Florida Aviation System Plan (FASP) 2043
Technical Report

FDOT

2043 FASP FLORIDA AVIATION SYSTEM PLAN

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Abbreviations and Acronyms

FDOT | 2043 FASP FLORIDA AVIATION SYSTEM PLAN

A

AAC – Aircraft Approach Category

AAGR – Average Annual Growth Rate

AAM – Advanced Air Mobility

AC – Advisory Circular

ACA – Airport Carbon Accreditation

ACI – Airports Council International

ACRP – Airport Cooperative Research Program

ADA – Americans with Disabilities Act

ADIP – Airport Data and Information Portal

ADG – Airplane Design Group

ADP – Aviation Development Program

AFFF – Aqueous Film Forming Foam

AFRA – Aircraft Fleet Recycling Association

AIG – Airport Infrastructure Grant

AIP – Airport Improvement Program

ALP – Airport Layout Plan

AO – Aviation Office

APV – Approaches with Vertical Guidance

ARI – Advanced Air Mobility Realty Index

ARPA – American Rescue Plan

ASOS – Automated Surface Observing Systems

ATCT – Airport Traffic Control Tower

ATP – Airport Terminal Program

ATR – Airport Technology Research & Development Branch

Avgas – Aviation Gas

AWOS - Automated Weather Observing Systems

B

BIL – Bipartisan Infrastructure Law

BMP Manual – Statewide Airport Stormwater Best Management Practices Manual

C

CAGR – Compound Annual Growth Rate

CARES – Coronavirus Aid, Relief, and Economic Security

CEDDS – Complete Economic and Demographic Data Source

CERCLA – Comprehensive Environmental Response, Compensation and Liability Act

CO2 – Carbon Dioxide

CFASPP – Continuing Florida Aviation Systems Planning Process

CFR – Code of Federal Regulations

CMRA – Climate Mapping for Resilience and Adaptation

CRESA – Coronavirus Response and Relief Supplemental Appropriation

CRT – Comprehensive Review Team

CTAF – Common Traffic Advisory Frequencies

D

DBE – Disadvantaged Business Enterprise

DNI – Direct Normal Irradiance

DoE – Department of Energy

E

EAA - Experimental Aircraft Association

eALP – Electronic Airport Layout Plan

EAGLE – Eliminate Aviation Gasoline Lead Emissions

EAS – Essential Air Service

EASA – European Union Aviation Safety Agency

EB – Engineering Brief

eCTOL – Electric Conventional Takeoff and Landing Aircraft

EDTF – Economic Development Transportation Fund

eGSE – Electric Ground Service Equipment

EIS – Entry-into-Service

EJScreen – Environmental Justice Screening and Mapping Tool

EOC – Emergency Operations Center

EPA – Environmental Protection Agency

ERAU – Embry-Riddle Aeronautical University

ESG – Environmental Social Governance

eSTOL – Electric Short Takeoff and Landing Aircraft
EV – Electric Vehicle
eVTOL – Electric Vertical Takeoff and Landing Aircraft

F

FAA – Federal Aviation Administration
FAC – Florida Airports Council
FASP – Florida Aviation System Plan
FBO – Fixed-Based Operators
FCEV – Fuel Cell Electric Vehicle
FDOT – Florida Department of Transportation
FDOT AO – Florida Department of Transportation Aviation Office
FIT – FASP Input Team
FMTP – Freight Mobility and Trade Plan
FTP - Florida Transportation Plan
FRATIS – Freight Advanced Traveler Information System

G

GA – General Aviation
GAMI – General Aviation Modifications, Inc.
GHG – Greenhouse Gas
GPS – Global Positioning System
GRI – Global Reporting Initiative
GSE – Ground Support Equipment
GTAA – Greater Toronto Airports Authority

H

I

IAP – Instrument Approach Procedure
ICAO – International Civil Aviation Organization
IFR – Instrument Flight Rules
ILC – Intermodal Logistics Center

ILS – Instrument Landing Systems

IPCC – Intergovernmental Panel on Climate Change

IRA – Inflation Reduction Act

ITS – Intelligent Transportation System

J

JACIP – Joint Automated Capital Improvement Program

K

KW - Kilowatt

L

LL – Low Lead (as in, 100 LL fuel)

LOS – Levels of Service

M

MRO – Maintenance, Repair, Overhaul

MPOAC – Metropolitan Planning Organization Advisory Council

MWS – Micro Weather Station

N

NAAQS – National Ambient Air Quality Standards

NASR – National Airspace System Resource

NAVAID – Navigational Aids

NEPA – National Environmental Policy Act

NPIAS – National Plan of Integrated Airport Systems

O

OEM – Original Equipment Manufacturers

OFA - Object Free Area

OPSNET – Operations Network

P

PCI – Pavement Condition Index

PCN – Pavement Classification Number

PFAS – Poly-Fluoroalkyl Substances

PFC – Passenger Facility Charges

PI – Performance Indicators

PM – Performance Measures

PV – Photovoltaic

Q

R

RDC – Runway Design Code

REDI – Rural Economic Development Initiative

ROFA – Runway Object Free Area

RSA – Runway Safety Area

RPZ – Runway Protection Zone

S

SAF – Sustainable Aviation Fuel

SAFE – Secure Airports for Florida's Economy

SAPMP – Statewide Airfield Pavement Management Program

SEP – Stakeholder Engagement Plan

SHS – State Highway System

SIB – State Infrastructure Bank

SIS – Strategic Intermodal System

SIT – Strategic Investment Tool

SPB – Seaplane Base

STC – Supplemental Type Certificates

STTF – State Transportation Trust Fund

SWMP – Stormwater Management Plan

SWOT – Strengths, Weaknesses, Opportunities, and Threats

T

TAF – Terminal Area Forecast

TFMSC – Traffic Flow Management System Count

TIFIA – Transportation Infrastructure Finance and Innovation Act

TOFA – Taxiway Object Free Area

TRIP – Transportation Regional Incentive Program

TSA – Taxiway Safety Area

TSM&O – Transportation Systems Management and Operations

U

UAM – Urban Air Mobility

UAS – Unmanned Aerial System

UNEP – United Nations Environment Program

UNICOM – Universal Communications Frequencies

V

VALE – Voluntary Airport Low Emissions Program

VHF – Very-High Frequencies

VFR – Visual Flight Rule

W

WHMP – Wildlife Hazard Management Plan

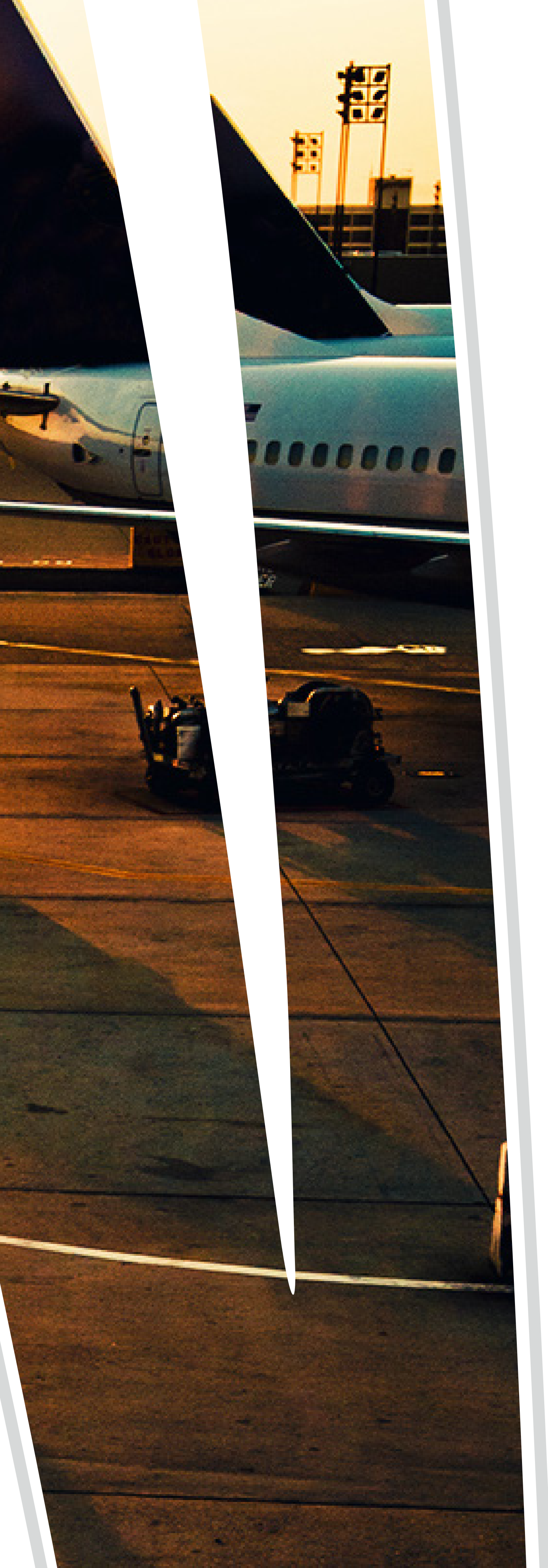
WSDOT – Washington State Department of Transportation

X

Y

Z

ZEV – Zero Emission Vehicle Program



1 Study Introduction

Chapter 1

Study Introduction

The State of Florida establishes its long-range transportation goals and objectives for the overall statewide transportation system in the Florida Transportation Plan (FTP). The Florida Department of Transportation (FDOT) Aviation Office (AO) uses the Florida Aviation System Plan (FASP) process to evaluate how the existing aviation system is performing and what changes or improvements are necessary over the long term to meet current aviation demands and those anticipated for the future. Through its commitment to these comprehensive and consistent planning efforts, Florida strengthens its reputation as one of the most comprehensive and progressive airport systems in the country.

1.1 Florida Aviation System Plan 2043 Purpose

The FDOT AO upholds §332.006 of the Florida Statutes through periodic updates of the FASP. The updates focus on the needs of Florida airports as well as the entire Florida aviation system to remain consistent with FTP goals. The FASP 2043 served as an opportunity for the FDOT AO to assess the condition of certain facilities, the equipment at those facilities, operational needs, and activity demands. As a result of the effort, the FDOT AO has a clearer picture of the existing and future aviation needs of the state. With this information, the FDOT AO can promote further development and improvement of air routes, airport facilities and landing fields, protect airport approaches, and stimulate the development of aviation commerce and air facilities. The FASP 2043 focused primarily on Florida's 106 publicly owned, public-use airports, reviewing whether the goals, objectives, and performance measures (PMs) from the 2035 system plan remain applicable to support two primary goals:

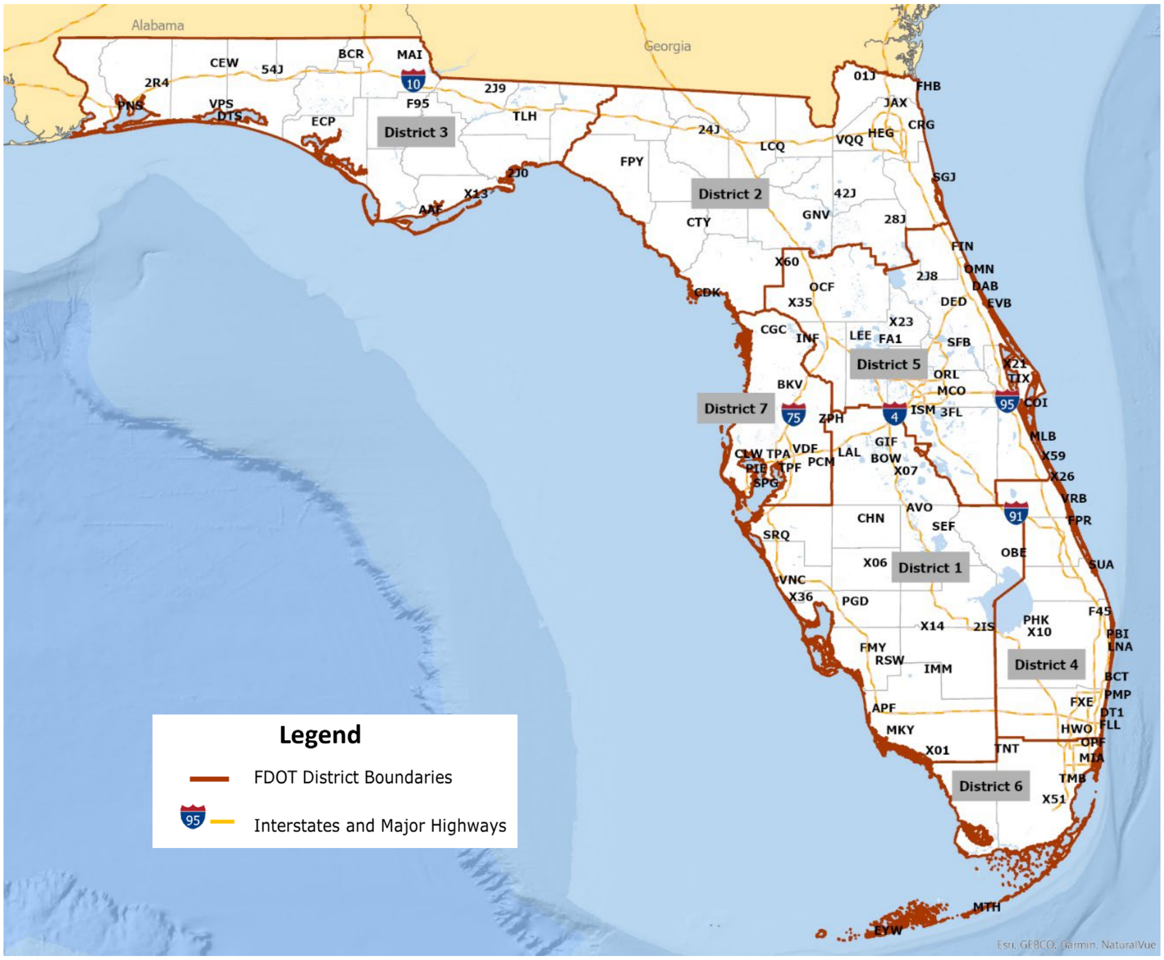
The FASP 2043 focuses on supporting more efficient decision-making and supplying system airports with useful recommendations for development that supports airport's individual missions and the whole system.

1. Provide for more efficiency in decision-making within the FDOT AO to support funding and development decisions.
2. Provide airports within the system with recommendations for development that support their individual missions while contributing to the overall strength and health of the Florida airport system.

1.2 Roles of the Districts and the Continuing Florida Aviation System Planning Process (CFASPP)

The Florida aviation system is comprised of 106 public-use airports including 19 commercial service airports and 87 general aviation airports. The State of Florida demonstrates its commitment to a healthy and robust aviation system through dual administrative organization. The Florida aviation system makes use of the decentralized FDOT district system (**Figure 1-1**), where local administrators manage, maintain, and implement maintenance and development projects daily and administrate funding, expenditures, and planning.

Figure 1-1. Florida Airports and Districts



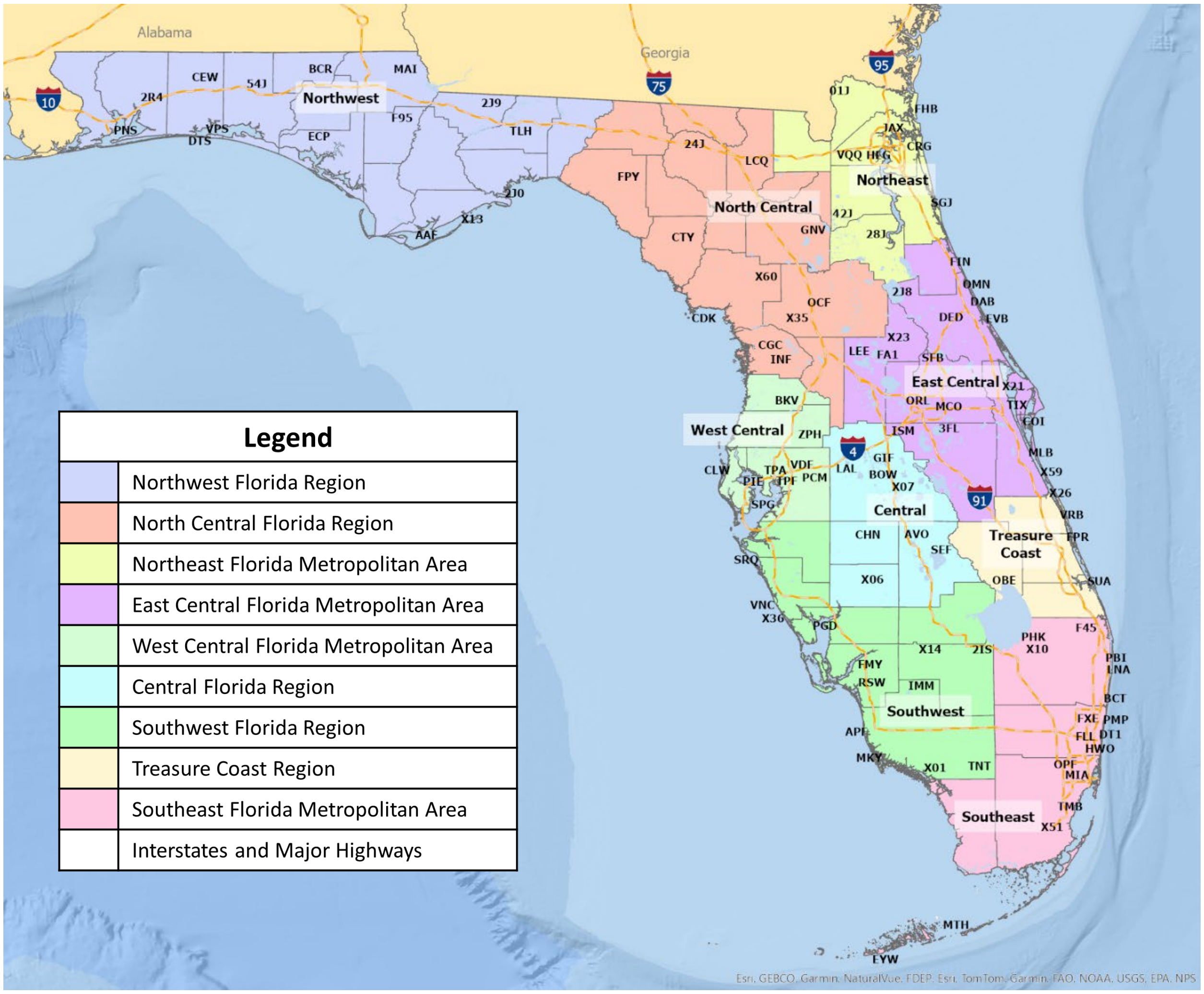
Source: Cignus, 2023

In addition, the Florida aviation system leverages the CFASPP. The FDOT AO and the Federal Aviation Administration (FAA) established the CFASPP as an information exchange to support statewide aviation operations and facilities in meeting activity and growth demands. The CFASPP administrator holds regularly scheduled regional and statewide committee meetings at which attendees discuss topics that are critical to a thriving aviation system in Florida. **Figure 1-2** shows the nine CFASPP regions and the system airports located within each CFASPP region. Topics include changes to state regulations, legislative activity in the house and senate that applies to aviation, any updates to FDOT and FAA funding programs, available training, the Florida Aviation Database, and status reports for ongoing projects as well as those nearing completion or just kicking off at individual airports.

Meeting attendees discuss emerging trends and needs at the meeting, which in turn become integrated into current initiatives at their regional airports or are incorporated into future plans, including system plan efforts such as this one.

Table 1-1 shows all 106 system airports by district and identifies their associated CFASPP Region.

Figure 1-2. Florida Airports and CFASPP Regions



Source: Cignus, 2024

Table 1-1. Airports Identified by District and Location

Florida DOT District	Airport ID	Airport Name	Location	CFASPP* Region
1	2IS	Airglades	Clewiston	Southwest
1	X06	Arcadia Municipal	Arcadia	Central
1	AVO	Avon Park Exec	Avon Park	Central
1	BOW	Bartow Exec	Bartow	Central
1	X36	Buchan	Englewood	Southwest
1	X01	Everglades Airpark	Everglades	Southwest
1	IMM	Immokalee Rgnl	Immokalee	Southwest
1	X14	La Belle Muni	La Belle	Southwest
1	X07	Lake Wales Muni	Lake Wales	Central
1	LAL	Lakeland Linder Intl	Lakeland	Central
1	MKY	Marco Island Exec	Marco Island	Southwest
1	APF	Naples Muni	Naples	Southwest

Florida DOT District	Airport ID	Airport Name	Location	CFASPP* Region
1	OBE	Okeechobee County	Okeechobee	Treasure Coast
1	FMY	Page Fld	Fort Myers	Southwest
1	PGD	Punta Gorda	Punta Gorda	Southwest
1	SRQ	Sarasota/Bradenton Intl	Sarasota/Bradenton	Southwest
1	SEF	Sebring Regional	Sebring	Central
1	RSW	Southwest Florida Intl	Fort Myers	Southwest
1	VNC	Venice Muni	Venice	Southwest
1	CHN	Wauchula Municipal	Wauchula	Central
1	GIF	Winter Haven Regional	Winter Haven	Central
2	VQQ	Cecil	Jacksonville	Northeast
2	CTY	Cross City	Cross City	North Central
2	FHB	Fernandina Beach Muni	Fernandina Beach	Northeast
2	GNV	Gainesville Rgnl	Gainesville	North Central
2	CDK	George T Lewis	Cedar Key	North Central
2	HEG	Herlong Recreational	Jacksonville	Northeast
2	01J	Hilliard Airpark	Hilliard	Northeast
2	CRG	Jacksonville Exec at Craig	Jacksonville	Northeast
2	JAX	Jacksonville Intl	Jacksonville	Northeast
2	42J	Keystone Heights	Keystone Heights	Northeast
2	LCQ	Lake City Gateway	Lake City	North Central
2	SGJ	Northeast Florida Rgnl	St Augustine	Northeast
2	28J	Palatka Muni - Lt Kay Larkin Fld	Palatka	Northeast
2	FPY	Perry-Foley	Perry	North Central
2	24J	Suwannee County	Live Oak	North Central
2	X60	Williston Muni	Williston	North Central
3	AAF	Apalachicola Rgnl-Cleve Randolph Fld	Apalachicola	Northwest
3	CEW	Bob Sikes Airport	Crestview	Northwest
3	F95	Calhoun County Airport	Blountstown	Northwest
3	X13	Carrabelle-Thompson	Carrabelle	Northwest
3	54J	Defuniak Springs	Defuniak Springs	Northwest
3	DTS	Destin Exec	Destin	Northwest
3	VPS	Eglin AFB/Destin-Ft Walton Beach	Valparaiso/Destin-Ft Walton Beach	Northwest
3	MAI	Marianna Muni	Marianna	Northwest
3	ECP	Northwest Florida Beaches Intl	Panama City	Northwest
3	PNS	Pensacola Intl	Pensacola	Northwest
3	2R4	Peter Prince Fld	Milton	Northwest
3	2J9	Quincy Muni	Quincy	Northwest
3	TLH	Tallahassee Intl	Tallahassee	Northwest
3	BCR	Tri-County	Bonifay	Northwest
3	2J0	Wakulla County	Panacea	Northwest
4	X10	Belle Glade State Muni	Belle Glade	Southeast
4	BCT	Boca Raton	Boca Raton	Southeast

