Advisory Circular (AC).

This AC explains the specifications for establishing geodetic control on or near an airport. It also describes how to submit the information to the National Geodetic Survey (NGS) for approval and inclusion in the National Spatial Reference System (NSRS) in support of aeronautical information surveys.

b. Audience.

Engineering and surveying companies contracted by state aviation agencies or local airport authorities to perform an aeronautical information survey of an airport should read this AC thoroughly and other related advisory circulars before commencing an airport project.

c. Application.

The Federal Aviation Administration and the NGS Aeronautical Survey Program recommend the guidance and specifications in this AC for establishing on-airport geodetic control and submitting it to NGS for approval and inclusion in the NSRS in support of aeronautical information surveys. This AC does not constitute a regulation and in general is not mandatory. However, use of these guidelines is mandatory for surveys that are funded under Federal grant assistance programs. It also provides one, but not the only, acceptable means of meeting the requirements of Title 14 Code of Federal Regulations (CFR) part 139, *Certification of Airports*. Mandatory terms such as "must" apply only to those who conduct aeronautical information surveys using Airport Improvement Program (AIP) or Passenger Facility Charge Program (PFC) funds or those who seek to demonstrate compliance by use of the specific method described by this AC.

d. Cancellation.

This AC cancels AC 150/5300-16, General Guidance and Specifications for Aeronautical Surveys: Establishment of Geodetic Control and Submission to the National Geodetic Survey, dated February 13, 2006.

AC 150/5300-17C

U.S. Department of Transportation
Federal Aviation Administration

Advisory Circular

Subject: General Guidance and Specifications for Aeronautical Survey Airport Imagery Acquisition and Submission to the National Geodetic Survey

Date: 9/29/08 **AC No:** 150/5300-17B
Initiated by: AAS-100 **Change:**

1. Purpose.

This AC provides the specifications for Airport Imagery acquisition and how to submit the imagery for review and approval in support of aeronautical information and airport engineering surveys.

2. Application.

The Federal Aviation Administration (FAA) recommends the guidance and specifications in this Advisory Circular for Aeronautical Survey Airport Imagery. In general, use of this AC is not mandatory. However, use of this AC is mandatory for all projects funded with federal grant monies through the Airport Improvement Program (AIP) and with revenue from the Passenger Facility Charges (PFC) Program. See Grant Assistance No. 34, "Policies, Standards, and Specifications," and PFC Assurance No.9, "Standards and Specifications."

3. Cancellation.

This AC cancels AC 150/5300-17A, *General Guidance and Specifications for Aeronautical Survey Airport Imagery Acquisition and Submission to the National Geodetic Survey*, dated September 15, 2007.

4. Principal Changes.

- Reformatted entire document for readability, usability, and to provide clarification of some criteria.
- Added requirement for submission and approval of an imagery plan prior to imagery acquisition.
- Clarified requirement of flying height to consider the use of the imagery of further endeavors such as future engineering or planning activities.
- Eliminated requirement for a final report except under most conditions unless there is a change from the provided plan or an unusual circumstance was encountered during the collection effort.
- Add requirement for development and delivery to FAA of digital orthoimagery.
- Added a requirement for the use of the Airports GIS to submit and track project requirements such as the plan and deliverables.
- Changes the exterior orientation reporting units for omega, phi, kappa, from radians to decimal degrees.
- Allows the use of state plane coordinates, reported in meters.

Michael J. O'Donnell
Director, Office of Airport Safety and Standards

AC 150/5300-18B

U.S. Department of Transportation
Federal Aviation Administration

Advisory Circular

Subject: General Guidance and Specifications for Submission of Aeronautical Surveys to NGS: Field Data Collection and Geographic Information System (GIS) Standards

Date: 3/29/2006 **AC No:** 150/5300-18
Initiated by: AAS-100

a. Purpose of this Advisory Circular (AC).