Florida DOT District	Airport ID	Airport Name	Location	CFASPP* Region
4	DT1	Downtown Fort Lauderdale	Fort Lauderdale	Southeast
4	FXE	Fort Lauderdale Exec	Fort Lauderdale	Southeast
4	FLL	Fort Lauderdale/Hollywood Intl	Fort Lauderdale	Southeast
4	F45	North Palm Beach County General Aviation	West Palm Beach	Southeast
4	HWO	North Perry	Hollywood	Southeast
4	PHK	Palm Beach County Glades	Pahokee	Southeast
4	LNA	Palm Beach County Park	West Palm Beach	Southeast
4	PBI	Palm Beach Intl	West Palm Beach	Southeast
4	PMP	Pompano Beach Airpark	Pompano Beach	Southeast
4	X26	Sebastian Muni	Sebastian	Treasure Coast
4	FPR	Treasure Coast Intl	Fort Pierce	Treasure Coast
4	VRB	Vero Beach Rgnl	Vero Beach	Treasure Coast
4	SUA	Witham Fld	Stuart	Treasure Coast
5	X21	Arthur Dunn Air Park	Titusville	East Central
5	DAB	Daytona Beach Intl	Daytona Beach	East Central
5	DED	Deland Muni-Sidney H Taylor Fld	Deland	East Central
5	ORL	Exec	Orlando	East Central
5	FIN	Flagler Exec	Palm Coast	East Central
5	ISM	Kissimmee Gateway	Orlando	East Central
5	LEE	Leesburg Intl	Leesburg	East Central
5	X35	Marion County	Dunnellon	North Central
5	MLB	Melbourne Orlando Intl	Melbourne	East Central
5	COI	Merritt Island	Merritt Island	East Central
5	EVB	New Smyrna Beach Muni	New Smyrna Beach	East Central
5	OCF	Ocala Intl-Jim Taylor Fld	Ocala	North Central
5	MCO	Orlando Intl	Orlando	East Central
5	SFB	Orlando Sanford Intl	Orlando	East Central
5	OMN	Ormond Beach Muni	Ormond Beach	East Central
5	2J8	Pierson Muni	Pierson	East Central
5	TIX	Space Coast Rgnl	Titusville	East Central
5	3FL	St Cloud	St Cloud	East Central
5	FA1	Tavares	Tavares	East Central
5	X23	Umatilla Muni	Umatilla	East Central
5	X59	Valkaria	Valkaria	East Central
6	TNT	Dade-Collier Training And Transition	Miami	Southeast
6	EYW	Key West Intl	Key West	Southeast
6	TMB	Miami Exec	Miami	Southeast
6	X51	Miami Homestead General Aviation	Homestead	Southeast
6	MIA	Miami Intl	Miami	Southeast
6	OPF	Miami-Opa Locka Exec	Miami	Southeast
6	MTH	The Florida Keys Marathon Intl	Marathon	Southeast
7	SPG	Albert Whitted	St Petersburg	West Central
7	BKV	Brooksville-Tampa Bay Rgnl	Brooksville	West Central

Florida DOT District	Airport ID	Airport Name	Location	CFASPP* Region
7	CLW	Clearwater Air Park	Clearwater	West Central
7	CGC	Crystal River-Capt Tom Davis Fld	Crystal River	North Central
7	INF	Inverness	Inverness	North Central
7	TPF	Peter O Knight	Tampa	West Central
7	PCM	Plant City	Plant City	West Central
7	PIE	St Pete-Clearwater Intl	St Petersburg-Clearwater	West Central
7	VDF	Tampa Exec	Tampa	West Central
7	TPA	Tampa Intl	Tampa	West Central
7	ZPH	Zephyrhills Muni	Zephyrhills	West Central

*CFASPP-Continuing Florida Aviation System Planning Process

1.3 FASP 2043 Process

The FASP 2043 occurred in three phases (**Figure 1-3**) with a methodical approach that built on the 2035 System Plan. The core elements of the FASP 2043 were guided by FAA Advisory Circular 150/5070-7, *The Airport System Planning Process*.

1.3.1 Phase 1

The first phase established the strategic direction for the system plan and stakeholder engagement, beginning with the broadest analysis of the system that narrowed to very focused elements to be reviewed as part of the Phase 2 and Phase 3 activities.

1.3.2 Phase 2

Based on decisions from the findings in Phase 1 and the framework provided by the goals, objectives, PMs, and performance indicators (PIs), deeper analysis for the selected topics and the collected survey data occurred in Phase 2. A critical element of Phase 2 was the actual data inventory effort, along with its analysis for system performance. A review of the non-National Plan of Integrated Airport Systems (NPIAS) airports for possible eligibility was addressed, along with the development of forecasts of aviation activity for operations, enplanements and based aircraft.

1.3.3 Phase 3

Work efforts in Phase 3 centered on reviewing funding availability, further exploration of the potential initiatives the FDOT AO may consider pursuing for implementation as a result of the FASP 2043, and overall recommendations resulting from the system plan process. The final element of Phase 3 was the generation of the final deliverables, which included the FASP 2043 executive summary, technical report, individual airport profiles, and the appropriate material for posting on the FDOT website.

Figure 1-3. System Plan Process Phases and Work Efforts

Phase 1

- Strategic Direction for FASP Update
- Stakeholder Engagement Plan & Project Branding
- Goals, Objectives, and Performance Measures/Targets
- Airport Functional Uses Analysis
- Data Source Review

Phase 2

- Stakeholder Engagement Outreach
- Data Inventory
- NPIAS Eligibility Analysis
- Aviation Activity Forecasts
- System Performance

Phase 3

- State Transportation Trust Fund (STTF) Allocation Review
- FDOT Aviation Office Initiatives
- Recommendations
- Final Deliverables

1.4 Stakeholder Engagement Plan

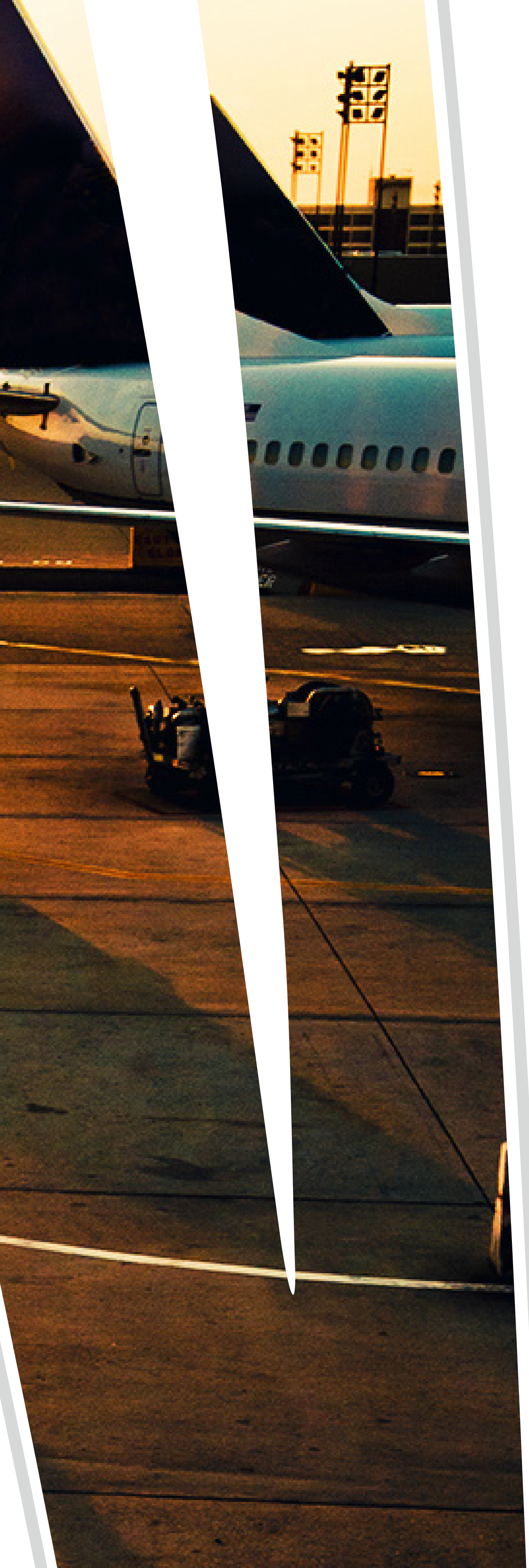
As part of Phase 1, the Stakeholder Engagement Plan (SEP) was developed and implementation began to guide stakeholder involvement. One resource used to develop the SEP was the FDOT Public Involvement Handbook. Implementing the SEP outreach efforts over the course of the project carried out the essential task of providing information, updating study progress, and allowing for comments and feedback.

Stakeholder engagement created an opportunity for a combination of stakeholders to contribute to the development of appropriate and influenceable performance measures for the FASP 2043. FDOT staff, airport managers, and Florida Airports Council members, among others, participated in data collection and helped identify key priorities for the Florida aviation system. Stakeholder engagement occurred through a combination of in-person and online opportunities, across all three phases, which included: several surveys, creation of and numerous meetings with the FASP Input Team (FIT), a presentation at the 2023 Florida Airports Council (FAC) Annual Conference, several informational webinars, and FASP updates as part of the CFASPP meetings over the course of the project.

Appendix A – Stakeholder Engagement, contains the SEP in its entirety, including greater detail about the content covered, the format, and the attendance for each outreach event.

1.5 Summary

The FASP 2043 technical report summarizes the work effort undertaken through the three phases of work. The technical report uses brief chapters that contain the highlights and key themes and findings of each aspect of the study. Numerous appendices in support of the findings contain the more robust analysis upon which the key highlights, key themes, and recommendations are based. Appendices include numerous working papers generated within each phase.



2 History and Recent Impacts

Chapter 2

History of Florida Aviation and Recent Impacts

Florida has a rich aviation history that extends more than 100 years and covers not only traditional aircraft flight but also space flight with the activity associated with the Kennedy Space Center. This history has led to a robust system across the state of Florida that has had success through the continued development of aviation system plans that provide guidance. Recent impacts to the aviation industry such as the COVID-19 pandemic and new technologies are acknowledged in this chapter as issues being important to the Florida Aviation System Plan (FASP) 2043.

2.1 History of Florida Aviation

Florida is the historic home to the birthplace of commercial aviation. The 23-minute, 18-mile flight across Tampa Bay in 1914, in Thomas Benoist's bi-wing seaplane piloted by aviator Tony Jannus with former St. Petersburg Mayor A.C. Pheil as the lone passenger is recognized as the first commercial flight in the world. This inaugural flight laid the earliest foundation for the progressive public-use airport system that today consists of 19 commercial service and 87 general aviation airports.

This system constantly evolves to keep pace with the industry and continue meeting air travel needs for people and cargo, providing flight instruction, and serving as a center for maintenance, repair, and overhaul services. Florida airports are critical in serving communities while responding to disasters, centralizing and transporting people and supplies, and serving as staging areas during crises.

Florida is home to more than 470 aviation and aerospace companies. Industry giants such as Boeing, Embraer, Lockheed Martin, and Sikorsky conduct major operations here.

2.2 Previous FASPs

With so many residents, businesses, and visitors depending on the system for these services and with the industry evolving so quickly, the Florida Department of Transportation Aviation Office (FDOT AO) recognizes the importance of regular, frequent planning efforts with the support of the Federal Aviation Administration (FAA), airport sponsors, and the many communities our airports serve. The FDOT AO focus remains consistent throughout each planning effort—safe, efficient, secure, and convenient operations to meet the needs of all users.

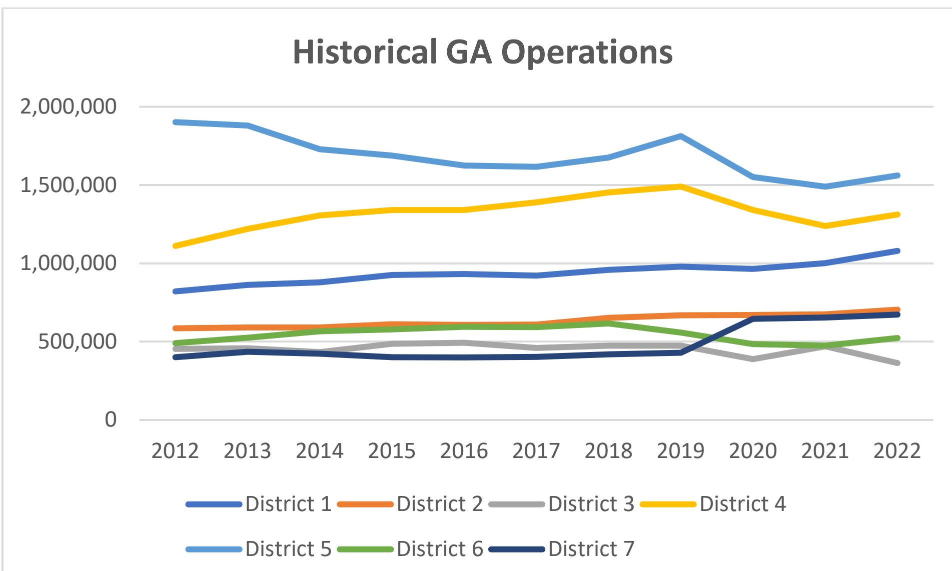
The two most recent system plans for Florida are the *Florida Aviation System Plan* 2025, drafted in 2012, and the *Florida Aviation System Plan* 2035, developed in 2015. While many system plans are updated on a five-to-ten-year timeframe, the FDOT AO furthers its interest in meeting and anticipating the air travel needs of the public in Florida keeping pace with industry change by more frequent, routine updates to its system plan. Each new plan provides the opportunity to assess previous goals and objectives, evaluate their continuing effectiveness in guiding development, and either move forward, add new goals or objectives, or a combination of the two to guide the next development priorities and initiatives for the next term.

2.3 COVID-19 Pandemic Impacts

The COVID-19 pandemic had a profound impact on life in general, but stunning historical impacts on aviation in particular. Florida was no exception to the disruptions in air travel experienced worldwide, yet there were some notable distinctions in the changes in activity level and economic impacts.

In Florida, a downturn in general aviation (GA) operations occurred in 2020 for most districts, except for Districts 2 and 7, due to the impact of the COVID-19 Pandemic. Between 2019 and 2020, GA operations across the state were down by 6 percent. Since 2020, they have rebounded to reach near pre-pandemic levels by the end of 2023.

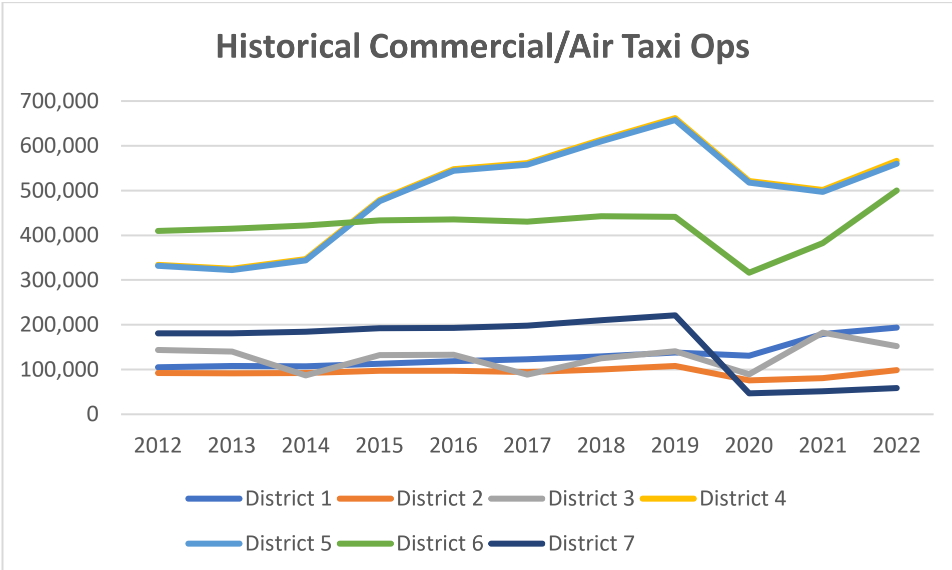
Figure 2-1. Historical GA Operations and COVID-19 Impacts



Source: Mead & Hunt, 2023

Also, much like general aviation operations, commercial operations witnessed a significant loss due to the impacts of the COVID-19 Pandemic. Between 2019 and 2020, commercial operations in Florida decreased by 33 percent. By 2021, they had started to regain and by 2022 were recovered to 90 percent of their pre-pandemic levels.

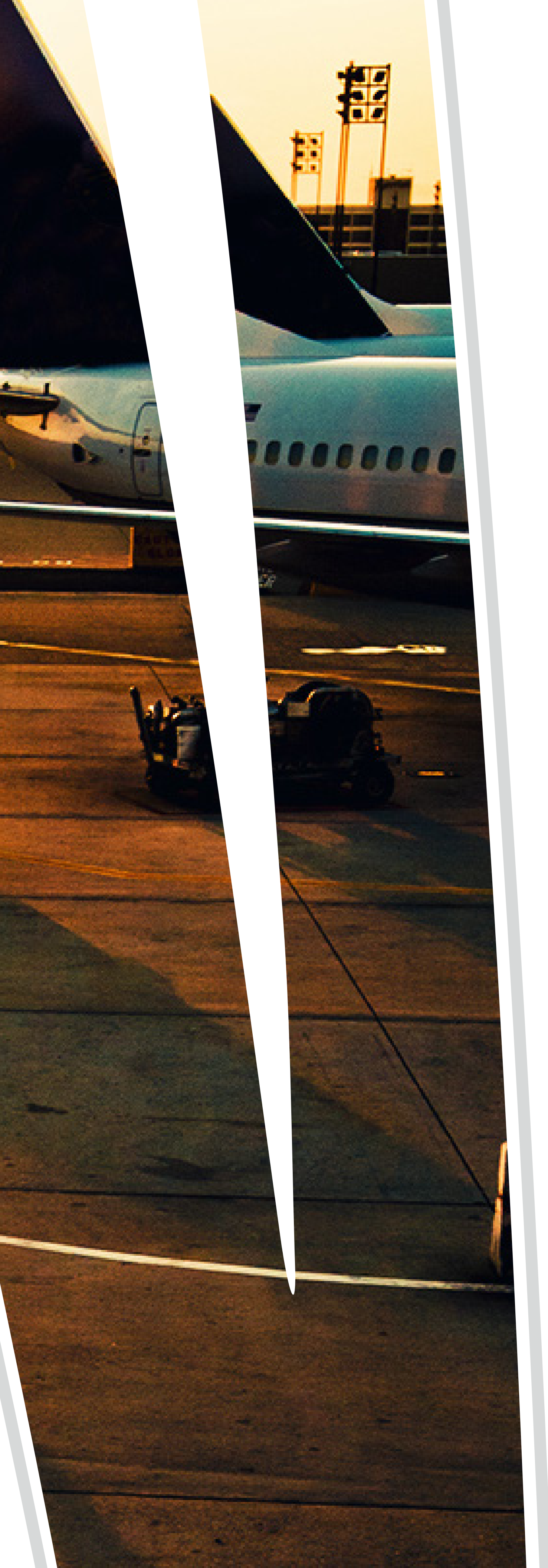
Figure 2-2. Historical Commercial/Air Taxi Operations and COVID-19 Impacts



Source: Mead & Hunt, 2023

2.4 Summary

The history of Florida aviation demonstrates a spirit of innovation, adventure, and forward-thinking. Despite the challenges encountered during the COVID-19 pandemic, Florida's aviation system has bounced back and is on track for exciting growth and new technologies in the years to come. By continuing to set planning as a priority, the FDOT AO demonstrates its commitment to supporting the efforts of its seven districts in serving the entire population of Florida apace with an ever-evolving aviation industry. The remaining chapters of the FASP describe the system as of 2023 and explore the opportunities to enhance service and meet capacity demands as the system continues to grow.



3 Airport System NPIAS Classifications

FDOT 2043 FASP FLORIDA AVIATION SYSTEM PLAN

Chapter 3

Airport NPIAS Classifications

According to the Federal Aviation Administration's (FAA's) Airport Data and Information Portal (ADIP), there are 940 airports, heliports, and seaplane bases in Florida. These facilities range from large, publicly-owned hubs such as Miami International to small, privately-owned, restricted-use grass airstrips and heliports. Only a fraction of these facilities are considered part of the Florida airport system. The group that is generally recognized as the Florida Aviation System of Airports consists of the 106 facilities that are both publicly-owned and available for public use.

The 106 airports recognized in the FASP represent 11 percent of all airports within the state.

This chapter summarizes the airports within the Florida aviation system analyzed for the Florida Aviation System Plan (FASP) 2043, including identifying the airports based upon their federal classification within the *National Plan of Integrated Airport System* (NPIAS). A brief discussion of those airports within the state system but not within the NPIAS is also provided.

3.1 National Plan of Integrated Airport Systems Analysis

One key element in determining overall system performance was an analysis of the airport system from the perspective of the NPIAS, which is the FAA document that is updated every two years and addresses the classification of airports within the national airport system. This section briefly highlights the criteria for inclusion in the NPIAS, a prerequisite for airports to be eligible for FAA grant programs.

The analysis documented here looked closely at publicly owned airports within the State of Florida that may wish to be considered for future inclusion in the NPIAS. Those airports potentially close to moving from one category to another received some attention as well, with close consideration given to those at risk of losing their classification.

3.1.1 Background on the NPIAS

FAA publishes the NPIAS every two years, with the most recent version being issued for 2023-2027. The NPIAS identifies those airports deemed critical to the national transportation system, for access as well as contribution to the national economy. Airports in the NPIAS become eligible for federal funding under the Airport Improvement Program (AIP).

The FAA is required to publish its assessment of the national airport system every two years.

The NPIAS also estimates the expected development costs over the next five years for those airports that are part of the NPIAS. It classifies those airports based on several criteria, which are summarized later in this chapter.

3.1.2 The National Airport System

According to the NPIAS, the U.S. has more than 19,000 airport facilities. The classifications shown in **Table 3-1** demonstrate that the vast majority (nearly three-quarters, or close to 14,800) are private-use, meaning they are not open to the public.

Table 3-1. Types of Existing Airport Facilities in the U.S.

Type of Facility	Total U.S. Facilities	Private-Use Facilities	Public-Use Facilities	Existing NPIAS Facilities	Florida System NPIAS Facilities*
Airport	13,098	8,315	4,783	3,247	99
Heliport	6,059	6,004	55	8	0
Seaplane Base	534	312	222	32	0
Ultralight	113	110	3	0	0
Gliderport	36	31	5	0	0
Balloonport	13	12	1	0	0
Total	**19,853**	**14,784**	**5,069**	**3,287**	**99**

*The FAA treats Miami Seaplane Base (X44) as publicly owned, but FDOT does not. As a result, X44 is not part of the Florida airport system, but it is part of the NPIAS.
Source: 2023-2027 NPIAS

Of these 19,000 airport facilities, 3,287 facilities are considered critical to the national airport system and are eligible for federal funding under the AIP and the Infrastructure Investment and Jobs Act, also known as the Bipartisan Infrastructure Law (BIL). Nearly all of these critical facilities are airports (**Table 3-1**). The rest consist of eight heliports and 32 seaplane bases. The heliports are predominately located in metropolitan areas, while most of the NPIAS seaplane bases are in Alaska.

3.1.3 NPIAS Service Levels

The NPIAS categorizes airport facilities in several ways. At the highest level, it groups airports into service levels, of which there are four:

- Primary – an airport with more than 10,000 annual enplanements.
- Commercial Service – an airport with between 2,500 and 10,000 annual enplanements.
- Reliever – a general aviation (GA) airport that serves to relieve congestion at a commercial service airport.

The NPIAS categorizes airports into one of four service levels and one of five roles based on multiple sets of criteria.

- General Aviation – a public airport that does not have scheduled airline service or has scheduled airline service but enplanes fewer than 2,500 annual passengers.

3.1.4 NPIAS Roles

The NPIAS establishes various criteria for the five defined NPIAS roles associated with general aviation airports – National, Regional, Local, Basic, and Unclassified airports.

National airports typically link communities to U.S. and international markets and feature significant aviation activity involving turbine and multiengine aircraft.

To be classified as a National airport, airports must meet one of the following criteria:

- 5,000 or more annual instrument operations, 11 or more validated based jets, and 20 or more international flights or 500 or more interstate departures annually,
- 10,000 or more annual enplanements and at least one carrier enplanement by a large, certificated air carrier, or
- 500 million pounds or more of landed cargo weight annually.

Regional airports connect communities to regional and national markets. Located in metropolitan areas serving relatively large populations, regional airports have high levels of activity with some jets and multiengine propeller aircraft.

Figure 3-1. Example of a Regional Airport

Source: Flagler Executive Airport

To be classified as a Regional airport, airports must meet one of the following criteria:

- Located in a Metropolitan or Micropolitan Statistical Area, 10 or more annual domestic flights over 500 miles, 1,000 or more annual instrument operations, and one or more validated based jets, or 100 or more validated based aircraft,
- Nonprimary commercial service airport (requiring scheduled service) within a Metropolitan Statistical Area, or
- Currently designated by the FAA as a Reliever with 90 or more validated based aircraft.

Local airports provide access to nearby markets, generally within a state or immediate region. Local airports are generally found near larger population centers, but outside of metropolitan or micropolitan areas. Aviation activity at these airports is predominately conducted by piston aircraft used for business and personal needs. Typical services found at these airports include flight training, emergency services, and charter flights.

To be classified as a Local airport, airports must meet one of the following criteria:

- Publicly owned facility and 10 or more annual instrument operations, and 15 or more validated based aircraft, or
- Publicly owned facility and 2,500 or more annual enplanements.

Basic airports typically support aviation activities such as flight training, air ambulance service, and personal flying. The activity found at these airports is nearly all by prop aircraft flown for business and personal reasons. These airports tend to have minimal infrastructure, with only a single runway or helipad available.

To be classified as a Basic airport, airports must meet one of the following criteria:

- Publicly owned facility with 10 or more validated based aircraft, or four or more validated based helicopters if a heliport,
- Publicly owned facility located 30 or more miles from the nearest NPIAS airport,
- Owned by or serving a Native American community,
- Identified and used by the U.S. Forest Service, U.S. Marshals, U.S. Customs and Border Protection (designated, international, or landing rights), U.S. Postal Service (air stops), or having Essential Air Service,
- A new or replacement publicly owned airport that has opened within the last 10 years, or
- Unique circumstances related to special aeronautical use.

Unclassified airports are facilities that have historically been included in the NPIAS but do not currently meet any of the above listed criteria. Typically, the issue is an airport dropping below 10 or more validated based aircraft if the airport is within 30 miles of another NPIAS airport. Should the facility meet the criteria necessary for classification, then that facility will be reclassified in the next publication of the NPIAS.

3.1.5 NPIAS Eligibility Criteria

The FAA establishes the criteria that determine which facilities are NPIAS eligible in FAA Order 5090.5 *National Plan of Integrated Airport Systems (NPIAS) and the Airports Capital Improvement Plan (ACIP);* hereafter, FAA Order 5090.5. The order explains the FAA uses both quantitative and qualitative evaluation to admit airport facilities into the NPIAS. This section explains the initial screening requirements for facilities to be eligible for inclusion. Even though a facility may meet the criteria, it will not be included automatically in the NPIAS. Other qualitative evaluation factors may be taken into account in the final determination.

The NPIAS establishes different initial screening requirements for different situations, such as existing airport facilities compared to proposed airport facilities. Multiple sets of criteria determine whether an existing Florida airport or seaplane base (SPB) is NPIAS-eligible.

Commercial Service Airports – This first set of criteria addresses airports that meet the definition of primary or commercial service airport, since all of these airports are part of the NPIAS. To be NPIAS-eligible, an existing Florida airport or SPB must meet all of the following criteria:

- The facility is publicly owned and publicly accessible.
- The facility has scheduled air carrier service.
- The facility enplanes 2,500 or more passengers annually.

General Aviation Airports – This second set of criteria applies to general aviation airports. If an existing Florida airport or SPB meets all of the following criteria, it is NPIAS eligible:

- The facility is operated by a sponsor eligible to receive federal funds and can meet obligations.
- The facility has 10 or more based aircraft (verified by tail numbers).
- The facility is at least 30 miles from the nearest NPIAS airport (including NPIAS airports in other states).
- The facility can demonstrate an identifiable role in the national system.
- The facility is included in the FASP and recommended to be part of the NPIAS.
- A review by the FAA found no significant airfield design standard deficiencies, compliance violations, and wetland or wildlife issues.

Special Conditions – This third set of criteria covers facilities that do not meet the two previous sets of criteria, but the airport serves a unique role that justifies being part of the NPIAS. A Florida airport or SPB that meets any one or more of the following criteria is NPIAS eligible:

- The facility is owned or serves a Native American community.
- The facility has been identified and used by any of the following:
  - U.S. Forest Service,
  - U.S. Marshals,
  - U.S. Customs and Border Protection (designated, international, or landing rights),
  - U.S. Postal Service (air stops), or
  - Essential Air Service program.

Heliports – In addition to existing airports and SPB, the NPIAS gives consideration to existing heliports. To be NPIAS eligible, an existing Florida heliport must meet all of the following criteria:

- The heliport is publicly owned and open to public use.
- The heliport is operated by a sponsor eligible to receive federal funds and meet obligations.
- The heliport has four or more based aircraft for at least two years prior.
- The heliport has 400 annual instrument flight rules (IFR) flights.
- The heliport is part of the FASP.

Reliever Airports – The NPIAS also has a set of criteria for determining which airports can be considered eligible to be a reliever airport in the NPIAS. To be a reliever airport, an existing Florida airport must meet all of the following criteria:

- The facility is operated by a sponsor eligible to receive federal funds and meet obligations.
- The facility has 100 or more based aircraft (verified by tail numbers).
- The facility relieves a large- or medium-hub airport that is operating at 60 percent capacity or higher.
- The facility demonstrates an identifiable role in the national system.
- The facility is included in the FASP and recommended to be part of the NPIAS.
- A review by the FAA found no significant airfield design standard deficiencies, compliance violations, and wetland or wildlife issues.

Proposed Airports – Finally, the NPIAS has a set of criteria for proposed airports. Not surprisingly, the criteria for a proposed airport are more stringent than an existing airport. For a proposed airport to be eligible for the NPIAS, it must meet all of the following criteria:

- The airport demonstrates how it will meet the operational activity required within the first five years of operation (based on a forecast validated by the FAA).
- The airport provides enhanced facilities that will accommodate the current aviation activity and improve functionality as well as provide room for future development based on imminent, justified demand.
- A benefit-cost analysis shows a 1.0 ratio or higher.
- The airport has a detailed financial plan that accomplishes its construction and ongoing maintenance.
- The level of local support/consensus is adequate to achieve development of the new airport.

For those nonprimary facilities that meet all of the initial screening requirements, inclusion in the NPIAS still requires approval by the FAA at the Airports District Office, Regional Office, and Headquarters levels. During this review and approval process, the FAA may consider qualitative factors, such as:

- The concentration of aircraft owners and users at the facility,
- Existing conditions, such as lease agreements, or non-aeronautical activity on airport property, which could impact the ability of the facility to comply with FAA requirements, and
- Historic trends of population, or other demographic characteristics, which could drive demand for aeronautical services at the facility.

A full listing of the issues that the FAA may consider when reviewing a NPIAS entry request can be found in FAA Order 5090.5.

3.2 Florida's Airport System

Most of the facilities within the Florida Airport System are included in the NPIAS, but there are a number of non-NPIAS facilities that are publicly owned and considered for potential inclusion in the NPIAS.

Of the 940 airports, heliports, and seaplane bases in Florida, 106 that are both publicly owned and for public use are generally recognized as the Florida Aviation System of Airports.

All but three of Florida's 106 airport system facilities are airports (**Table 3-2**). Of those three, one is a heliport, and the other two are seaplane bases. These three facilities and four of the airports are not in the NPIAS. Of the 99 facilities within the NPIAS, Florida represents just over 3 percent of the NPIAS airports nationwide.

Table 3-2. Types of Existing Airport Facilities in Florida

Type of Facility	Total Florida Facilities	Total System Facilities	Florida System NPIAS Facilities*	Florida System Facilities Not in NPIAS
Airport	491	103	99	4
Heliport	381	1	0	1
Seaplane Base	64	2	0	2
Ultralight	2	0	0	0
Gliderport	2	0	0	0
Balloonport	0	0	0	0
Total	**940**	**106**	**99**	**7**

*The FAA treats Miami Seaplane Base (X44) as publicly owned, but FDOT does not. As a result, X44 is not part of the Florida airport system, but it is part of the NPIAS.

Source: 2023-2027 NPIAS and FAA Airport Data Information Portal

Table 3-3 shows the number of Florida system airports in each NPIAS service level. Like most states, the majority of Florida's airports fall into the general aviation service level. However, Florida does have a substantial number of reliever airports, with only Texas and California surpassing Florida's 17 relievers.

Table 3-3. Florida's System Airports by NPIAS Service Level

Service Level	Number of Florida System Airports
Primary	19
Commercial Service	2
Reliever	17
General Aviation	61
Total	**99**

Source: 2023-2027 NPIAS

The NPIAS further classifies primary airports into four different hub types. Hub types for Florida's 19 primary airports are listed in **Table 3-4**. The proportion of total U.S. enplanements defines their hub type. Florida's primary airports are distributed among the four hub types, with the largest number falling into the small hub classification. Florida also has four large hub airports, more than any other state.

Table 3-4. Types of Primary Airports in Florida

NPIAS Primary Airport Hub Type	Number of Florida Airports	Defining Criteria Based on Annual Enplanements
Large Hub	4	1.0% or more of all U.S. enplanements
Medium Hub	3	Between 0.25% and 1.0% of all U.S. enplanements
Small Hub	8	Between 0.05% and 0.25% of all U.S. enplanements
Nonhub	4	More than 10,000 but less than 0.05% of all U.S. enplanements
Total	**19**	

Source: 2023-2027 NPIAS

As noted above, the NPIAS also classifies GA airports and nonprimary commercial service airports into NPIAS roles based on a variety of criteria. **Table 3-5** lists the NPIAS roles and the number of Florida airports within each role.

Table 3-5. Florida's Non-Primary/General Aviation NPIAS Airports

NPIAS Role	Number of Florida Airports
National Airports	12
Regional Airports	34
Local Airports	25
Basic Airports	7
Unclassified Airports	2
Total	**80**

Source: 2023-2027 NPIAS

Additionally, Florida has seven publicly owned airports that are not included in the NPIAS, which are part of the Florida aviation system. These three groups of airports (primary, non-primary and non-NPIAS) account for the total of 106 facilities in the Florida aviation system.

Table 3-6 lists each Florida system airport and its respective NPIAS role for GA airports and hub type for the primary airports, as reported in the 2023-2027 NPIAS, along with its designation in the 2021-2025 NPIAS, the previous assessment. Airports that have changed role or hub type have been highlighted with those moving up in classification shown in green and those moving to a lower classification shown in yellow.

Airports that changed role or hub type may want to evaluate their situation prior to December in odd numbered years since that is when the FAA begins collecting data for evaluation in the next NPIAS. Those airports that moved up will want to guard against slipping back to their previous designations, and the airports that moved down will want to make certain that any beneficial changes in data are updated and communicated to the FAA for possible reclassification to a higher role. These roles have become important to funding allocations with the various COVID relief programs as well as the recently enacted BIL funding, which allocates funds based upon NPIAS level and roles.

Key Considerations for airports moving between NPIAS roles:

For an airport that moved up, guard against a return to previous designation; for an airport that moved down, report beneficial data changes routinely for FAA to consider during reclassification.

Table 3-6. Florida's System Airports Organized Alphabetically by Airport Name by NPIAS Roles

Note: Airports that moved up in role are highlighted green, while those that moved down in role are highlighted yellow.

Airport ID	Airport	2023-2027 NPIAS Role or Hub Type	2021-2025 NPIAS Role or Hub Type
FLL	Fort Lauderdale/Hollywood International	Large Hub	Large Hub
MIA	Miami International	Large Hub	Large Hub
MCO	Orlando International	Large Hub	Large Hub
TPA	Tampa International	Large Hub	Large Hub
JAX	Jacksonville International	Medium Hub	Medium Hub
PBI	Palm Beach International	Medium Hub	Medium Hub
RSW	Southwest Florida International	Medium Hub	Medium Hub
VPS	Eglin AFB/Destin-Ft Walton Beach	Small Hub	Small Hub
EYW	Key West International	Small Hub	Nonhub
ECP	Northwest Florida Beaches International	Small Hub	Small Hub
SFB	Orlando Sanford International	Small Hub	Small Hub
PNS	Pensacola International	Small Hub	Small Hub
PGD	Punta Gorda	Small Hub	Small Hub
SRQ	Sarasota/Bradenton International	Small Hub	Small Hub
PIE	St Pete-Clearwater International	Small Hub	Small Hub
DAB	Daytona Beach International	Nonhub	Nonhub
GNV	Gainesville Regional	Nonhub	Nonhub
MLB	Melbourne Orlando International	Nonhub	Nonhub
TLH	Tallahassee International	Nonhub	Nonhub
BCT	Boca Raton	National	National
BKV	Brooksville-Tampa Bay Regional	National	Regional
DTS	Destin Executive	National	National
ORL	Executive	National	Regional
FXE	Fort Lauderdale Executive	National	National
ISM	Kissimmee Gateway	National	National

Airport ID	Airport	2023-2027 NPIAS Role or Hub Type	2021-2025 NPIAS Role or Hub Type
LAL	Lakeland Linder International	National	National
APF	Naples Municipal	National	National
SGJ	Northeast Florida Regional	National	Basic
FMY	Page Field	National	National
VRB	Vero Beach Regional	National	Nonhub
SUA	Witham Field	National	National
SPG	Albert Whitted	Regional	Regional
BOW	Bartow Executive	Regional	Regional
VQQ	Cecil	Regional	Regional
CGC	Crystal River-Capt Tom Davis Field	Regional	Regional
DED	DeLand Municipal-Sidney H Taylor Field	Regional	Regional
FIN	Flagler Executive	Regional	Regional
CRG	Jacksonville Executive at Craig	Regional	Regional
LCQ	Lake City Gateway	Regional	Regional
LEE	Leesburg International	Regional	Regional
MKY	Marco Island Executive	Regional	Regional
COI	Merritt Island	Regional	Local
TMB	Miami Executive	Regional	Regional
OPF	Miami-Opa Locka Executive	Regional	Regional
EVB	New Smyrna Beach Municipal	Regional	Regional
F45	North Palm Beach County General Aviation	Regional	National
HWO	North Perry	Regional	Regional
OCF	Ocala International-Jim Taylor Field	Regional	National
OBE	Okeechobee County	Regional	Regional
OMN	Ormond Beach Municipal	Regional	Regional
28J	Palatka Municipal - Lt Kay Larkin Field	Regional	Regional
LNA	Palm Beach County Park	Regional	Regional
TPF	Peter O Knight	Regional	Regional
2R4	Peter Prince Field	Regional	Local
PCM	Plant City	Regional	Local
PMP	Pompano Beach Airpark	Regional	Regional
SEF	Sebring Regional	Regional	Regional
TIX	Space Coast Regional	Regional	Local
VDF	Tampa Executive	Regional	Regional
MTH	The Florida Keys Marathon International	Regional	Regional
FPR	Treasure Coast International	Regional	Regional
VNC	Venice Municipal	Regional	Regional
X60	Williston Municipal	Regional	Regional
GIF	Winter Haven Regional	Regional	Regional
ZPH	Zephyrhills Municipal	Regional	Regional
2IS	Airglades	Local	Basic
X06	Arcadia Municipal	Local	Local

Airport ID	Airport	2023-2027 NPIAS Role or Hub Type	2021-2025 NPIAS Role or Hub Type
X21	Arthur Dunn Air Park	Local	Local
AVO	Avon Park Executive	Local	Local
CEW	Bob Sikes	Local	Local
F95	Calhoun County	Local	Basic
CLW	Clearwater Air Park	Local	Local
54J	Defuniak Springs	Local	Local
FHB	Fernandina Beach Municipal	Local	Local
HEG	Herlong Recreational	Local	Regional
01J	Hilliard Airpark	Local	Local
IMM	Immokalee Regional	Local	Local
42J	Keystone Heights	Local	Local
X14	La Belle Municipal	Local	Local
X07	Lake Wales Municipal	Local	Local
MAI	Marianna Municipal	Local	Local
X35	Marion County	Local	Local
X51	Miami Homestead General Aviation	Local	Local
2J9	Quincy Municipal	Local	Local
X26	Sebastian Municipal	Local	Local
24J	Suwannee County	Local	Local
BCR	Tri-County	Local	Local
X23	Umatilla Municipal	Local	Local
X59	Valkaria	Local	Local
CHN	Wauchula Municipal	Local	Local
AAF	Apalachicola Regional-Cleve Randolph Field	Basic	Basic
CTY	Cross City	Basic	Basic
TNT	Dade-Collier Training and Transition	Basic	Basic
CDK	George T Lewis	Basic	Basic
INF*	Inverness	Basic	Local
PHK*	Palm Beach County Glades	Basic	Basic
FPY	Perry-Foley	Basic	Basic
X10	Belle Glade State Municipal	Unclassified	Unclassified
X01	Everglades Airpark	Unclassified	Unclassified
X36	Buchan	Not in NPIAS	Not in NPIAS
X13	Carrabelle-Thompson	Not in NPIAS	Not in NPIAS
DT1	Downtown Fort Lauderdale	Not in NPIAS	Not in NPIAS
2J8	Pierson Municipal	Not in NPIAS	Not in NPIAS
3FL	St. Cloud SPB	Not in NPIAS	Not in NPIAS
FA1	Tavares SPB	Not in NPIAS	Not in NPIAS
2J0	Wakulla County	Not in NPIAS	Not in NPIAS

*These airports risk losing their Basic airport designation should their based aircraft decline. See **Table 3-9** for details.

Source: 2023-2027 NPIAS and 2021-2025 NPIAS

3.3 Funding Implications of NPIAS Roles and Service Levels

Historically, the FAA uses the NPIAS roles and service levels for determining grant eligibility and funding amounts. This section examines how the FAA's AIP, supplemental appropriations, and COVID relief funding programs have taken NPIAS role or service level into account.

3.3.1 AIP Funding Levels

Congress appropriates the AIP from the Airport and Airway Trust Fund (funded by taxes on aviation-related activities), and FAA distributes the funds. The AIP consists of entitlement, state apportionment, discretionary, and supplementary funding. Appropriated AIP funds are distributed into entitlement categories by formula. Funds from the AIP must be spent in accordance with the criteria outlined in FAA Order 5100.38D – Airport Improvement Program Handbook.

- Entitlement funds are distributed to primary airports based on the number of annual enplanements in the most recent calendar year. General aviation airports with more than 10,000 passengers also receive an annual entitlement.

- Nonprimary airports classified as national, regional, local, and basic are eligible for an annual entitlement of $150,000.

- Unclassified NPIAS airports are limited to using this entitlement on projects that:
  - Rehabilitate the airport's existing primary runway pavement at a frequency not to exceed 10 years,
  - A one-time project to remove obstructions from each end of the primary runway, and
  - Runway maintenance projects allowed per FAA Order 5100.38D *Airport Improvement Program Handbook* (AIP Handbook), Chapters 3-10.

Nonprimary airports classified as national, regional, local, and basic are eligible for an annual entitlement of $150,000.

Other projects at unclassified airports may be funded with entitlement money, but they are limited to "…cases where extraordinary justification exists..." according to the AIP Handbook. Furthermore, these projects also require pre-approval by APP-500, the FAA Airports Financial Assistance Division.

Additional funds may be allocated to the various NPIAS airports for specific projects from state apportionment, and discretionary funds on a project-by-project basis. The additional funds are often competitive with preference often placed on projects that preserve existing infrastructure or enhance safety.

3.3.2 Supplemental Funding and COVID Programs

Congress has recently made use of NPIAS roles and service levels in supplemental appropriations, many of which were tied to the COVID-19 pandemic. **Table 3-7** lists the airport appropriations authorized by Congress since the start of the pandemic. As shown in the table, NPIAS roles were used to determine the allocation of funding to nonprimary airports for several of the initial appropriation actions.

Table 3-7. Airport Appropriations Since the Pandemic

Appropriation	Amount	Award Cutoff	Details
Coronavirus Aid, Relief, and Economic Security (CARES)	$10 billion	Until funds expended	Primary airports – formula based National – $157,000 Regional – $69,000 Local – $30,000 Basic – $20,000 Unclassified - $1,000
Coronavirus Response and Relief Supplemental Appropriation (CRESA)	$2 billion	September 2021	Primary airports – formula based National – $57,000 Regional – $23,000 Local – $13,000 Basic – $9,000 Unclassified - $0
American Rescue Plan (ARPA)	$8 billion	September 2024	Primary airports – formula based National – $148,000 Regional – $59,000 Local – $32,000 Basic – $22,000 Unclassified - $0
Airport Improvement Program (AIP) 2018-2020 Supplemental Appropriation	$1 billion	September 2020	Priority consideration given to projects at: Regional, Local, or Basic airports not located within metropolitan or micropolitan statistical areas Small hub or nonhub airports
AIP 2019-2021 Supplemental Appropriation	$500 million	September 2021	Not less than 50% of funds must be used at nonprimary, nonprimary commercial service, reliever, nonhub primary, and small hub primary airports.
AIP 2020-2022 Supplemental Appropriation	$400 million	September 2022	Any NPIAS airport is eligible regardless of role or service level.
AIP 2021-2023 Supplemental Appropriation	$400 million	September 2023	Any NPIAS airport is eligible regardless of role or service level.
AIP 2022-2024 Supplemental Appropriation	$547.9 million	September 2024	Any NPIAS airport is eligible regardless of role or service level.

Source: FAA Airports Program (www.faa.gov/airports)

Table 3-7 illustrates that the first two Supplemental Appropriations made use of NPIAS roles and directed portions of the appropriations to specific hub sizes. The FAA also uses NPIAS role classifications and hub sizes in its National Priority System equation that ranks project importance for discretionary grants. Details are available in Appendix E of FAA Order 5090.5.

One of the designations that has had a limited role in funding in recent years is the classification as a reliever airport. As noted in the 2021 NPIAS report, Florida had 18 airports classified as reliever airports, as shown in **Table 3-8**. This decreased to 17 airports per the 2023 NPIAS report with Ft. Lauderdale Executive (FXE) moving up to a nonprimary commercial service airport when its enplanements exceeded 2,500 but remained below 10,000 annually. The FAA has ceased to provide any additional funding for those airports identified as relivers; therefore, the classification has limited impact on funding levels. The designation is more relevant in demonstrating the importance of the airport to the overall system, with these sites usually providing critical capacity in metropolitan regions.