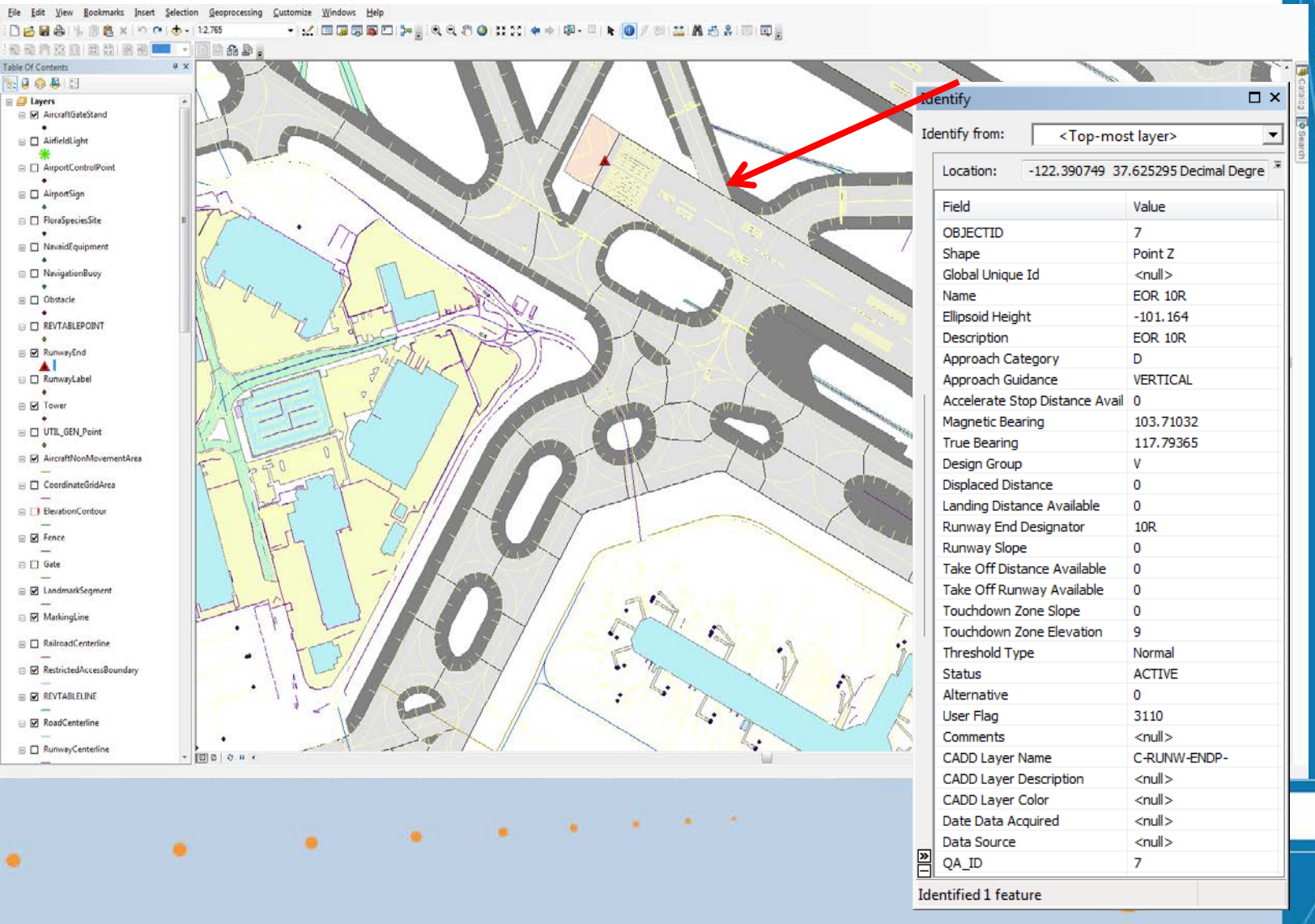
This AC provides the specifications for the collection of airport survey data through field and office methodologies in support of aeronautical information and airport engineering surveys. It also explains how to submit data to the Federal Aviation Administration (FAA), which will forward the data to the National Geodetic Survey (NGS) for quality control purposes. The primary purpose of these general guidelines and specifications is to list the requirements for aeronautical surveys conducted at airports in support of the Federal Aviation Administration (FAA) Airport Surveying–GIS Program. The FAA's Office of Airport Safety and Standards (AAS-1) administers this program. The surveys covered in this document provide critical information to the operation and safety of the National Airspace System (NAS) and are classified as critical by the International Civil Aviation Organization (ICAO). ICAO defines data as critical when "there is a high probability when using corrupted critical data that the continued safe flight and landing of an aircraft would be severely at risk with the potential for catastrophe." The information furnished under these standards includes runway and stopway data, navigational aid (NAVAID) data, obstruction data, and data on various airport features, including taxiways, aprons, and landmark features. Most of this information is source data, which is acquired by field survey and/or remote sensing methods.