Table 3-8. Florida's Reliever Airports

Airport ID	Airport	2023-2027 NPIAS Service Level	2021-2025 NPIAS Service Level
BCT	Boca Raton	Reliever	Reliever
CLW	Clearwater Air Park	Reliever	Reliever
FXE	Fort Lauderdale Executive	Commercial Service	Reliever
FMY	Page Field	Reliever	Reliever
HWO	North Perry	Reliever	Reliever
HEG	Herlong Recreational	Reliever	Reliever
CRG	Jacksonville Executive at Craig	Reliever	Reliever
LAL	Lakeland Linder International	Reliever	Reliever
TMB	Miami Executive	Reliever	Reliever
OPF	Miami-Opa Locka Executive	Reliever	Reliever
ORL	Executive	Reliever	Reliever
ISM	Kissimmee Gateway	Reliever	Reliever
SPG	Albert Whitted	Reliever	Reliever
TPF	Peter O Knight	Reliever	Reliever
VDF	Tampa Executive	Reliever	Reliever
VNC	Venice Municipal	Reliever	Reliever
F45	North Palm Beach County General Aviation	Reliever	Reliever
LNA	Palm Beach County Park	Reliever	Reliever

Source: 2023-2027 NPIAS and 2021-2025 NPIAS

Since Congress has made use of NPIAS roles and service levels in the past, it stands to reason that future appropriations may make use of these classifications. Additionally, Congress may choose to use these same roles and service levels for AIP distributions in the future. Airport sponsors should keep this in mind and take actions to monitor and, at a minimum, actively safeguard their NPIAS role and service level to protect future appropriations. With past appropriation amounts tied to NPIAS roles, proactive airport sponsors should take steps to improve their NPIAS role designations to maximize future appropriations.

3.4 Assessment of Florida's Non-NPIAS Facilities

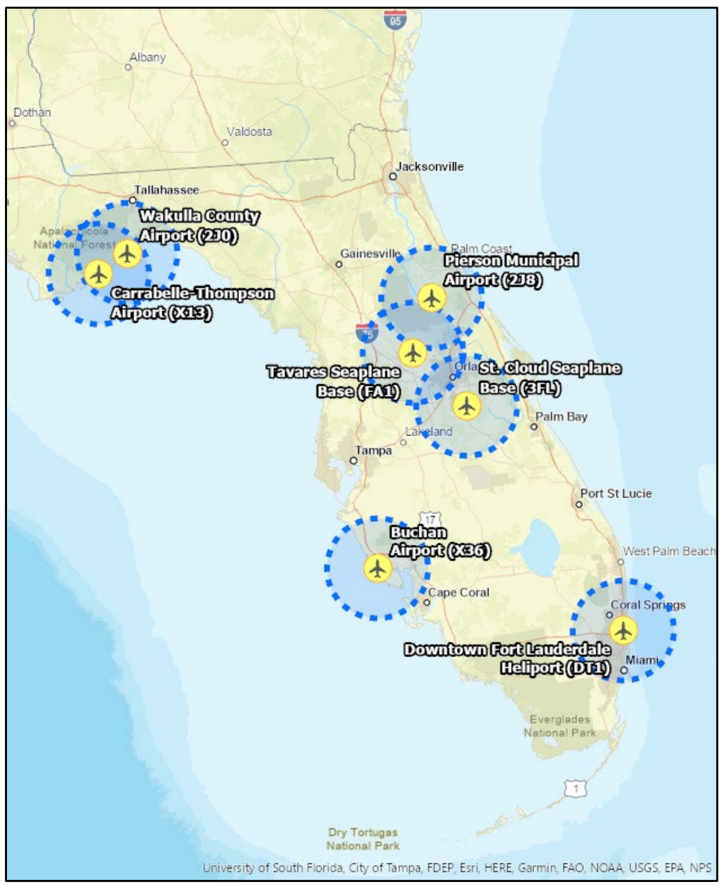
The Florida aviation system has seven facilities that are not included in the NPIAS. All of these facilities are existing airports, SPBs, or heliports:

- Buchan Airport.
- Carrabelle-Thompson Airport.
- Pierson Municipal Airport.
- St. Cloud Seaplane Base.
- Tavares Seaplane Base.
- Wakulla County Airport.
- Downtown Fort Lauderdale Heliport.

This section examines each facility and explains their challenges to being considered for NPIAS inclusion.

Figure 3-2 provides an overview of the location of these seven facilities. Six are either existing airports or SPBs and are assessed using the NPIAS initial screening requirements for existing facilities. The seventh is an existing heliport assessed using the existing heliport initial screening requirements. None of these facilities have scheduled air carrier service. All of these facilities are publicly owned and open to public use.

Figure 3-2. Florida's system airports not in the NPIAS.

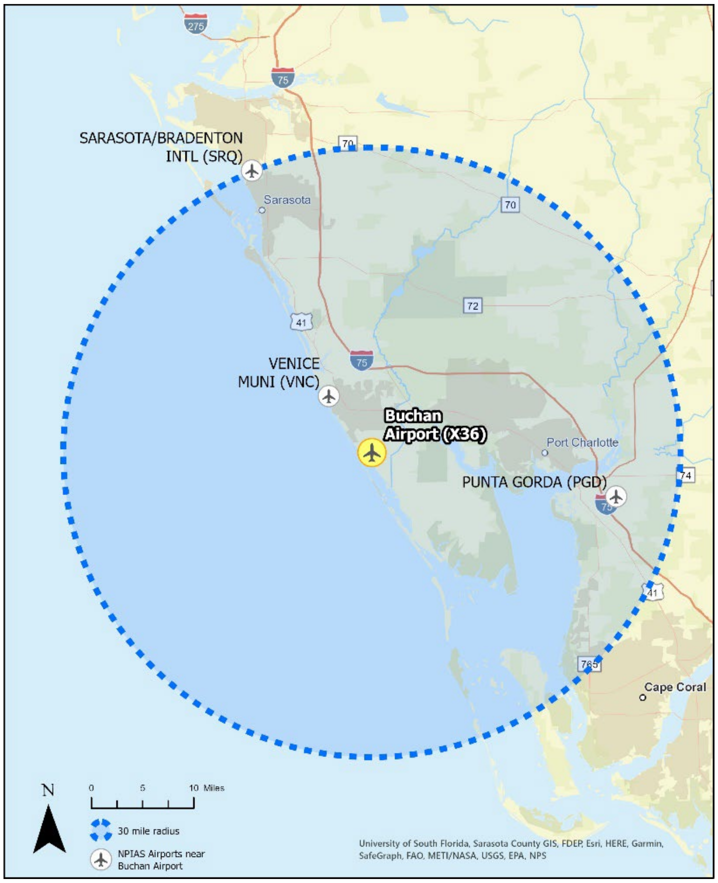


Since none of the facilities are in the NPIAS, none of them report their based aircraft numbers to the National Based Aircraft Inventory Database. Therefore, based aircraft data came from the most recent FAA 5010 Master Record report obtained for each site. The FAA also relies on this source of data, so it is imperative that airports interested in inclusion in the NPIAS keep their 5010 data updated.

3.4.1 Buchan Airport

Buchan Airport (X36) is located near Englewood, Florida, along the gulf coast, south of the Sarasota metro area. The airport has a single, turf runway and is owned by Sarasota County. Two NPIAS airports are within 30 miles of X36, as shown in **Figure 3-3**.

Figure 3-3. NPIAS airports within 30 miles of X36.



Airport officials report that the U.S. Air Force uses X36 approximately twice per year for training. No other federal agencies reportedly use the airport.

X36 does not meet any of the special justification criteria as shown in **Table 3-9**. X36 has less than 10 based aircraft and is within 30 miles of two NPIAS airports. For these reasons, it is unlikely that the FAA will include it in the NPIAS.

Table 3-9. NPIAS Initial Screening Requirements: Buchan (X36)

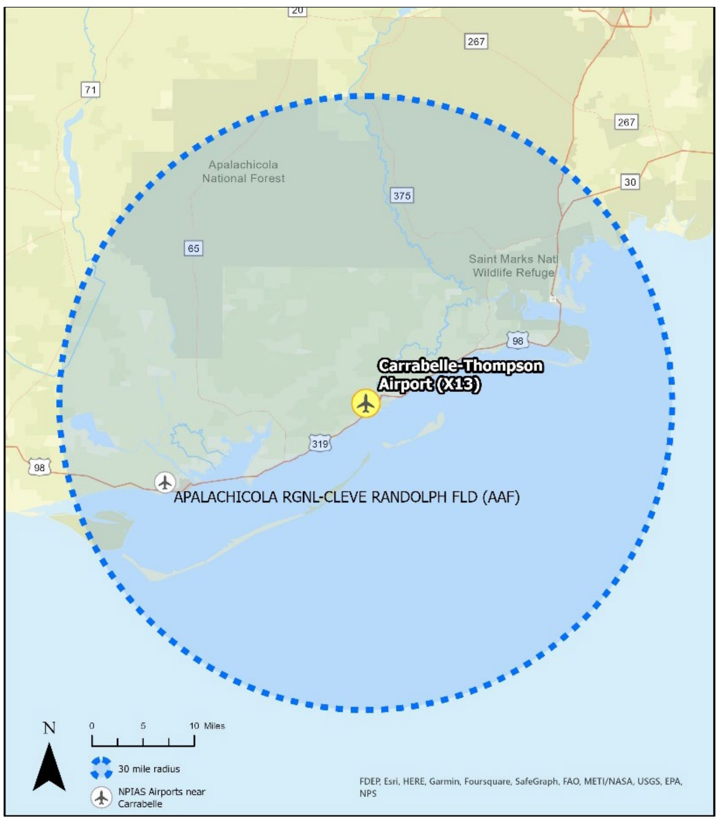
Existing Airport or Seaplane Base If ALL of the following questions are answered in the affirmative, then the facility is eligible.	Status	Details
Is the facility publicly owned, and publicly accessible?	Yes	
Does the facility have scheduled air carrier service?	No	
Does the facility enplane 2,500 or more passengers annually?	No	
If ALL of the following questions are answered in the affirmative, then the facility is eligible.	**Status**	**Details**
Is the facility operated by a sponsor eligible to receive federal funds and meet obligations?		
Does the facility have 10 or more based aircraft (verified by tail numbers)?		7 based aircraft
Is the facility at least 30 miles from the nearest NPIAS airport (including NPIAS airports in other states)?	No	Venice Municipal (VNC) Punta Gorda (PGD)
Can the facility demonstrate an identifiable role in the national system?	No	Too few based aircraft < 30 mi. to NPIAS airport
Is the facility included in the Florida Aviation System Plan and recommended to be part of the NPIAS?	Yes	
Has a review by the FAA found no significant airfield design standard deficiencies, compliance violations, and wetland or wildlife issues?	No	No review conducted
SPECIAL JUSTIFICATION: For a publicly-owned facility, if ANY of the following questions are answered in the affirmative, then the facility is eligible.	**Status**	**Details**
Is the facility owned or serving a Native American community?	No	
Has the facility been identified and used by the:		
U.S. Forest Service?	No	
U.S. Marshals?	No	
U.S. Customs and Border Protection (designated, international, or landing rights)?	No	
U.S. Postal Service (air stops)?	No	
Essential Air Service (EAS) program?	No	No Florida communities are EAS eligible

3.4.2 Carrabelle-Thompson Airport

Carrabelle-Thompson Airport (X13) is located near Carrabelle, Florida, along the Gulf Coast, in the Florida panhandle, near Apalachicola. The airport has a single, asphalt runway and is owned by the City of Carrabelle. One NPIAS airport is within 30 miles of X13 (**Figure 3-4**).

An airport supporter reported interest in getting X13 into the NPIAS. The airport's 5010 reported six based aircraft. He indicated, since the last update of the airport's based aircraft data, 14 aircraft are based at X13. This number of based aircraft, if verified by the FAA, surpasses the 10 based aircraft threshold that would help X13 get classified as a Basic airport in the NPIAS. Updating the 5010 to reflect the current number of based aircraft would assist in the FAA's verification of based aircraft.

Figure 3-4. NPIAS airports within 30 miles of X13.



The airport supporter also stated that recent work on getting X13 into the NPIAS determined that there were no NPIAS facilities within a 30-mile drive of X13 (which appears to reference FAA Order 5090.3C *Field Formulation of the National Plan of Integrated Airport Systems [NPIAS]* [Cancelled], the order superseded in 2019 by the current FAA Order 5090.5). A potential remaining hurdle for getting X13 into the NPIAS was having staff available for administrative duties associated with being in the NPIAS.

The individual also reported that the U.S. Forest Service uses Carrabelle-Thompson Airport for emergencies. Should the U.S. Forest Service demonstrate that X13 is important to their mission, such as with a letter of support, it could provide an alternative path into the NPIAS for X13.

X13 does not meet any of the special justification criteria (**Table 3-10**) since emergency use alone by the U.S. Forest Service is insufficient to qualify. X13 has less than 10 based aircraft and is within 30 miles of one NPIAS airport. For these reasons, it is unlikely that the FAA will include it in the NPIAS.

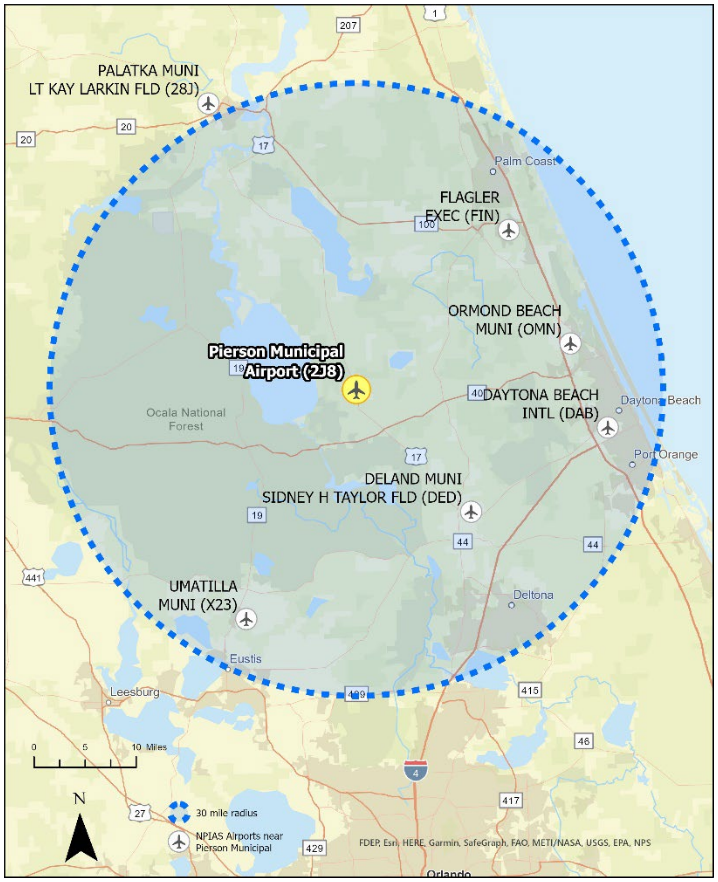
Table 3-10. NPIAS Initial Screening Requirements: Carrabelle-Thompson (X13)

Existing Airport or Seaplane Base	Response	Details
If ALL of the following questions are answered in the affirmative, then the facility is eligible.		
Is the facility publicly owned, and publicly accessible?	Yes	
Does the facility have scheduled air carrier service?	No	
Does the facility enplane 2,500 or more passengers annually?	No	
If ALL of the following questions are answered in the affirmative, then the facility is eligible.	**Response**	**Details**
Is the facility operated by a sponsor eligible to receive federal funds and meet obligations?	Yes	
Does the facility have 10 or more based aircraft (verified by tail numbers)?	No	6 based aircraft
Is the facility at least 30 miles from the nearest NPIAS airport (including NPIAS airports in other states)?	No	Apalachicola Regional (AAF)
Can the facility demonstrate an identifiable role in the national system?	No	Too few based aircraft < 30 mi. to NPIAS airport
Is the facility included in the Florida Aviation System Plan and recommended to be part of the NPIAS?	Yes	
Has a review by the FAA found no significant airfield design standard deficiencies, compliance violations, and wetland or wildlife issues?	No	
SPECIAL JUSTIFICATION: For a publicly-owned facility, if ANY of the following questions are answered in the affirmative, then the facility is eligible.	**Response**	**Details**
Is the facility owned or serving a Native American community?	No	
Has the facility been identified and used by the:		
U.S. Forest Service?	Yes	Emergency use
U.S. Marshals?	No	
U.S. Customs and Border Protection (designated, international, or landing rights)?	No	
U.S. Postal Service (air stops)?	No	
Essential Air Service (EAS) program?	No	No Florida communities are EAS eligible

3.4.3 Pierson Municipal Airport

Pierson Municipal Airport (2J8) is located near Pierson, Florida, approximately 25 miles west of Daytona Beach. The airport has a single, turf runway and is owned by the Town of Pierson. Five NPIAS airports are within 30 miles of 2J8 (see **Figure 3-5**).

Figure 3-5. NPIAS airports within 30 miles of 2J8.



While 2J8 has more than 10 based aircraft, as shown in **Table 3-11**, 2J8 does not meet any of the special justification criteria. Additionally, 2J8 is within 30 miles of five NPIAS airports. For these reasons, it is unlikely that the FAA would consider 2J8 for inclusion in the NPIAS.

Table 3-11. NPIAS Initial Screening Requirements: Pierson Municipal (2J8)

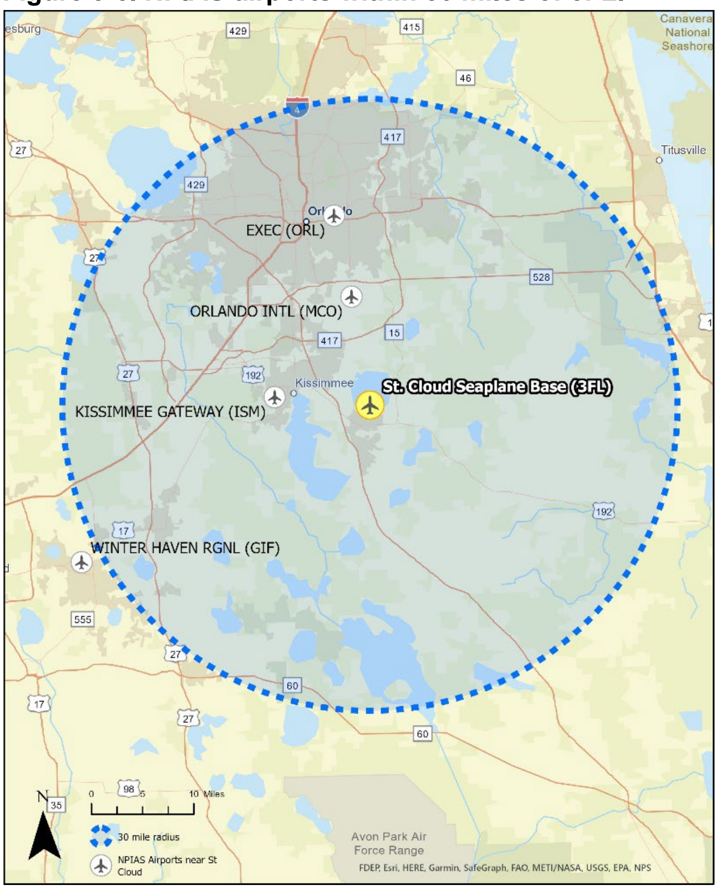
Existing Airport or Seaplane Base	Response	Details
If ALL of the following questions are answered in the affirmative, then the facility is eligible.		
Is the facility publicly owned, and publicly accessible?	Yes	
Does the facility have scheduled air carrier service?	No	
Does the facility enplane 2,500 or more passengers annually?	No	
If ALL of the following questions are answered in the affirmative, then the facility is eligible.	**Response**	**Details**
Is the facility operated by a sponsor eligible to receive federal funds and meet obligations?	Yes	
Does the facility have 10 or more based aircraft (verified by tail numbers)?	Yes	12 based aircraft
Is the facility at least 30 miles from the nearest NPIAS airport (including NPIAS airports in other states)?	No	Flagler Executive (FIN) Ormond Beach Municipal (OMN) Daytona Beach International (DAB) Deland Municipal (DED) Umatilla Municipal (X23)
Can the facility demonstrate an identifiable role in the national system?	Yes	Basic airport
Is the facility included in the Florida Aviation System Plan and recommended to be part of the NPIAS?	Yes	
Has a review by the FAA found no significant airfield design standard deficiencies, compliance violations, and wetland or wildlife issues?	No	
SPECIAL JUSTIFICATION: For a publicly-owned facility, if ANY of the following questions are answered in the affirmative, then the facility is eligible.	**Response**	**Details**
Is the facility owned or serving a Native American community?	No	
Has the facility been identified and used by the:		
U.S. Forest Service?	No	
U.S. Marshals?	No	
U.S. Customs and Border Protection (designated, international, or landing rights)?	No	
U.S. Postal Service (air stops)?	No	
Essential Air Service (EAS) program?	No	No Florida communities are EAS eligible

3.4.4 St. Cloud Seaplane Base

St. Cloud Seaplane Base (3FL) is located one mile north of St. Cloud, Florida, approximately 20 miles south of downtown Orlando. The SPB, owned by the City of St. Cloud, has a single, water runway. Three NPIAS airports are within 30 miles of 3FL, as shown in **Figure 3-6**.

The St. Cloud SPB lacks shore facilities, although planning and design for future infrastructure is in progress. Staff reported that 3FL does not serve the Native American community currently, but with talk of a possible Indian casino, could serve that community in the future.

Figure 3-6. NPIAS airports within 30 miles of 3FL.



3FL does not meet any of the special justification criteria (**Table 3-12**). Additionally, 3FL has no reported based aircraft and is within 30 miles of three NPIAS airports. For these reasons, it is unlikely that the FAA would include 3FL in the NPIAS. However, with the possibility of a future Indian casino being constructed in the community and the airport serving the resulting Native American community, FDOT may want to track the progress of this development and assess if this special justification criteria could be applicable to inclusion in the NPIAS for 3FL.

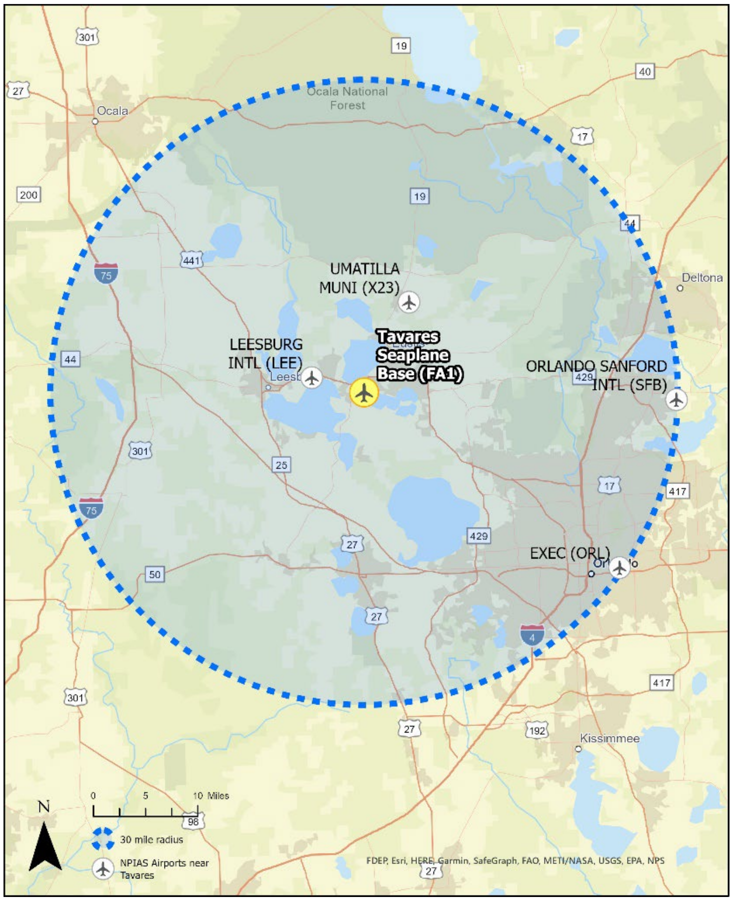
Table 3-12. NPIAS Initial Screening Requirements: St. Cloud SPB (3FL)

Existing Airport or Seaplane Base	Response	Details
If ALL of the following questions are answered in the affirmative, then the facility is eligible.		
Is the facility publicly owned, and publicly accessible?	Yes	
Does the facility have scheduled air carrier service?	No	
Does the facility enplane 2,500 or more passengers annually?	No	
If ALL of the following questions are answered in the affirmative, then the facility is eligible.	**Response**	**Details**
Is the facility operated by a sponsor eligible to receive federal funds and meet obligations?	Yes	
Does the facility have 10 or more based aircraft (verified by tail numbers)?	No	0 based aircraft
Is the facility at least 30 miles from the nearest NPIAS airport (including NPIAS airports in other states)?	No	Kissimmee Gateway (ISM) Orlando Intl. (MCO) Executive (ORL)
Can the facility demonstrate an identifiable role in the national system?	No	Too few based aircraft < 30 mi. to NPIAS airport
Is the facility included in the Florida Aviation System Plan and recommended to be part of the NPIAS?	Yes	
Has a review by the FAA found no significant airfield design standard deficiencies, compliance violations, and wetland or wildlife issues?	No	
SPECIAL JUSTIFICATION: For a publicly-owned facility, if ANY of the following questions are answered in the affirmative, then the facility is eligible.	**Response**	**Details**
Is the facility owned or serving a Native American community?	No	
Has the facility been identified and used by the:		
U.S. Forest Service?	No	
U.S. Marshals?	No	
U.S. Customs and Border Protection (designated, international, or landing rights)?	No	
U.S. Postal Service (air stops)?	No	
Essential Air Service (EAS) program?	No	No Florida communities are EAS eligible

3.4.5 Tavares Seaplane Base

Tavares Seaplane Base (FA1) is located one mile southeast of Tavares, Florida, approximately 30 miles northwest of downtown Orlando. The SPB, owned by the City of Tavares, has a single, water runway. Four NPIAS airports are within 30 miles of FA1, as shown in **Figure 3-7**.

Figure 3-7. NPIAS airports within 30 miles of FA1.



An airport official reported FA1 is not used by any federal agencies. The official indicated that a Part 135 charter business operates seaplanes out of FA1 and owns all six based aircraft.

FA1 does not meet any of the special justification criteria (**Table 3-13**). FA1 also has less than 10 based aircraft and is within 30 miles of four NPIAS airports. For these reasons, it is unlikely that the FAA would consider inclusion of FA1 in the NPIAS.

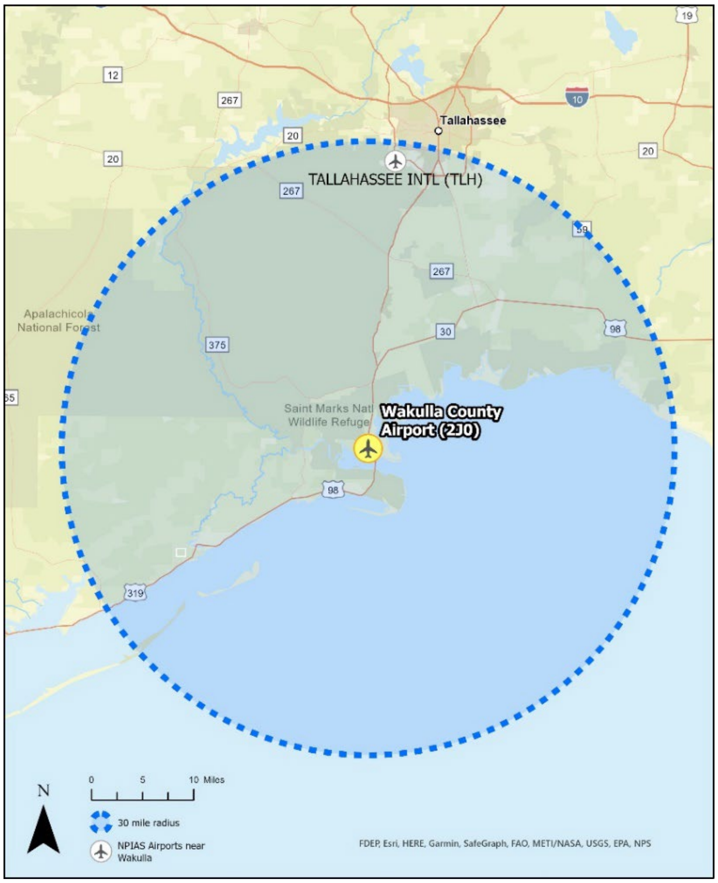
Table 3-13. NPIAS Initial Screening Requirements: Tavares SPB (FA1)

Existing Airport or Seaplane Base	Response	Details
If ALL of the following questions are answered in the affirmative, then the facility is eligible.		
Is the facility publicly owned, and publicly accessible?	Yes	
Does the facility have scheduled air carrier service?	No	
Does the facility enplane 2,500 or more passengers annually?	No	
If ALL of the following questions are answered in the affirmative, then the facility is eligible.	**Response**	**Details**
Is the facility operated by a sponsor eligible to receive federal funds and meet obligations?	Yes	
Does the facility have 10 or more based aircraft (verified by tail numbers)?	No	6 based aircraft
Is the facility at least 30 miles from the nearest NPIAS airport (including NPIAS airports in other states)?	No	Umatilla Municipal (X23) Leesburg Intl. (LEE) Orlando Sanford Intl. (SFB) Executive (ORL)
Can the facility demonstrate an identifiable role in the national system?	No	Too few based aircraft < 30 mi. to NPIAS airport
Is the facility included in the Florida Aviation System Plan and recommended to be part of the NPIAS?	Yes	
Has a review by the FAA found no significant airfield design standard deficiencies, compliance violations, and wetland or wildlife issues?	No	
SPECIAL JUSTIFICATION: For a publicly-owned facility, if ANY of the following questions are answered in the affirmative, then the facility is eligible.	**Response**	**Details**
Is the facility owned or serving a Native American community?	No	
Has the facility been identified and used by the:		
U.S. Forest Service?	No	
U.S. Marshals?	No	
U.S. Customs and Border Protection (designated, international, or landing rights)?	No	
U.S. Postal Service (air stops)?	No	
Essential Air Service (EAS) program?	No	No Florida communities are EAS eligible

3.4.6 Wakulla County Airport

Wakulla County Airport (2J0) is located south of Tallahassee on the Gulf Coast in the Florida panhandle. It is three miles south of Panacea, Florida. The airport, owned by Wakulla County, has a single, turf runway. One NPIAS airport, Tallahassee International (TLH), is within 30 miles of 2J0, (**Figure 3-8**). A representative of 2J0 indicated that there is a great deal of interest for getting 2J0 into the NPIAS. He indicated the U.S. Forest Service uses 2J0 for controlled burns, training, and refueling operations.

Figure 3-8. NPIAS airports within 30 miles of 2J0.

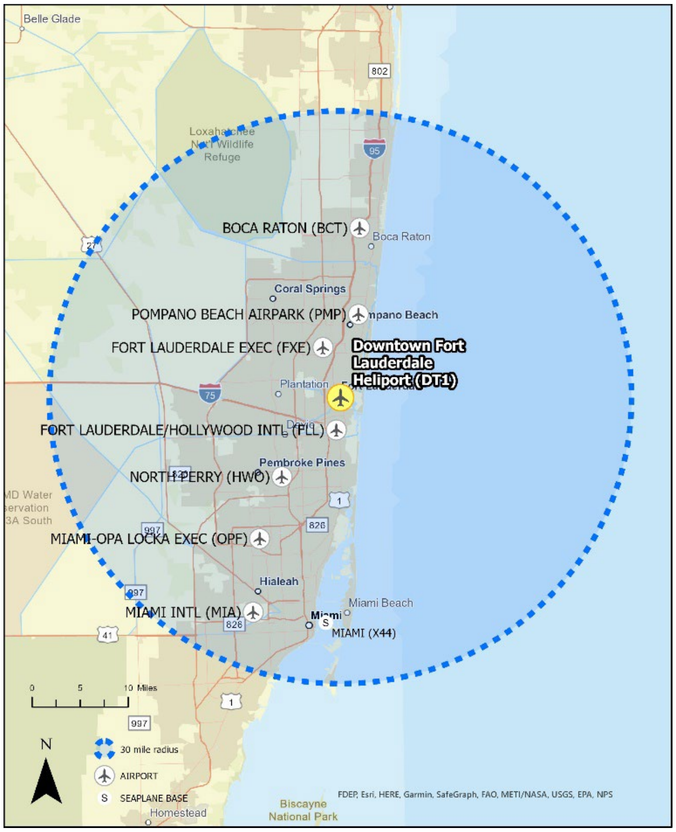


A major challenge to entry into the NPIAS is that the airport is a through-the-fence operation, serving the Tarpine Fly-In Community. Airport property encompasses only the land for the runway, leaving little opportunity to generate revenue through lease opportunities, which would help to make the airport financially sustainable. As shown in the **Table 3-14**, 2J0 may meet the special justification criteria based on U.S. Forest Service use, if the U.S. Forest service identifies 2J0 as important to its mission. 2J0 has less than 10 based aircraft and is within 30 miles of one NPIAS airport. Unless the U.S. Forest Service supports its inclusion in the NPIAS, it is unlikely that the FAA will include 2J0 in the NPIAS.

Table 3-14. Wakulla County Airport (2J0)

Existing Airport or Seaplane Base	Response	Details
If ALL of the following questions are answered in the affirmative, then the facility is eligible.		
Is the facility publicly owned, and publicly accessible?	Yes	
Does the facility have scheduled air carrier service?	No	
Does the facility enplane 2,500 or more passengers annually?	No	
If ALL of the following questions are answered in the affirmative, then the facility is eligible.	**Response**	**Details**
Is the facility operated by a sponsor eligible to receive federal funds and meet obligations?	Yes	Tarpine Fly-In Community is through the fence
Does the facility have 10 or more based aircraft (verified by tail numbers)?	No	2 based aircraft
Is the facility at least 30 miles from the nearest NPIAS airport (including NPIAS airports in other states)?	No	Tallahassee Intl. (TLH)
Can the facility demonstrate an identifiable role in the national system?	No	Too few based aircraft < 30 mi. to NPIAS airport
Is the facility included in the Florida Aviation System Plan and recommended to be part of the NPIAS?	Yes	
Has a review by the FAA found no significant airfield design standard deficiencies, compliance violations, and wetland or wildlife issues?	No	
SPECIAL JUSTIFICATION: For a publicly-owned facility, if ANY of the following questions are answered in the affirmative, then the facility is eligible.	**Response**	**Details**
Is the facility owned or serving a Native American community?	No	
Has the facility been identified and used by the:		
U.S. Forest Service?	Yes	Controlled burns, training, and refueling
U.S. Marshals?	No	
U.S. Customs and Border Protection (designated, international, or landing rights)?	No	
U.S. Postal Service (air stops)?	No	
Essential Air Service (EAS) program?	No	No Florida communities are EAS eligible

Figure 3-9. NPIAS airports within 30 miles of DT1.



3.4.7 Downtown Fort Lauderdale Heliport

Downtown Fort Lauderdale Heliport (DT1) is located on the top floor of a parking garage in Fort Lauderdale, Florida. The heliport has two helipads and is owned by the City of Fort Lauderdale. A number of NPIAS facilities are near DT1 (**Figure 3-9**). As shown in **Table 3-15**, DT1 does not have any based aircraft, and, without any instrument approaches, is unable to meet the 400 annual IFR operations threshold. For these reasons, it is very unlikely that the FAA would include DT1 in the NPIAS.

Table 3-15. NPIAS Initial Screening Requirements: Downtown Ft. Lauderdale Heliport (DT1)

Existing Heliport If an existing publicly-owned, public-use heliport answers ALL of the following questions in the affirmative, it is eligible.	Response	Details
Is the heliport operated by a sponsor eligible to receive federal funds and meet obligations?	Yes	
Does the heliport have four or more based aircraft for at least two years prior?	No	No facilities for basing helicopters
Does the heliport have 400 annual IFR flights?	No	No instrument approach procedures to DT1 No Traffic Flow Management System Count data
Is the heliport part of the Florida Aviation System Plan?	Yes	

3.5 Airports at Risk of Unclassified Status

Experience with other state aviation system plans has demonstrated that, in addition to getting airports into the NPIAS, state aviation agencies also need to concern themselves with keeping their airports at appropriate classifications in the NPIAS to maintain the receipt of FAA funding. Should the FAA reclassify an airport into an Unclassified role, it has limited access to non-primary entitlement funding and is ineligible for special funds such as those recently allocated under the supplemental funds noted in **Table 3-7**. This can be detrimental for projects already planned within a capital improvement program as well as limit the eligibility for additional supplementary funds. Consequently, the Florida Department of Transportation Aviation Office (FDOT AO) and individual airport sponsors should monitor their status since airports may be at risk of losing federal funding due to a possible change in their NPIAS role designation. This could result from a reduction in classification or in extreme conditions, becoming unclassified.

Table 3-16 lists the Basic airports in the Florida airport system identified as at risk of losing their Basic airport designation in the NPIAS due to their based aircraft numbers. Having 10 or more based aircraft is one of several criteria that allows an airport to be classified as a Basic airport. The three airports with fewer than 10 based aircraft may still qualify as Basic airports by virtue of being more than 30 miles from any other NPIAS airport; however, where feasible, increasing the number of based aircraft is recommended.

Table 3-16. Basic Airports at Risk Using Based Aircraft Criteria

ID	Airport	NPIAS Role	Basedaircraft.com Validated Aircraft - 2023	Notes
TNT	Dade-Collier Training and Transition	Basic	0	More than 30 miles from nearest NPIAS airport
CDK	George T Lewis	Basic	0	More than 30 miles from nearest NPIAS airport
AAF	Apalachicola Regional-Cleve Randolph Field	Basic	7	More than 30 miles from nearest NPIAS airport
INF	Inverness	Basic	11	Within 30 miles of at least one NPIAS airport
PHK	Palm Beach County Glades	Basic	10	Within 30 miles of at least one NPIAS airport

Source: 2023-2027 NPIAS and National Based Aircraft Inventory (basedaircraft.com as of April 11, 2023)

While Apalachicola Regional-Cleve Randolph Field reports seven based aircraft on basedaircraft.com, recent field observations and input from county staff and fixed-base operator representatives suggest the actual number of permanently based aircraft at AAF is approximately 40. This is further evidence of the importance of keeping official records, such as basedaircraft.com, up to date.

Inverness and Palm Beach County Glades Airports are of particular interest because they have only 11 and 10 based aircraft, respectively. Potential loss of based aircraft for either airport could jeopardize their status as Basic airports. The five airports listed in **Table 3-9** should take steps to appropriately report their based aircraft to remain classified. NPIAS airports should also review their current status and be cognizant of any changes they can make to maintain or improve their classification prior to the FAA gathering data in odd numbered years when it updates the NPIAS.

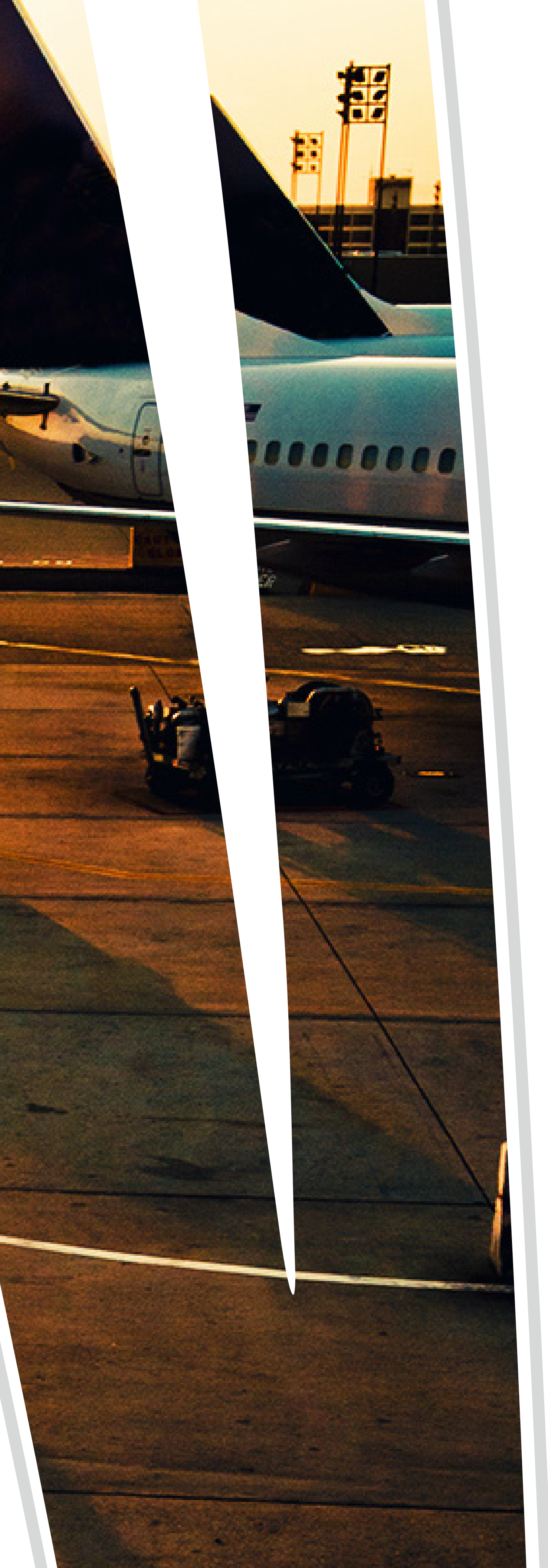
3.6 Summary

Florida's airport system has a mix of facilities serving various roles and service levels defined by the NPIAS. The Florida airport system also includes seven facilities that are not part of the NPIAS, and this report presents the obstacles to those facilities becoming part of the NPIAS. Based on the initial screening requirements, these facilities have one or more hurdles to overcome before they can be eligible for inclusion in the NPIAS. The largest hurdle for all of these facilities is their proximity to one or more existing NPIAS airports within 30 miles. Other hurdles include a lack of based aircraft and sufficient aviation activity that would allow them to fill a defined NPIAS role.

Two facilities – Carrabelle-Thompson (X13) and Wakulla County (2J0) – indicated a strong interest in being part of the NPIAS. Both also reported that the U.S. Forest Service uses their airports. Neither airport meets the general eligibility requirements for inclusion in the NPIAS due to lack of reported based aircraft and proximity to other NPIAS facilities. However, either may qualify under the special justification criteria established by the FAA if the U.S. Forest Service, at the national headquarters level, were to identify its use of the facility as important to its mission.

For the other five non-NPIAS Florida facilities, none of them meet the initial screening requirements for inclusion in the NPIAS. Pierson Municipal is the closest, having sufficient based aircraft that would allow it to be identified as a Basic airport in the NPIAS. However, its proximity to five existing NPIAS airports prevents it from passing the initial screening requirements. The other facilities reported too few based aircraft and are too close to existing NPIAS airports to be included in the NPIAS. So, unless a federal agency chooses to use and identify any of these facilities as important to their operations, it is unlikely that any will be eligible for inclusion in the NPIAS.

This section also identified those NPIAS airports with an elevated risk of getting reclassified by the FAA into a role that is no longer eligible for federal funding opportunities. The recommendation is that FDOT Aviation Office monitor these airports to take preemptive action should it appear that any of these airports are likely to fall below the minimum criteria for NPIAS classification as a Basic airport.



4

System Goals

2043 FASP FLORIDA AVIATION SYSTEM PLAN

Chapter 4

System Goals

The Florida Department of Transportation Aviation Office (FDOT AO) used the Florida Aviation System Plan (FASP) 2043 Update as the opportunity to assess goals, objectives, and performance measures established in the previous system plan update and maintain or add new ones as appropriate. For this update, two primary goals remained top of mind:

- Provide for more efficiency in decision-making within the FDOT AO to support funding and development decisions.
- Provide airports within the system with recommendations for development that support their individual missions while contributing to the overall strength and health of the Florida airport system.

The FDOT AO developed a renewed set of goals, objectives, performance measures, and targets that guide elements of the system plan. Terminology was defined to make sure all stakeholders shared the same understanding of what was being addressed throughout the process. Steps in the process consisted of a document review of previous FDOT AO FASPs, other documents pertaining to planning transportation in Florida, comparable other states, and industry documents such as the Airport Cooperative Research Program research reports.

Stakeholder engagement was also a critical element to determining the goals, objectives, and PMs. Steps in the process consisted of participation in the Florida Airports Council (FAC) Conferences in 2021, 2022 and 2023, numerous meetings with the FASP Input Team (FIT) at key decision points, and several webinars for public input, as discussed in **Appendix A – Stakeholder Engagement.**

4.1 Definition of Goals, Objectives, and Performance Measures

For the FASP 2043, the FDOT AO aimed to develop a set of goals, objectives, performance measures, and targets that will guide certain elements of the system plan. This process began by first clearly defining the meaning and intent of the terms goals, objectives, performance measures, and targets.

4.1.1 Goals

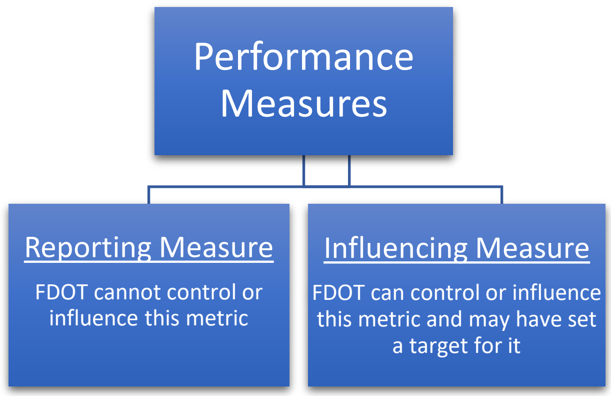
These are broad targets or aims that FDOT would like the system plan to achieve. The goals will also collaborate with the current goals of the Florida Transportation Plan, where feasible. An example could be that a goal of the FASP is to enhance the safety of the Florida airport system.

4.1.2 Objectives

Objectives are more detailed and quantifiable than goals. They define specific areas where progress is desired to achieve the goal and may include timeframes for accomplishment of objectives. Because goals tend to be broad in nature, multiple objectives are usually needed to support the achievement of each goal. An example of an objective that supports the goal previously noted may be for airports to meet critical Federal Aviation Administration (FAA) design standards.

4.1.3 Performance Measures/Targets

Performance measures (PMs) quantitatively assess a particular objective. Each objective needs one or more performance measures that are used to determine if the objective has been achieved or not. These PMs can evaluate specific aspects of each airport, or the collective performance of the airport system as a whole, depending upon the objective. Continuing our example, the performance measure for the objective of FAA design standards of Florida's airport system could assess the adequacy of each airport's runway safety area (RSA) dimensions and tabulate which airports do or do not meet the FAA RSA design standard. For the system as a whole, a performance measure reporting the percentage of system airports meeting their FAA design standard could be tracked by FDOT.



Source: Mead & Hunt, ACRP Report 223

Simply measuring performance without knowing what is or is not acceptable performance is not useful. To properly evaluate certain objectives and PMs, there needs to be a target against which the actual measurement can be compared. If the PM surpasses this target, then the associated objective is met.

4.2 Recommended Goals, Objectives, and Performance Measures

The following pages summarize the recommended goals, objectives, performance measures (PMs), and performance indicators (PIs) for the FASP 2043. The focus was on developing PMs that provide actionable items to support decision-making. Several past FASP goals were removed from consideration. **Appendix B – Goals and Performance Measures** summarizes the process and evaluation of the goals, objectives, and PMs in greater detail in addition to the other activities undertaken in Phase 1.