b. Application.

FAA and the NGS Aeronautical Survey Program (ASP) recommend the guidance and specifications in this AC for all airport projects. This AC describes an acceptable means, but not the only means, of collecting and submitting airport survey and Geographic Information System (GIS) data in support of aeronautical information surveys. Airport projects receiving Federal grant-in-aid assistance must use these standards. At certificated airports, the guidance and specifications may be used to satisfy specific requirements of Title 14, Code of Federal Regulations (CFR), Part 139, Certification of Airports.

David L. Bennett
Director, Office of Airport Safety and Standards

An Example of AGIS Spatial Data



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Why Spatial Data is Important to NextGen

High accuracy data supports key programs such as PBN and Multiple Runway Operations

- Safety
- Improvements to the environment
- Improved flight procedures

Not all Programs require high accuracy data such as AGIS compliant data

- Programs such as Surface Operations utilize third party sources that airlines and airports benefit from
  - Airfield operational efficiencies
  - Improved safety in aircraft and vehicle movements

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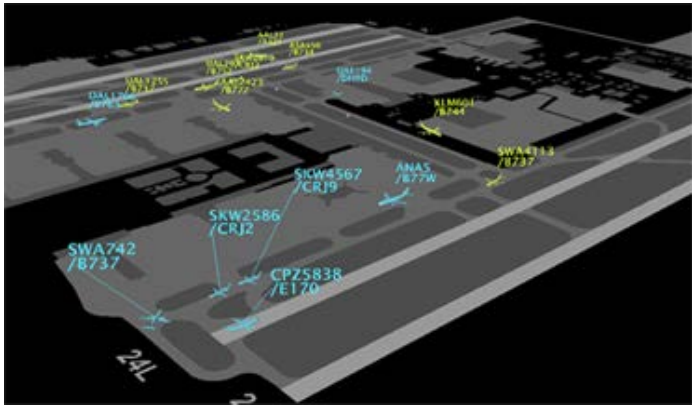
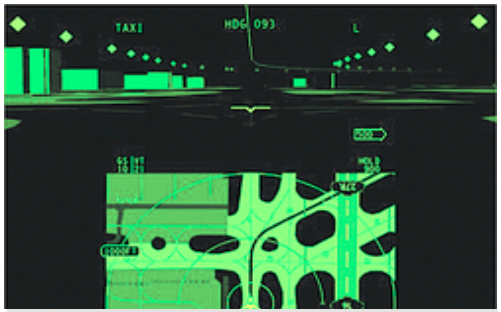
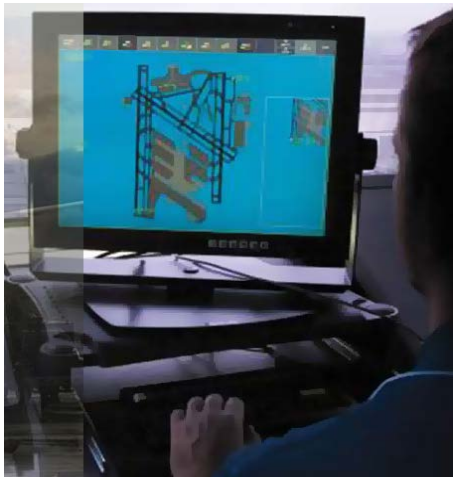
Other Spatial Data Applications