Goal 1:

Provide efficient, safe, secure, and convenient service to Florida’s citizens, businesses, and visitors

Table 4-1. Goal 1 Objectives and Associated Performance Measures

Objective: Support FASP airports in meeting FAA airfield geometric design criteria to promote operational safety.	**Objective: Support FASP airports in achieving greater capacity**
Performance Measures	***Performance Measures***
The number/percentage of FAA-obligated FASP airports: • That meet current FAA runway design standards. • That meet current FAA taxiway design standards. • That have FAA designated airfield "hot spots."	The number/percentage of airports with: • Pavement Condition Index (PCI) ratings of 70 or greater (currently or forecast within next 5-10 years) on their primary runway. • PCI ratings of 70 or greater (currently or forecast within next 5-10 years) on their primary taxiway. • A non-precision approach to at least one runway end. • A precision approach to at least one runway end. • Capacity related projects (runways, taxiways, aprons, and hangars) planned in their JACIP within the next 2 years, 3 years, 5 years, or more than 5 years out.

Goal 2:

Contribute to operational efficiency, economic growth, and competitiveness while remaining sensitive to Florida’s natural environment and exhibiting social responsibility

Table 4-2. Goal 2 Objectives and Associated Performance Measures and Performance Indicators

Objective: Encourage operational efficiency and economic growth	
Performance Measures	***Performance Indicators***

The number/percentage of airports providing pilot support:
• Broadband access.
• Fuel service:
  o Types of fuel (100 low lead [LL], Jet A, unleaded aviation gas [avgas], sustainable aviation fuel [SAF], other).
  o Methods of delivery:
    ▪ Self-fuel, full-service, credit card readers.
    ▪ Truck vs. fuel farm.
• Back-up generators for:
  o Fueling, airfield lighting, terminal building.
	• The number of based aircraft across system airports.
	• The number of annual operations across system airports.
	• The number of annual enplanements across system airports.
	• The hangar occupancy rate across the system airports.
	• The tonnage of air cargo shipped within the system.

Objective: Encourage environmental and community sustainability planning for FASP airports.	
Performance Measures	***Performance Indicators***
The number/percentage of airports with: • Master Plans updated in the past 5 years, 10 years, more than 20 years, or none. • Airport Layout Plans (ALPs) updated in the past 5 years, 10 years, more than 20 years, or none. • An Exhibit ‘A’ Property Plan updated in the past 5 years, 10 years, more than 20 years, or none. • A Stormwater Management Plan.	The number/percentage of airports: • With a DBE Plan updated in the past 5 years, 10 years, more than 20 years, no DBE plan. • With Airport Minimum Standards updated in the past 5 years, 10 years, more than 20 years, or no minimum standards. • With Airport Rules and Regulations updated in the past 5 years, 10 years, more than 20 years, or no rules and regulations.

Goal 3:

Protect airspace and promote compatible land uses around public airports

Table 4-3. Goal 3 Objectives and Associated Performance Measures and Performance Indicators

Objective: Encourage FASP airports to work with communities to enact airport zoning ordinances compatible with F.S. Chapter 333 and FDOT's Florida Airport Compatible Land Use Guidebook.	
Performance Measures	***Performance Indicators***
The number/percentage of municipalities: • Enacting Zoning Ordinances under F.S. Chapter 333.	The number/percentage of airports with: • A Wildlife Hazard Management Plan (WHMPs) updated in the past 5 years, 10 years, more than 20 years, or no WHMP.

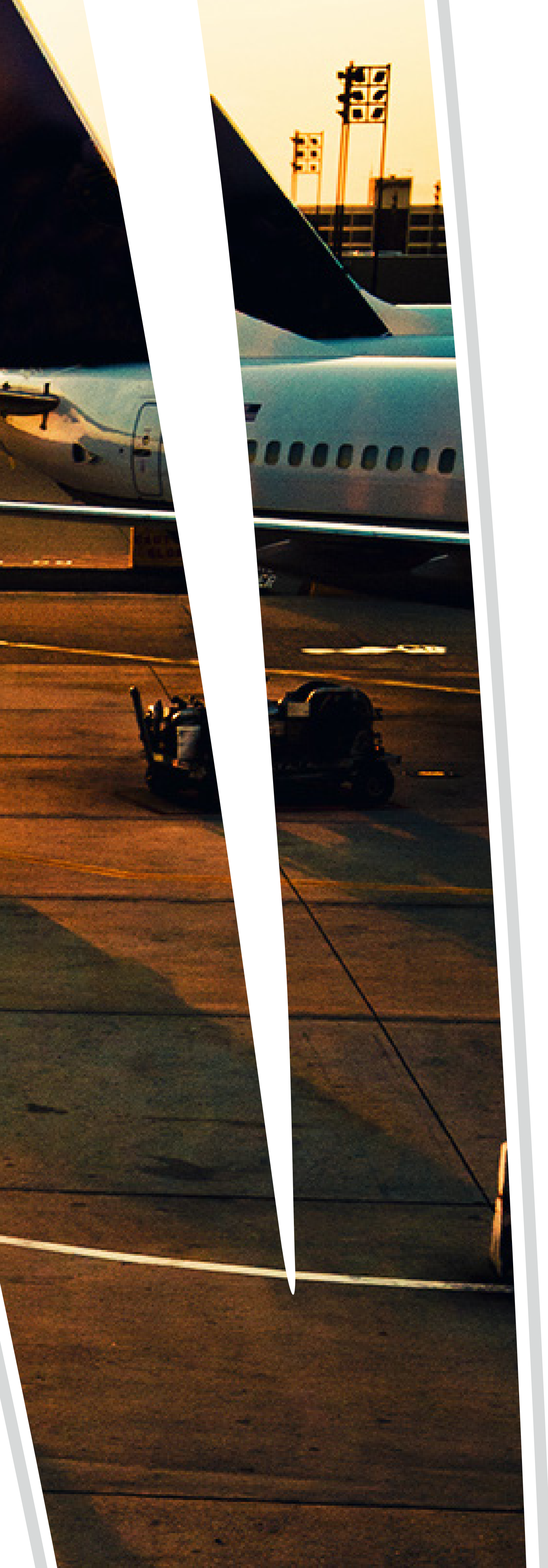
Goal 4:

Foster technological innovation and support implementation of new technologies

Table 4-4. Goal 4 Objectives and Associated Performance Measures

Objective: Encourage FASP airports to provide infrastructure and technologies that support innovation and the implementation of new technologies
Performance Measures
The number/percentage of airports • Providing charging opportunities for electric passenger vehicles. • Providing or planning for charging of electric aircraft. • Utilizing solar infrastructure on their airfield. • Utilizing geothermal infrastructure on their airfield. • Providing alternative weather reporting. • Providing alternative fuel options (SAF or unleaded avgas).

The goals stated above, along with the performance measures and indicators provided the basis to evaluate the entire Florida aviation system performance, which is discussed in **Chapter 7 – System Analysis**.



5

Data Collection and Inventory

FDOT 2043 FASP FLORIDA AVIATION SYSTEM PLAN

Chapter 5

Data Collection and Inventory

Detailed information regarding existing infrastructure, conditions, operations, and plans for the 106 airports that are part of the Florida airport system serves as the basis for many of the analyses and recommendations presented in this plan. The inventory process updated information from the previous Florida Aviation System Plan (FASP) effort and created a common data repository with relevant information about each airport. The information will ultimately be used to make decisions related to airport development, airport role classification, planning, and funding. Hence, the inventory process is a foundational step for the development of comprehensive recommendations and plans for Florida's aviation system.

This chapter documents the process used to create the updated airport and aviation inventory for the FASP.

5.1 Phase 1 Florida Department of Transportation (FDOT) and Industry Surveys

To begin the data collection, two survey efforts were undertaken to obtain information from FDOT Aviation Office (FDOT AO) staff and airport managers across the entire system. These surveys were conducted to investigate performance measures (PMs) for consideration and to review the types of activities and emerging trends potentially of interest for the FDOT AO to consider in the FASP 2043. The intent, process, and results of each are noted below.

5.1.1 FDOT AO Staff Surveys

Early in Phase 1, FDOT AO staff completed surveys regarding PMs and their implementation and level of influence within Florida's aviation system. Survey questions included many that evaluated current goals and PMs within the existing FASP. Other survey items asked participants to rank the success of existing PM implementation and to identify how future PMs should be implemented. In addition, the survey identified several PMs used nationally and asked respondents to rank their importance. Notably, 100 percent of the staff surveyed identified airport inspections, airport layout plans (ALPs), airport master plans, and pavement condition index (PCI) studies as important PMs to consider in the future.

100 percent of staff surveyed identified airport inspections, airport layout plans (ALPs), airport master plans, and pavement condition index (PCI) studies as important PMs to consider in the future.

5.1.2 Airport Management Survey

A two-part survey distributed to airport managers assessed various aviation activities along with airport perspectives on emerging trends. The FDOT AO issued the survey via email. Questions targeted areas of interest including aviation activities taking place at system airports and the importance of emerging trends. First, managers were asked to assess whether specified airport services and aircraft activities at their airports occurred at no level (none), minor levels, moderate, or significant levels. Second, airport managers were asked to assess whether the timing of anticipated impacts of emerging trends and technologies to their airports would be immediate, near-term, mid-term, long-term, or would not have an impact at all. **Appendix C – Airport Activity/Emerging Trends Survey Results** summarizes the results.

Aviation Activity

The purpose of the aviation activity survey was to help the FDOT AO understand the diversity of the activity across the system. The survey results confirmed that the Florida aviation system does, in fact, host diverse aviation activities across the state. The survey results were used to inform the development of the goals and PMs. The wide range of activities across the system includes aircraft maintenance; manufacturing; maintenance, repair, overhaul (MRO); air cargo operations; charter activities; military operations; and flight instruction. **Table 5-1** contains a summary of some of the activity survey highlights.

Table 5-1. Summary of Airport Activity Survey Results

Percentage of Airports Reporting	Airports Reporting Specific Activities
40%	Significant or moderate amount of charter flights
50%	Significant or moderate number of corporate flights
43%	Some level of agricultural spraying flights
58%	Significant level of personal/recreational flights
70%	Flight Club activity
70%	Sightseeing flights
80%	Emergency medical/air ambulance flights
80%	Law enforcement flights
10%	Significant military exercises/training flights
58%	Environmental or natural resources flights
20%	Prisoner transport
50%	Aerial inspection flights
66%	Aerial photography flights
80%	Private flight instruction activities
64%	Part 61 flight instruction activities

Source: 2022 FASP Phase 1 Airport Manager Survey

Emerging Trends and Technologies Survey

The emerging trends and technology portion of the airport survey was conducted to assist with focusing potential goals/objectives/PMs to support future development. In addition, this portion was necessary to access individual airport perspectives on current "hot topics" across the nation to see if these "hot" topics are relevant to the Florida aviation system. The

Figure 5-1. Example of Electric Ground Service Equipment (GSE)

responses were also used to guide PM development, where appropriate. General topics noted in the airport survey included the following:

- Electrification of Vehicles – Aircraft, Ground Support Equipment (GSE), and Passenger Vehicles.
- Equipment Innovations – Aircraft Counting, Remote Airport Traffic Control Tower (ATCT), Weather Reporting.
- Resiliency and Sustainability – Power Alternatives, Fuel Alternatives, Weather Impacts.
- Advanced Air Mobility (AAM) – AAM/Urban Air Mobility (UAM)/ Electric Vertical Takeoff and Landing Aircraft (eVTOL).

Figure 5-2. Example of Electric Passenger Vehicle

Figure 5-3. Example of Weather Reporting Equipment

Figure 5-4. Example of Electric Vertical Takeoff and Landing (eVTOL) Aircraft

Understanding the prevalence of a variety of airport activities and facilities allows the FDOT AO to proactively assess the needs necessary to accommodate existing and future flight activities within the system. This ability to evaluate demand by an assortment of flight activities together with the ability to identify where aviation-related facilities are available will allow the FDOT AO to be better positioned to accommodate them in future airport programming efforts.

In addition, the FDOT AO plays an important role with developments in emerging trends and technologies by being involved to represent the interests and challenges of airports across the state. By doing so and implementing recommendations related to the emerging trends, Florida will be well positioned to accommodate the increase in use of electrification of vehicles, Sustainable Aviation Fuels (SAFs), and the rapidly developing and impending airworthiness certification and operations use of AAM aircraft.

These survey findings provided guidance in selection of the following topics, which, as Part of Phase 1, were targeted for future review. **Chapter 8 – Aviation Office Initiatives** discusses the brief working papers developed to address these topics:

- Electrification of Airports.
- Power Alternatives.
- Resource Management.
- Sustainable Aviation Fuel (SAF).
- Unleaded AVGAS.
- Weather Reporting Alternatives.

5.2 Phase 1 Review of Existing Documents

As part of Phase 1, review of documents that addressed aviation related data, which may require FDOT AO support, was important. These items were relevant in terms of PMs that could be considered important for the FASP update. These documents included sources within Florida and other industry resources.

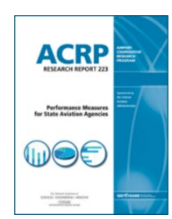
5.2.1 Florida Related Documents

Several sources reviewed outside of the FDOT AO that measure various aviation-related topics were reviewed as input into the development of PMs and included:

- Florida Transportation Plan.
- FDOT Freight Mobility and Trade Plan.
- FDOT Source Book.
- FDOT Strategic Intermodal System (SIS) Policy Plan.

The results of the document review identified eleven performance measures and eleven performance indicators (PIs) for consideration in the FASP.

5.2.2 ACRP Report 223: *Performance Measures for State Aviation Agencies*



Numerous performance measures are detailed in Airport Cooperative Research Program (ACRP) Research Report 223: *Performance Measures for State Aviation Agencies*.

Other comparable state PMs were reviewed within ACRP 223 for their compatibility with the FASP. Out of the ACRP 223 review, six other states were identified as comparable to Florida, plus 55 PMs and 45 PIs were identified as appropriate for further review and consideration for the FASP.

5.2.3 Summary of Other Documents

Through the review of existing FASP PMs and PIs, a review of other FDOT-related document PMs and PIs, and an assessment of PMs from comparable airports identified in ACRP Report 223, a multitude of PMs were identified for consideration to implement within FASP 2043.

This summary of 100 measures (PMs and PIs) were presented to the FDOT AO staff for consideration and became the foundation for the assessment of the recommended PMs and PIs outlined in **Chapter 4 – System Goals**.

5.3 Phase 1 Initial Data Collection Process

The FASP 2043 inventory is based on a variety of public and proprietary data sources as well as direct contact with airports. A primary goal of the effort was the capture of relevant information at appropriate levels of detail and relevancy that ultimately feed and support capital and operational planning decisions for the FDOT Aviation Office (AO), district coordinators, and airport managers. The data sources and elements collected throughout the inventory process were selected to align with the goals and objectives laid out for the FASP 2043 and the associated PMs and PIs. The initial data collection effort focused on the following information sources:

- Federal Aviation Administration (FAA) Airport Data and Information Portal (ADIP) - FAA Form 5010 (Airport Master Record).
- FAA National Airspace System Resource (NASR).
- National Based Aircraft Inventory Program.
- FAA Operations Network (OPSNET).
- Master Plans and Airport Layout Plans (ALP).
- Statewide Airfield Pavement Management Program (SAPMP).
- Airport Websites.

The information obtained from these data sources was processed and merged into a master database.

5.4 Phase 2 Airport Surveys

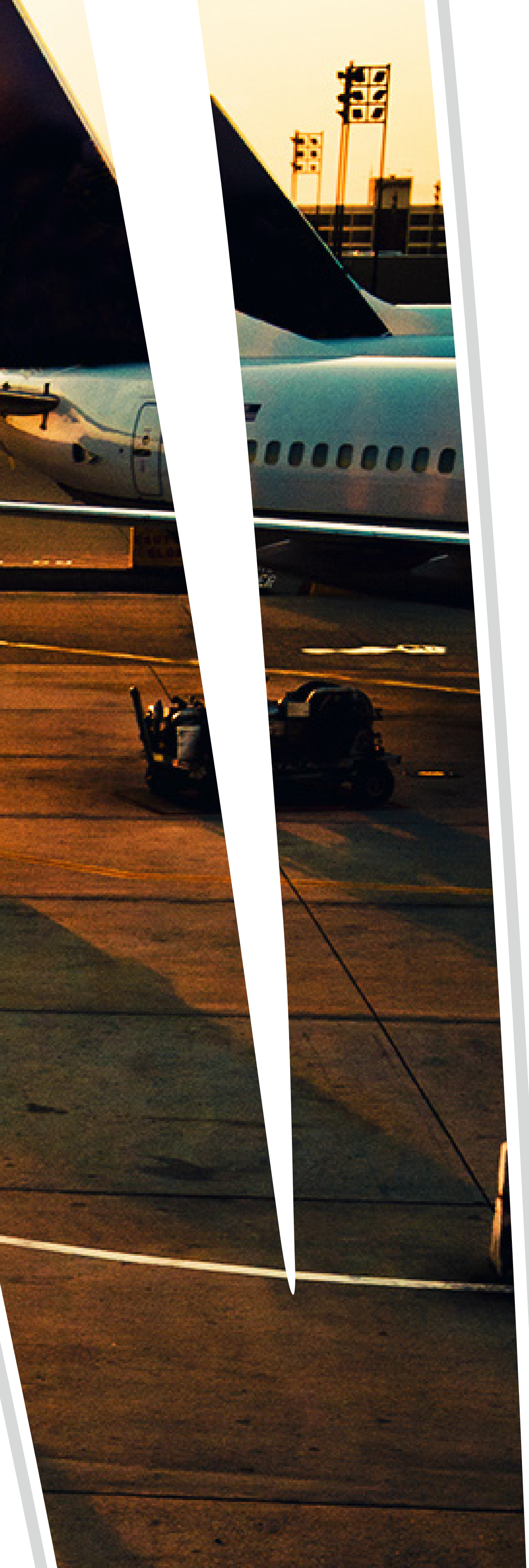
Following the initial inventory and data collection effort in Phase 1, an online survey was developed and distributed to points of contact for each of the 106 system airports through Phase 2. Survey participants included airport managers, operators, and contractors. The purpose of the survey was three-fold:

- To verify and update information gained from published data sources regarding airport facilities and airport services.
- To provide guidance on conflicting information obtained from other data sources.

- To obtain airport data that is not readily available through public data sources such as hangar availability, plans for technological improvements, and FAA safety compliance.

The survey was developed and distributed to airport points of contact using an Excel spreadsheet. Survey questions included pre-populated data from public sources that airports were asked to confirm or update. It contained a total of 48 questions individually customized for each airport according to information previously obtained. The survey was distributed through the FDOT district aviation coordinators. Targeted follow-ups via e-mail and telephone calls were conducted to maximize the response rate and ultimately the accuracy of the information in the inventory database. Follow-up calls and emails were centered on clarification of information entered that contradicted what was publicly available, or survey responses that displayed a misunderstanding of the questions asked. In total, 105 out of the 106 system airports responded to the survey. Non-responsive airport data was populated based on publicly available information.

Responses were consolidated into a comprehensive survey response database following a detailed clean-up process that identified and corrected errors and inconsistencies in the collected data. Data validation was also conducted with publicly available information.



6

Aviation Activity Forecasts

Chapter 6

Aviation Activity Forecasts

Forecasting aviation activity across the state of Florida is crucial for understanding the potential strains and demands that the Florida Aviation System may face in the future. The forecasts referred to in this chapter will be used to address future functionality of the airport system in the state and to ensure that every airport can serve appropriately in their role. The Florida Department of Transportation's (FDOT) seven regional districts will use these projections to assess the need for development of aviation facilities that service general and commercial aviation activity. These forecasts include 106 airports that are both publicly owned and available for public use. This group of airports is generally recognized as the Florida Aviation System of Airports.

The multiple, Florida systemwide forecasts developed address aircraft operations, enplanements, and based aircraft for both commercial service and general aviation airports.

6.1 Forecast Methodologies

The forecasts evaluate historical growth and trends using several methodologies: trend analysis, regression analysis, and market share analysis. Trendline analysis employs historical growth trends in activity and applies them to current demand levels to produce projections of future aviation activity.

The socioeconomic factors play a vital role and have a direct impact on the long-term passenger and operational demand on Florida's aviation system. In general, there is a correlation among areas of greater populations, employment, personal income per capita, and a strong aviation service demand. Specifically, these key socioeconomic indicators or drivers tend to have an influence on passenger enplanements and their future projections.

Figure 6-1. FAA Southern Region

Source: Federal Aviation Administration website, 2023

Market share analysis was conducted to project future aviation activity by comparing it to a higher-level forecast. In this case, the Southern Region Federal Aviation Administration (FAA) Terminal Area Forecast (TAF) serves as the basis of comparison for the Florida aviation system. The Southern Region of the FAA includes Alabama, Florida, Georgia, Kentucky, Mississippi, North Carolina, Tennessee, South Carolina, Puerto Rico, and the U.S. Virgin Islands.

6.2 Recommended Forecast Scenarios

Figures 6-1 to 6-4 compare the forecasts. **Tables 6-1 to 6-4** provide the forecast scenario data results for the years 2023, 2028, 2033, and 2043. In addition, tables present the Compound Annual Growth Rate (CAGR) for the 20-year period for each of the forecast scenarios. The recommended forecast scenario is highlighted for each forecast and is described in further detail on the following pages.

6.2.1 Based Aircraft

The recommended based aircraft forecast is the socioeconomic-population scenario. It yields the most aggressive growth rate when compared to the alternative forecast scenarios. Likewise, there has been a strong correlation between based aircraft and population over the past ten years. The socioeconomic-population forecast scenario for based aircraft results in a CAGR of 1.2 percent annually over the course of the forecast period. **Figure 6-2** and **Table 6-1** highlight the recommended forecast and compare it to the other forecast scenarios.

Figure 6-2. Statewide Based Aircraft Forecast Scenarios

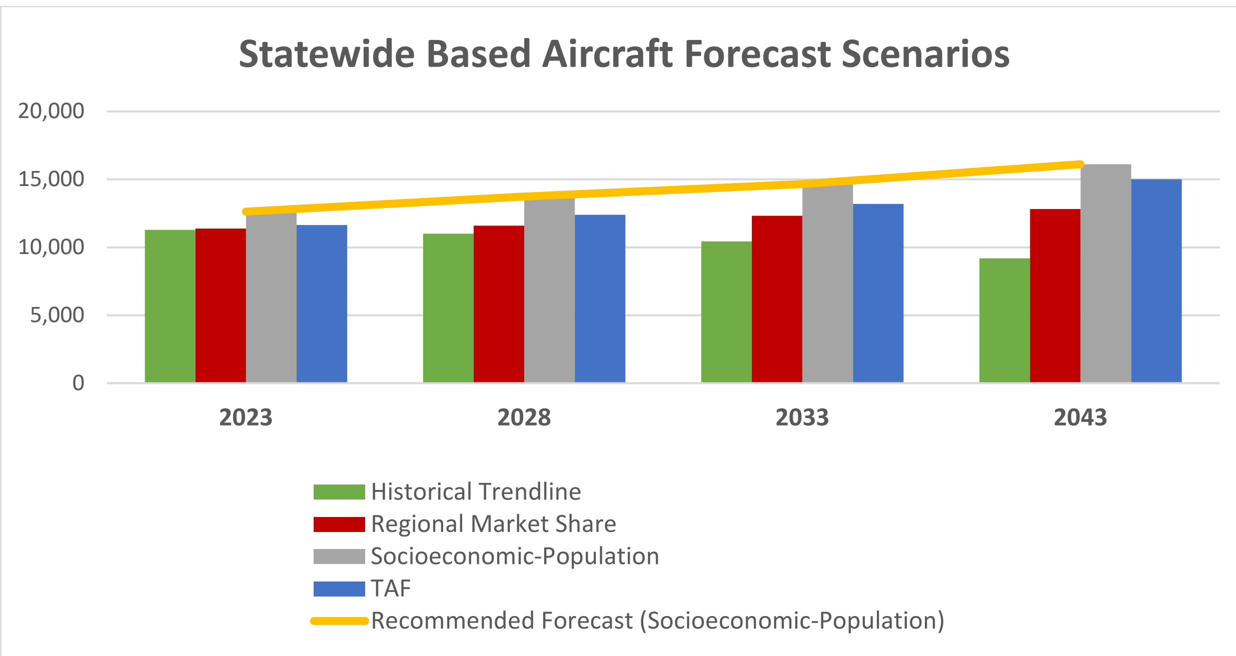


Table 6-1. Statewide Based Aircraft Forecast Scenarios

	Forecast Scenarios	2023	2028	2033	2043	CAGR
Based Aircraft	Historical Trendline	11,287	11,007	10,438	9,193	-1.0%
	Regional Market Share	11,385	11,594	12,313	12,819	0.6%
	Socioeconomic-Population	**12,629**	**13,748**	**14,656**	**16,118**	**1.2%**
	TAF	11,635	12,392	13,197	15,017	1.3%

6.2.2 General Aviation (GA) Operations

The historical trendline forecast is the recommended forecast for GA operations. It is the most aggressive forecast of the four scenarios presented but represents consistent growth in GA operations within the state of Florida over the past decade. This recommended forecast results in a CAGR of 1.0 percent annually over the 20-year forecast period. **Figure 6-3** and **Table 6-2** provide a comparative display of the GA operations forecast.