Rockwell Collins is developing a surface guidance system that puts an egocentric 3-D view of the airport environment along with a 2-D map on a head-up display. (Credit: Rockwell Collins)

Source: Cockpit Guidance Gets Down To The Ground, *Mar 25, 2013* [John Croft](#) | ***Aviation Week & Space Technology***



AIRPORT SURFACE SURVEILLANCE CAPABILITY - SAAB

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Situational Awareness

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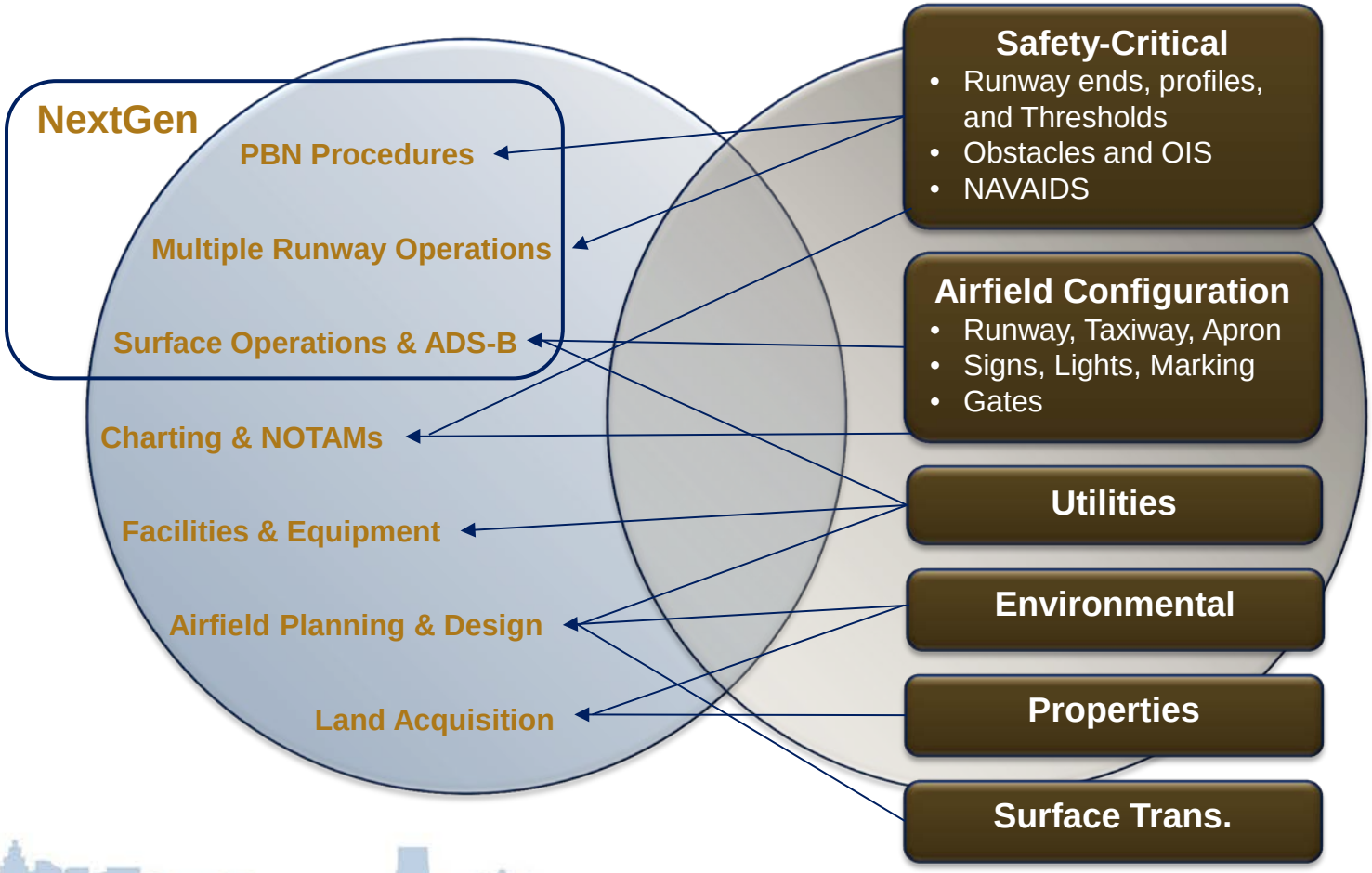
FAA Requires Airport Data