Figure 6-3. Statewide GA Operations Forecast Scenarios

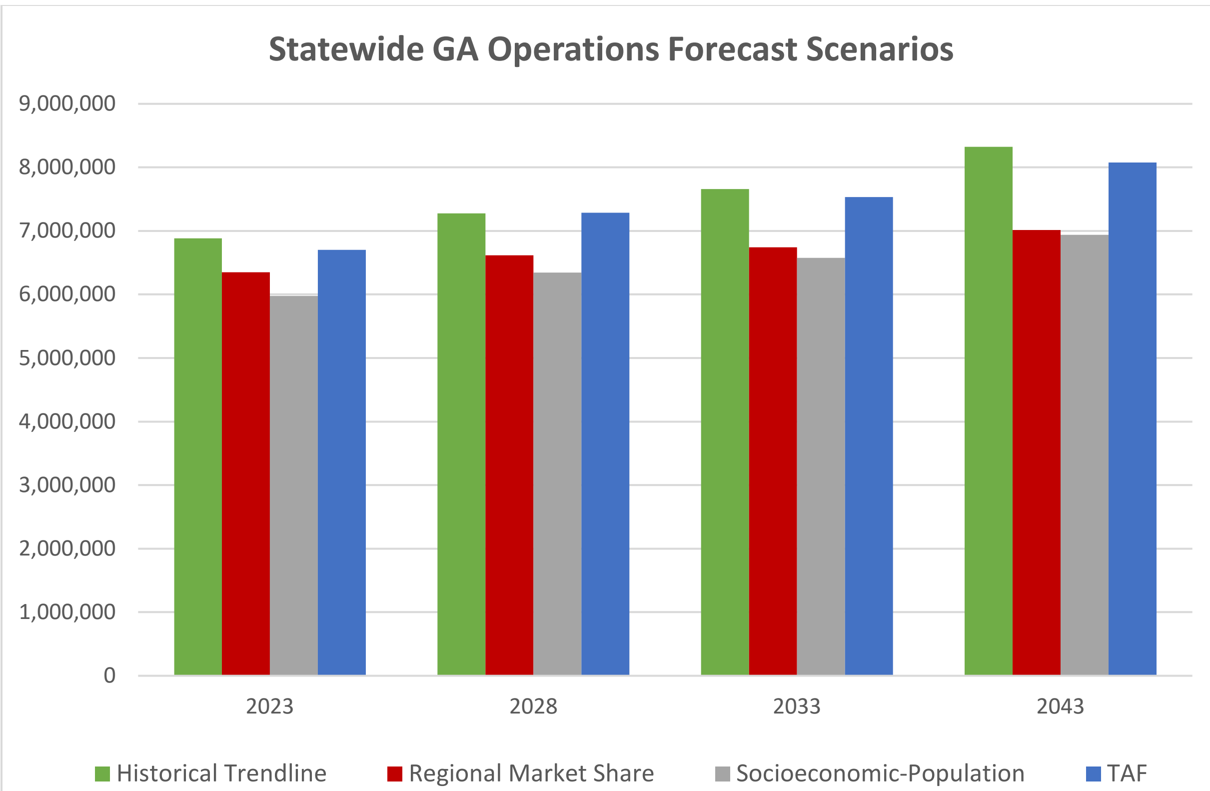


Table 6-2. Statewide GA Operations Forecast Scenarios

	Forecast Scenarios	2023	2028	2033	2043	CAGR
GA Operations	**Historical Trendline**	**6,884,315**	**7,277,803**	**7,658,240**	**8,322,191**	**1.0%**
	Regional Market Share	6,349,310	6,617,576	6,741,660	7,015,799	0.5%
	Socioeconomic-Population	5,979,445	6,344,369	6,573,862	6,937,903	0.8%
	TAF	6,704,703	7,286,087	7,531,358	8,078,515	0.9%

6.2.3 Commercial/Air Taxi Operations

Out of the six forecast scenarios presented for the commercial/air taxi operations forecast, the socioeconomic-employment based forecast is the recommended forecast. The correlation between employment and commercial/air taxi operations is 0.93, providing a high-level of confidence in this recommendation. This forecast does not yield the highest or the lowest annual growth rate but is moderate with a CAGR of 2.3 percent. **Figure 6-4** and **Table 6-3** present enplanement forecast scenarios and the resultant recommended commercial/air taxi operations forecast.

Figure 6-4. Statewide Commercial/Air Taxi Operations Forecast Scenarios

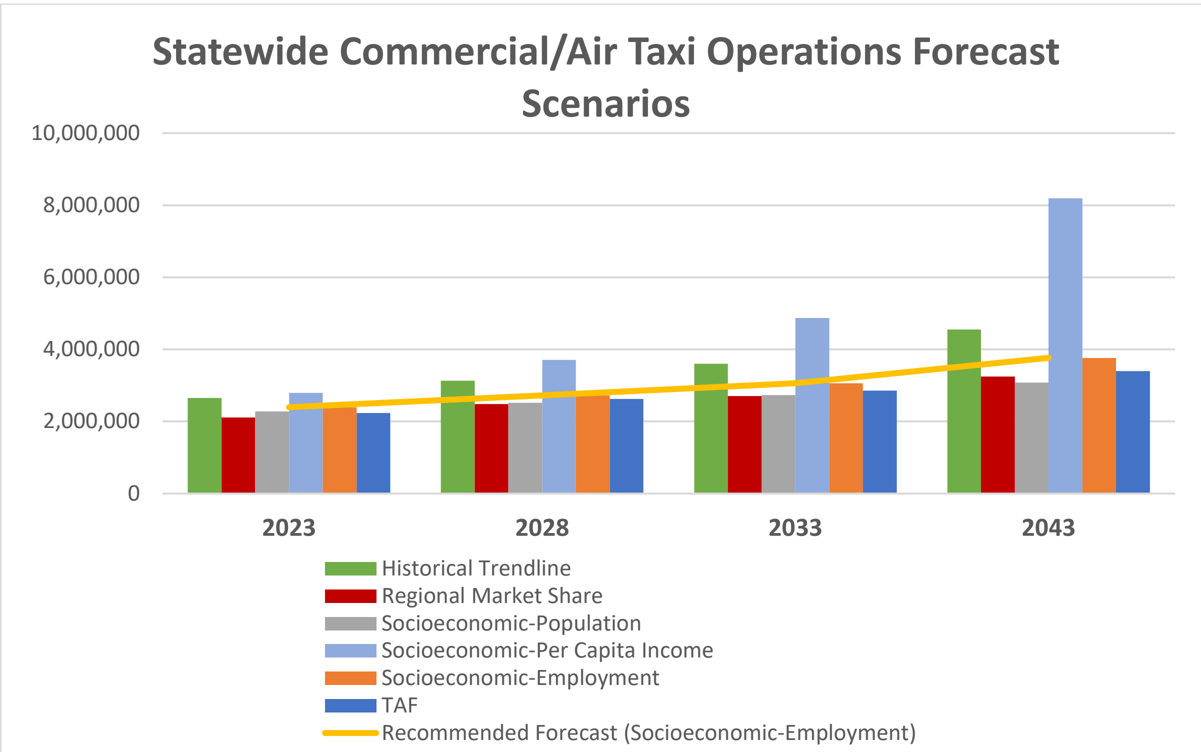


Table 6-3. Statewide Commercial/Air Taxi Operations Forecast Scenarios

	Forecast Scenarios	2023	2028	2033	2043	CAGR
Commercial/Air Taxi Ops	Historical Trendline	2,654,246	3,128,836	3,603,498	4,553,028	2.73%
	Regional Market Share	2,108,798	2,484,125	2,709,540	3,248,654	2.18%
	Socioeconomic-Population	2,276,900	2,519,084	2,734,501	3,080,662	1.52%
	Socioeconomic-Per Capita Income	2,797,274	3,707,910	4,873,159	8,195,982	5.52%
	Socioeconomic-Employment	**2,396,624**	**2,726,598**	**3,063,478**	**3,766,544**	**2.29%**
	TAF	2,233,413	2,622,319	2,859,028	3,399,001	2.12%

6.2.4 Enplanements

Like commercial/air taxi operations forecast, six forecast scenarios are also presented for enplanements. Regional market share forecast for enplanements is the recommended enplanement forecast for the 2043 FASP. Since 2012, enplanements have consistently represented more than 40 percent of the market share in the Southern Region. The market share forecast predicts that enplanements are going to grow to exceed 166 million in the State of Florida by 2043, yielding a CAGR of 2.6 percent. **Figure 6-5** and **Table 6-4** present enplanement forecast scenarios and the resultant recommended forecast.

Figure 6-5. Statewide Enplanement Scenarios

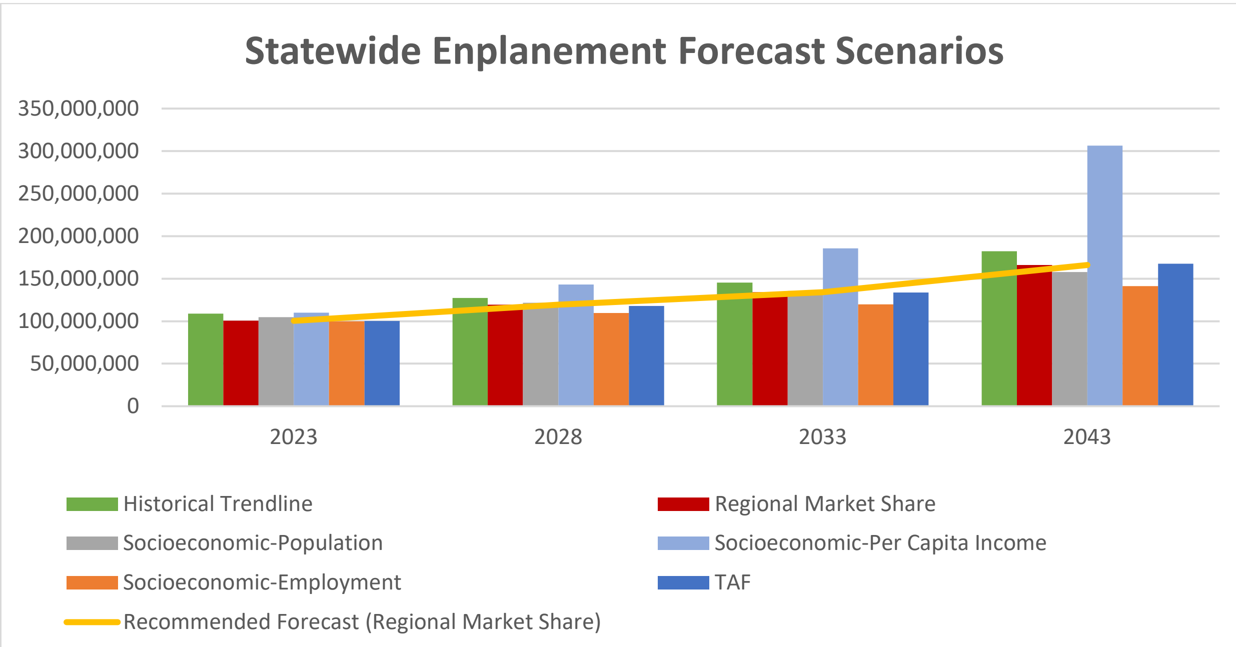


Table 6-4. Statewide Enplanement Forecast Scenarios

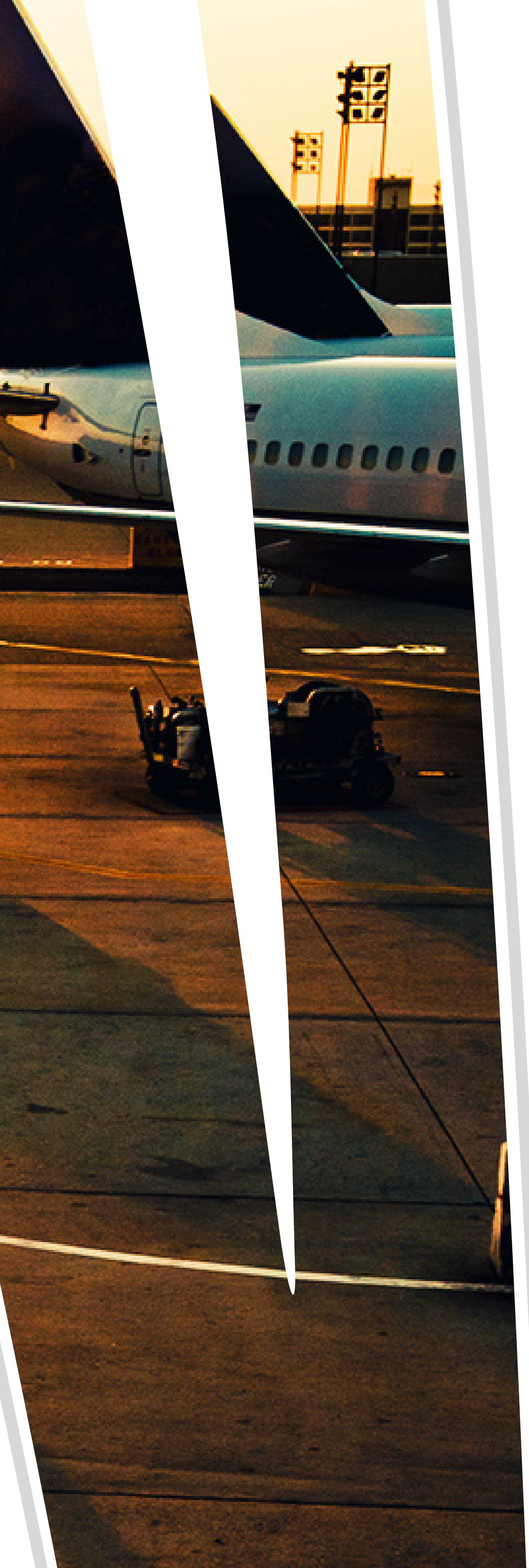
	Forecast Scenarios	2023	2028	2033	2043	CAGR
Enplanements	Historical Trendline	108,884,896	127,191,602	145,498,308	182,111,721	2.6%
	Regional Market Share	**100,414,423**	**119,467,756**	**133,898,928**	**166,052,220**	**2.6%**
	Socioeconomic-Population	104,583,708	121,480,137	135,398,253	157,801,735	2.1%
	Socioeconomic-Per Capita Income	109,884,343	143,080,522	185,521,657	306,343,412	5.3%
	Socioeconomic-Employment	99,899,614	109,809,045	119,854,715	141,138,221	1.7%
	TAF	100,394,115	118,069,071	133,517,517	167,574,724	2.6%

6.3 Forecast Summary

Table 6-5 presents the forecast summary for aviation activity in the State of Florida through 2043. The full analysis of system forecasts can be found within **Appendix D – Aviation Activity Forecasts**.

Table 6-5. FASP 2043 Forecast Summary

Aviation Activity	2023	2028	2033	2043	CAGR
Based Aircraft	12,629	13,748	14,656	16,118	1.2%
GA Operations	6,884,315	7,277,803	7,658,240	8,322,191	1.0%
Commercial/Air Taxi Operations	2,396,624	2,726,598	3,063,478	3,766,544	2.3%
Enplanements	100,414,423	119,467,756	133,898,928	166,052,220	2.6%



7
System Analysis

FDOT 2043 FASP FLORIDA AVIATION SYSTEM PLAN

Chapter 7

System Analysis

The analysis in this chapter builds on **Chapter 3 – Airport System NPIAS Classifications** and **Chapter 4 – System Goals**. This chapter looks at the performance metrics the Florida Department of Transportation Aviation Office (FDOT AO) established for the Florida Aviation System Plan (FASP) 2043. These metrics cover a variety of topics, including safety, airport facilities, and economic development. Since this is a broad overview, each metric is evaluated at the FDOT District level or by *National Plan of Integrated Airport Systems* (NPIAS) airport role, depending upon the metric.

The chapter concludes with a drive time analysis that quantifies the coverage provided by the airport system. This coverage is assessed for the entire airport system as well as specific segments.

7.1 Performance Metrics Analysis

Sets of performance metrics for the FASP 2043 are grouped into similar categories:

- Safety Metrics
- Operational Metrics
- Facility and Service Status Metrics
- Planning and Administration Metrics
- Development Metrics

These metrics were identified by the FDOT AO as either important for evaluating how the Aviation Office was performing in their role of overseeing the airport system, or for monitoring the status of the airport system. Icons first introduced in **Chapter 4 – System Goals** appear throughout the sections to align the performance measures and indicators with the appropriate system plan goal.

Icon Key:

Goal 1: Provide efficient, safe, secure, and convenient service to Florida's citizens, businesses, and visitors.

Goal 2: Contribute to operational efficiency, economic growth, and competitiveness while remaining sensitive to Florida's natural environment and exhibiting social responsibility.

Goal 3: Protect airspace and promote compatible land uses around public airports.

Goal 4: Foster technological innovation and support implementation of new technologies.

7.2 Safety Metrics

The first set of metrics consists of those pertaining to safety. These are generally regarded as items over which the Aviation Office has some degree of influence and that are a priority for improvements where feasible.

7.2.1 FAA Runway and Taxiway Design Standards

The FAA establishes design standards for the safe movement and operations of aircraft. Standards require that runway and taxiway designs must meet the demand of the most critical aircraft using the runway. The FDOT AO established performance measures to determine the number of system airports that meet both runway and taxiway design standards.

This analysis documents how many FDOT airports meet the design standards for the runways and taxiways as well as their specific safety areas. Each primary runway was evaluated for compliance with:

- Runway safety area standards,
- Runway protection zone standards,
- Runway object free area standards.

Those airports that met all three criteria were evaluated as meeting current FAA runway design standards. If one or more criteria were not met, the airport's primary runway was evaluated as not meeting FAA runway design standards.

As shown in **Table 7-1**, just over half of all Florida airports' primary runways meet FAA standards. In Districts 2 and 5, over two-thirds of the airports' primary runways meet standards. In the remaining districts, with the exception of District 6, 40 percent or more primary runways meet standards.

Similar to runways, the taxiways were evaluated for compliance with:

- Taxiway safety area standards
- Taxiway object free area standards.

Those airports that met both criteria were evaluated as meeting current FAA taxiway design standards. If one or more criteria were not met, the airport's primary taxiway was evaluated as not meeting FAA taxiway design standards.

Taxiways meet standards at a much higher level than runways. About 93 percent (99 airports) of the airports have primary taxiways that meet FAA standards. Although District 6 only had a single airport at which the primary runway meets standards, all seven of its airports (100 percent) have a primary taxiway that does. This is also true of District 2. Eighty-six percent or greater of the remaining district airports meet FAA taxiway design standards (**Table 7-1**).

Figure 7-1 shows that Districts 2 and 5 have the highest number of airports that meet FAA design standards for both the primary runway and the primary taxiway.

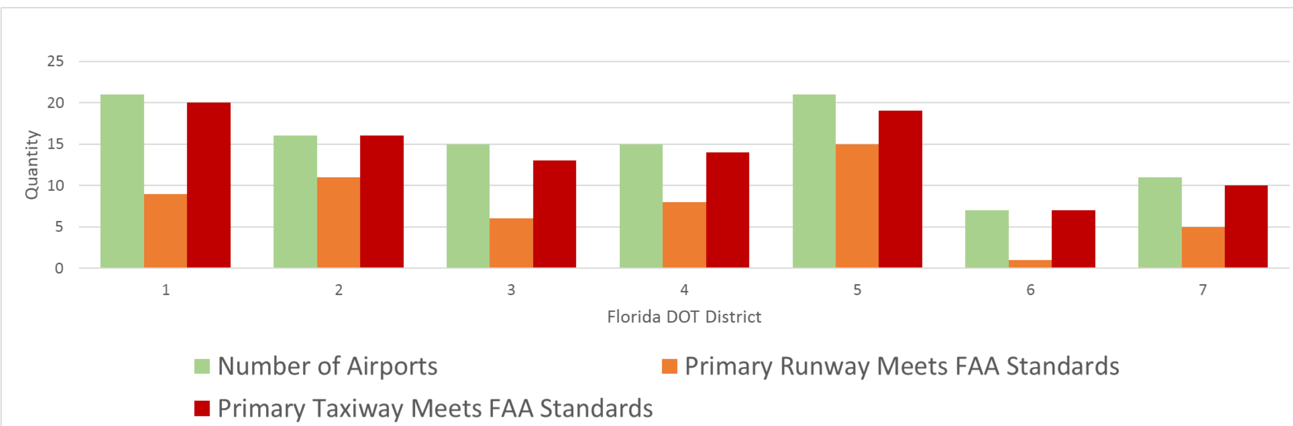
Analyzing the safety areas critical to safe operations for runways and taxiways yields additional insights. For runways, FAA requires airports to maintain runway safety areas (RSA), runway protection zones (RPZ), and Part 77 surfaces according to design standards. RSA standards generally apply to pavement conditions, sizes, and whether or not objects are located within them. RPZs serve to protect the people and property on the ground. As such, RPZ standards generally apply to compatible or non-compatible land uses as well as size and pavement conditions and seek to limit the RPZ to compatible uses.

Table 7-1. Airports That Meet Current FAA Runway and Taxiway Design Standards

FDOT District	Number of System Airports in District	Primary Runway Meets FAA Standards	Primary Taxiway Meets FAA Standards
1	21	9	20
2	16	11	16
3	15	6	13
4	15	8	14
5	21	15	19
6	7	1	7
7	11	5	10
Total	**106**	**55**	**99**

Source: FASP 2043 Airport Survey

Figure 7-1. Airports That Meet Current FAA Runway and Taxiway Design Standards



Note: Primary runway meets FAA standards if Primary RSA, Primary RPZ, and Primary Object Free Area (OFA) meet FAA standards. Primary taxiway meets FAA standards if Primary TSA and Primary TOFA meet FAA standards.
Source: FASP 2043 Airport Survey

The design standards regarding runway object free areas (ROFA) also factor into operational safety by requiring a clear area that is limited to only navigational aid equipment (ground and air) and wingtip clearance in the event of an excursion from the runway. Design standards for Part 77 surfaces are focused on making sure these surfaces are free of objects that are considered obstructions and therefore a potential hazard to air navigation.