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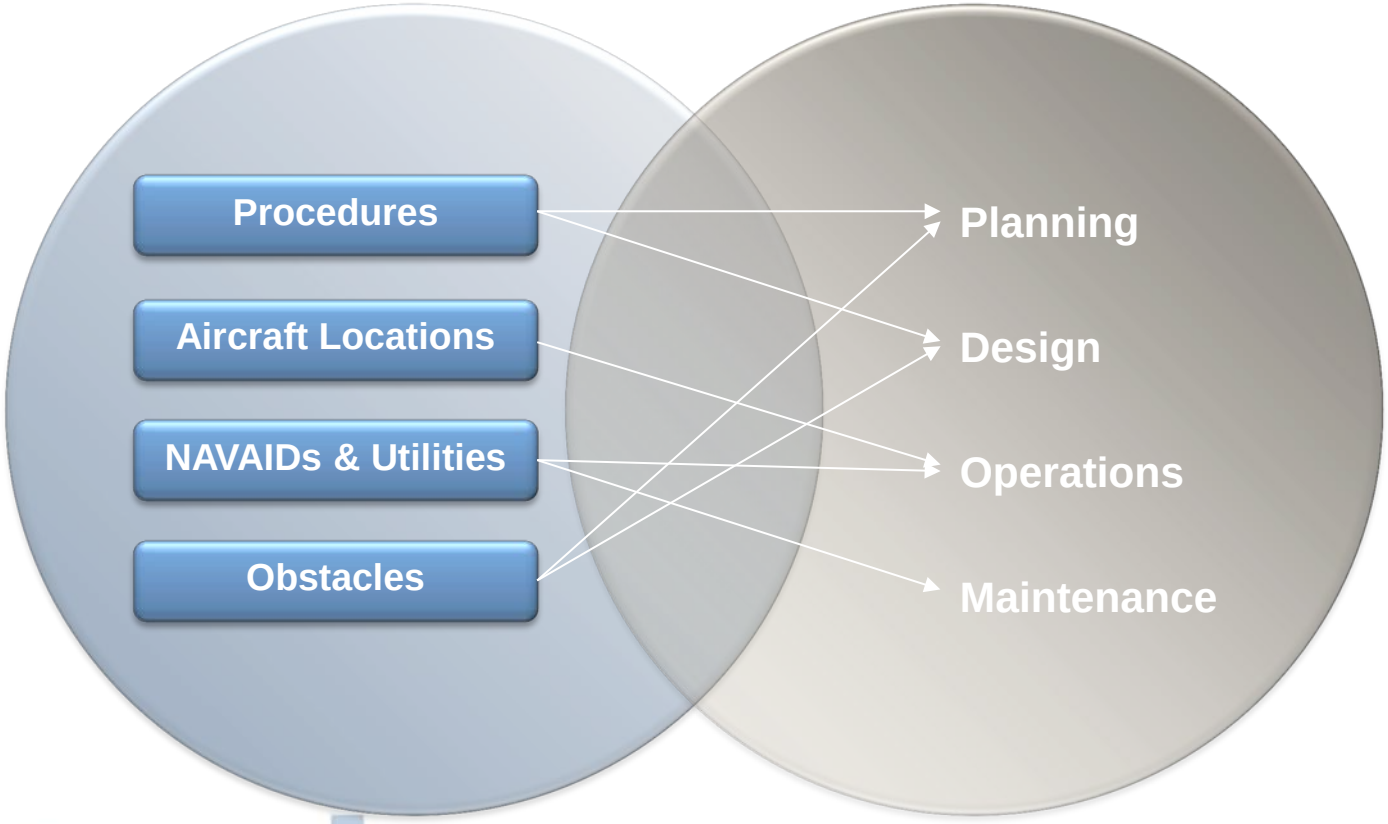
Airports Feel that NextGen Can Offer them Spatial Data



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Benefits and Costs

- There is a perception that airports bear new costs but do not reap new rewards for the collection of spatial data.
- Airports are in fact gaining new capacity, reducing minimums, and increasing safety because they have collected this data.
- These benefits, unfortunately, have not been as apparent or as well documented as the costs.
- The system-wide benefit to cost ratio of spatial data for procedure design is immeasurably high.
- The problem is that from an airport's perspective the costs are immediate, tangible, and not-optional, but the benefits are prolonged and indirect.

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Summary - NextGen

- “NextGen” has many meanings
- Airports find it difficult in clearly understanding what their roles and responsibilities are for NextGen
- Under NextGen, there is an increasing need for high quality, current, and accurate spatial data depicting airports, as well as airspace around airports
- Not all NextGen initiatives or programs within NextGen require or produce spatial data

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Summary - AGIS

- FAA's Airport Geographic Information System (AGIS) program has long been called an "enabler" of NextGen
- While there is a clear and direct link between AGIS and PBN, many of the programs do not currently utilize the FAA's AGIS data
- Spatial data for many of these programs is needed now for a larger number of airports than AGIS can currently provide
- Many NextGen capabilities rely on spatial data produced by third party vendors
- 1/3 of top 30 airports have still not done a full AGIS project however there is a push by FAA to get these done

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Summary - Spatial Data Outside of AGIS

- **Airports can benefit from the spatial data that NextGen initiatives produce (e.g. aircraft positions, FAA installed navaids & utilities)**
- **Through the use of third party or FAA legacy spatial data in NextGen, airports are receiving benefits.**
  - Situational awareness technologies using ASDE-X data
  - Spatial data technologies that share data between the TRACON and the airport tower
  - Heads up displays in the cockpit for low-visibility
- **These are indirect benefits; safety, efficiencies, revenue**

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Recommendations for Additional Research

Consideration for UAS in NextGen

- The integration of UAS into the national airspace is a high priority for the FAA and related agencies. An in depth study of the spatial data needs for UAS planning and operations and ways in which GIS can support UAS is recommended

Common set of spatial data standards

- DO 272 and AC 150/5300-18 are two standards that are either required or recommended for spatial data development. An assessment of the potential for merging them into one industry standard is warranted

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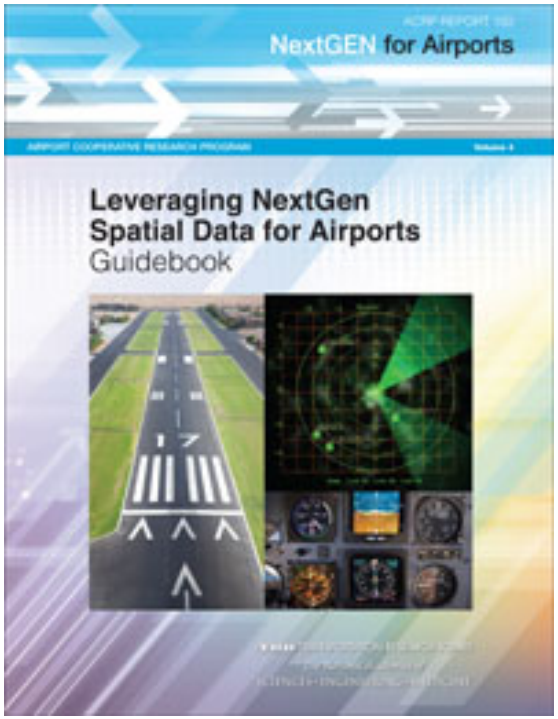
For additional information:



ACRP Report 150

Leveraging NextGen Spatial Data for Airports

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http://www.trb.org/Main/Blurbs/175223.aspx

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Panelists Presentations

http://onlinepubs.trb.org/onlinepubs/webinars/170522.pdf

After the webinar, you will receive a follow-up email containing a link to the recording

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