As a result, the FDOT AO established performance measures that track the percentage or number of Florida airports' primary runways with:

- RSAs meeting FAA standards,
- ROFAs meeting FAA standards,
- RPZs meeting FAA standards, and

- Primary runways with Part 77 surfaces clear of obstructions.

In three of the four standard categories above, for 81 percent (or more) of Florida airports, the primary runway meets FAA design standards for RSA, ROFA, and Part 77 Surfaces (**Table 7-2**). When looking only at RSAs, the percentage climbs closer to 90 percent. Although a lower number of the airports' overall meet standards for the primary RPZ, the total that do exceeds 57 percent (61 airports). The data shows that District 6, which had the lowest number of airports where the primary runway meets design standards, meets RSA and ROFA standards for 86 percent of their runways, and Part 77 design standards for all of them.

The category with the most room for improvement is RPZ design standards. Nearly three-fifths of Florida airports' primary runway RPZ meets FAA standards, with District 5 having the highest number overall, and District 6, the lowest. The remaining districts range from about 29 to 69 percent.

In Districts 4 and 6, the primary runway Part 77 surfaces meet standards for all of the airports.

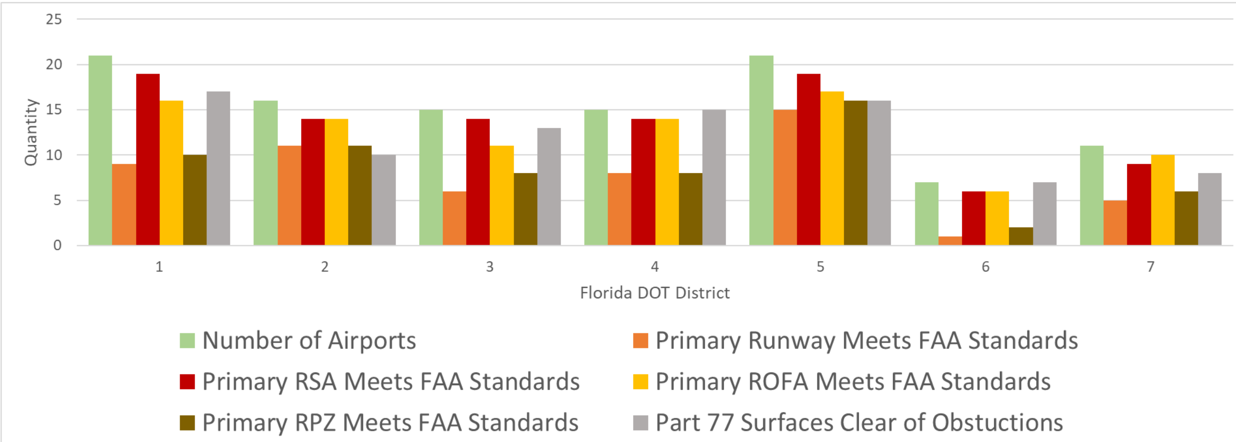
Figure 7-2 shows overall at least half or more airports in Districts 1 through 5 and 7 have primary runway safety areas (RSAs, RPZs, ROFAs and Part 77 surfaces clear of obstructions) that meet design safety standards.

Table 7-2. Airports That Meet FAA Design Standards Related to Safety Areas and Surfaces

FDOT District	Number of System Airports in District	Primary Runway Meets FAA Standards	Primary RSA Meets FAA Standards	Primary ROFA Meets FAA Standards	Primary RPZ Meets FAA Standards	Part 77 Surfaces Clear of Obstructions
1	21	9	19	16	10	17
2	16	11	14	14	11	10
3	15	6	14	11	8	13
4	15	8	14	14	8	15
5	21	15	19	17	16	16
6	7	1	6	6	2	7
7	11	5	9	10	6	8
Total	**106**	**55**	**95**	**88**	**61**	**86**

Source: FASP 2043 Airport Survey

Figure 7-2. Airports That Meet FAA Design Standards Related to Safety Areas and Surfaces



Source: FASP 2043 Airport Survey

As a result, the FDOT AO established performance measures that track the percentage or number of Florida airports' taxiways with:

- Taxiway safety areas (TSAs) meeting FAA standards and
- Taxiway object free areas (TOFAs) meeting FAA standards.

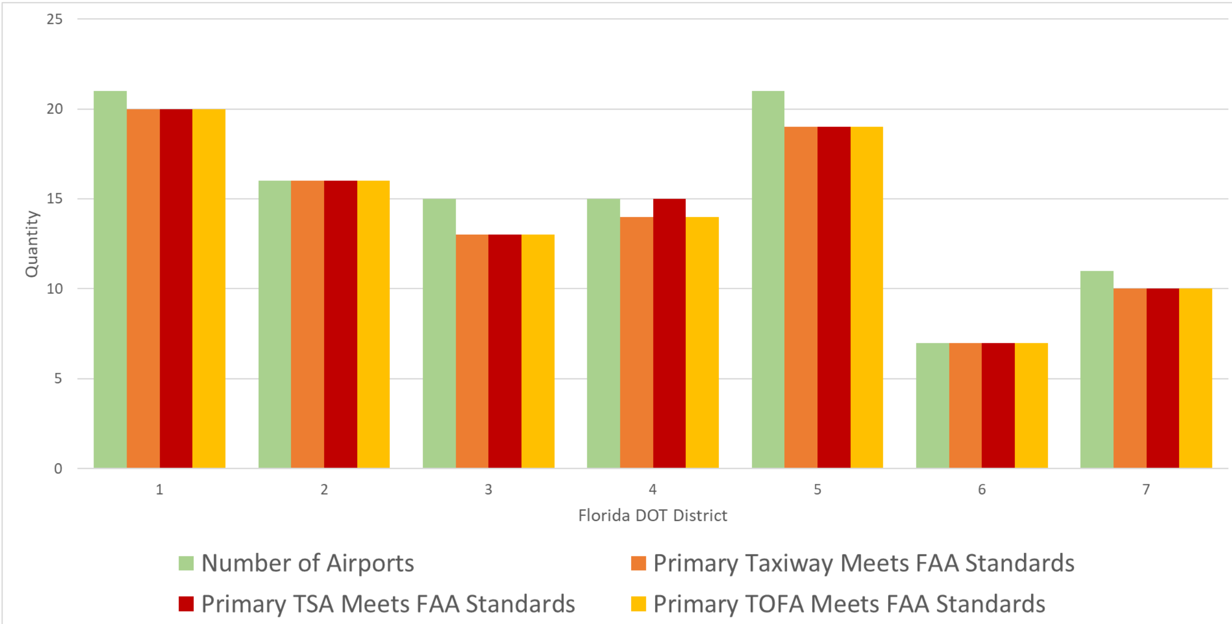
As **Table 7-3** and **Figure 7-3** show, currently 94 percent of all Florida primary taxiways have TSAs that meet FAA standards, as well as 93 percent meeting FAA standards for their Primary TOFA.

Table 7-3. Airports That Meet FAA TSA and TOFA Design Standards

FDOT District	Number of System Airports in District	Primary Taxiway Meets FAA Standards	Primary TSA Meets FAA Standards	Primary TOFA Meets FAA Standards
1	21	20	20	20
2	16	16	16	16
3	15	13	13	13
4	15	14	15	14
5	21	19	19	19
6	7	7	7	7
7	11	10	10	10
Total	**106**	**99**	**100**	**99**

Source: FASP 2043 Airport Survey

Figure 7-3. Airports That Meet FAA TSA and TOFA Design Standards



Notes: TSA=Taxiway Safety Area; TOFA=Taxiway Object Free Area
Source: FASP 2043 Airport Survey

7.2.2 FAA-Designated Hot Spots

The FAA has established design standards for safe airfield geometry. Configuring an airfield with right-angle turns from taxiways to runways and avoiding direct access from aprons to runways are examples of standard geometry that fit safety criteria. When airfield configurations contain non-standard geometry, pilots can become confused, which can lead to potential safety risks and runway incursions. The FAA designates these areas as hot spots. Because they are a safety concern, hot spots are an item high on the priority list for improvements. The FDOT AO established a performance measure to track these hot spots, the airports where they are found, and how many exist within the Florida airport system.

Review of the FAA Chart Supplement Southeast allowed analysis of the number of hot spots present in the Florida aviation system by number of airports per district and in total (**Table 7-4**). Nearly one-quarter (24 airports) of Florida's 106 airports have at least one hot spot. Districts 1 and 5 operate the most airports (21 airports) in the state with nearly one-fifth (20 percent) of the airports having at least one hot spot. District 4 has the highest number of hot spots – over half of its 15 airports, and 16 hot spots total. District 7, which operates roughly one-tenth of the state's airports, has the least number of hot spots, with just one at one of its airports. **Figure 7-4** illustrates that four of Florida's districts (Districts 2, 4, 5 and 6) have at least one airport (or more) with multiple hot spots.

The distribution of hot spots among Florida system airports by NPIAS role was also examined, as shown in **Figure 7-5**. Most obvious is that there are no hot spots shown for Local, Basic, or

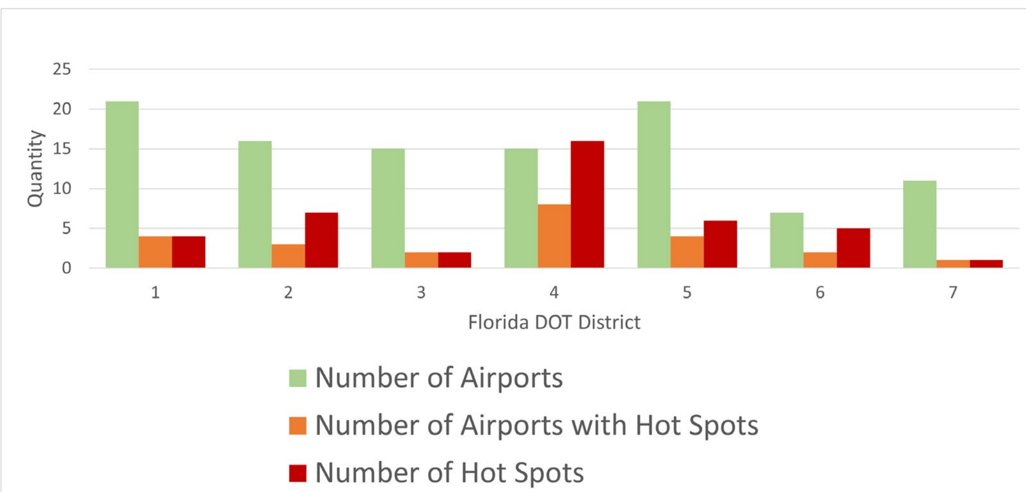
Unclassified Airports, or for any airports not in the NPIAS. The assumption is this has more to do with the fact that these categories of airports do not have airport diagrams available from the FAA, which is the document where the FAA portrays hot spots. Further investigation is likely warranted to determine if any of these airport categories may have areas that meet FAA hot spot criteria that need improvement.

Table 7-4. Airports with Hot Spots per District

FDOT District	Number of System Airports in District	Number of Airports with Hot Spots	Number of Hot Spots
1	21	4	4
2	16	3	7
3	15	2	2
4	15	8	16
5	21	4	6
6	7	2	5
7	11	1	1
Total	**106**	**24**	**41**

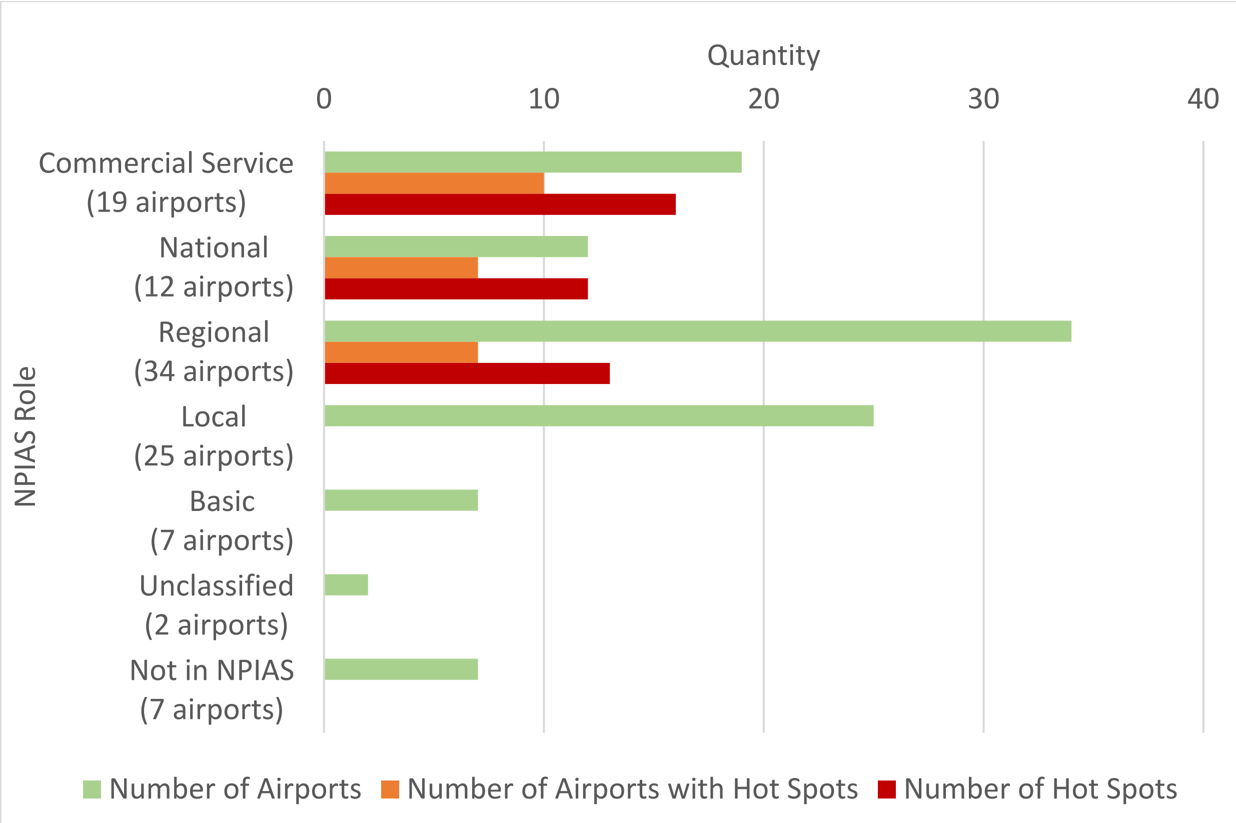
Source: FAA Chart Supplement Southeast U.S. 10 AUG 2023 to 5 OCT 2023

Figure 7-4. System Airports (by FDOT District) with FAA-Designated Hot Spots



Source: FAA Chart Supplement Southeast U.S. 10 AUG 2023 to 5 OCT 2023

Figure 7-5. System Airports (by NPIAS Role) with FAA-Designated Hot Spots



Source: FAA Chart Supplement Southeast U.S. 10 AUG 2023 to 5 OCT 2023

7.3 Operational Metrics

The operational metrics examine the level of usage of Florida's system airports. Monitoring these airport parameters allows the Aviation Office to identify capacity issues and formulate policies and decisions intended to address these issues.

7.3.1 Based Aircraft

Having knowledge of the based aircraft across the system equips the FDOT AO with the information needed to consider future development of all facilities, particularly needs for hangar development, taxiways and aprons, utilities, and possibly even Fixed-Base Operators (FBOs) as appropriate. This also helps with knowledge of the airports' revenue. As a result, the FDOT AO established a performance indicator for based aircraft across the system airports.

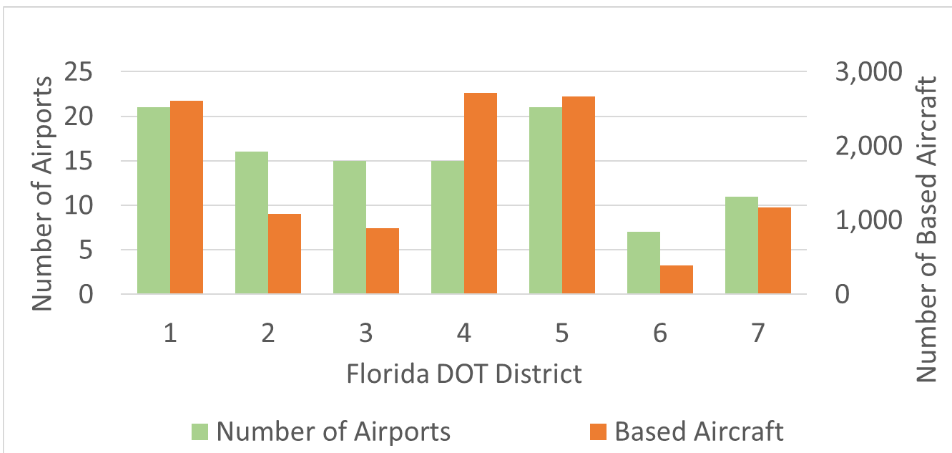
As **Table 7-5** and **Figure 7-6** show, Districts 1, 4, and 5 have the highest number of based aircraft, with District 4 having the highest number at 2,716 based aircraft. Districts 2 and 7 have about half as many as Districts 1, 4, and 5. District 6 has the lowest number at 385.

Table 7-5. District Airports with Total of Based Aircraft

FDOT District	Number of System Airports in District	Based Aircraft
1	21	2,608
2	16	1,087
3	15	892
4	15	2,716
5	21	2,667
6	7	385
7	11	1,175
Total	**106**	**11,530**

Source: FAA 5010 and National Based Aircraft Inventory

Figure 7-6. District Airports with Total of Based Aircraft



Source: FAA 5010 and National Based Aircraft Inventory

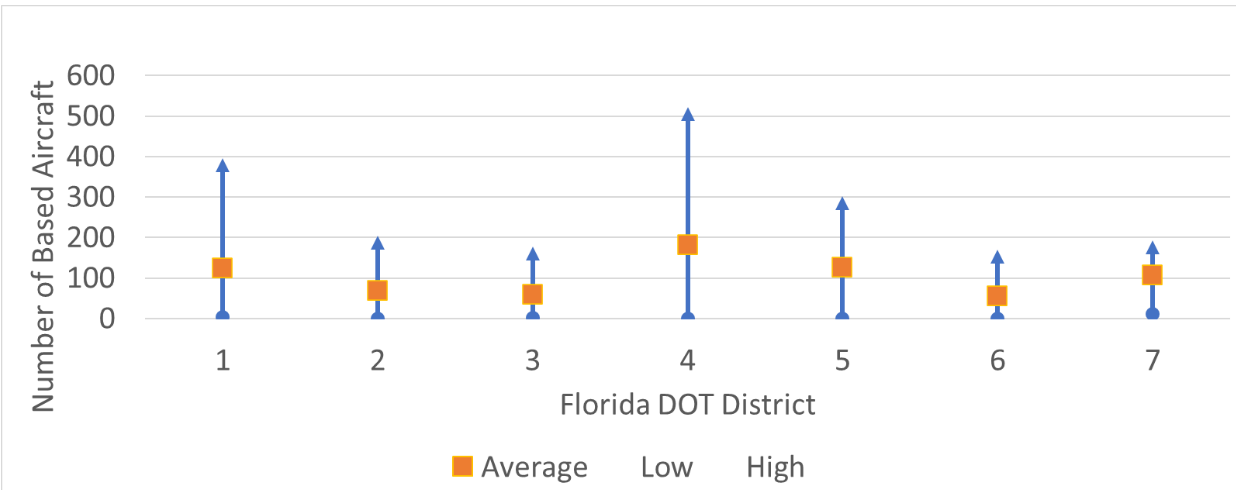
The data indicates District 4 has the highest average of based aircraft per airport (**Table 7-6** and **Figure 7-7**). District 6 has the lowest average. The overall average number of based aircraft per airport is 109.

Table 7-6. Average, Low, and High Number of Based Aircraft at District Airports

FDOT District	Number of System Airports in District	Based Aircraft	Average	Low	High
1	21	2,608	124	3	396
2	16	1,087	68	0	204
3	15	892	59	2	178
4	15	2,716	181	0	522
5	21	2,667	127	0	302
6	7	385	55	0	171
7	11	1,175	107	11	193
Total	**106**	**11,530**	109	**0**	**522**

Source: FAA 5010 and National Based Aircraft Inventory

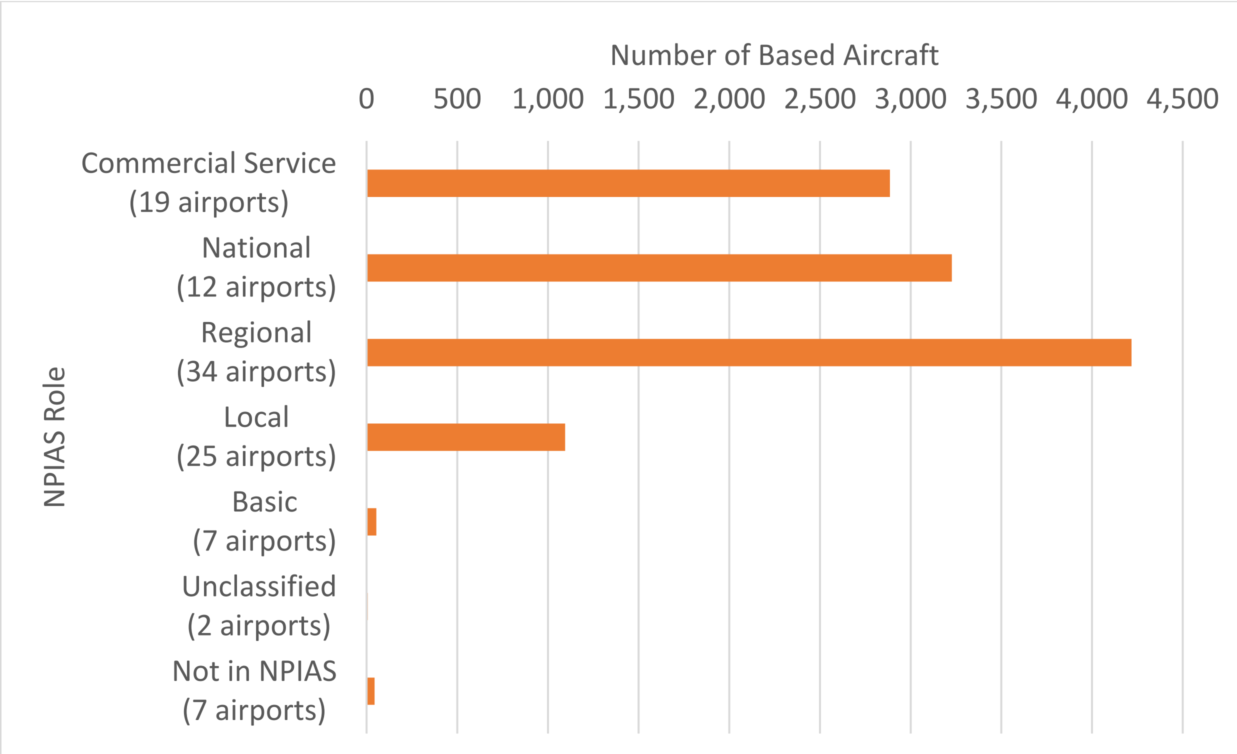
Figure 7-7. Average, Low, and High Number of Based Aircraft at District Airports



Source: FAA 5010 and National Based Aircraft Inventory

The number of based aircraft as distributed among the airports by NPIAS role was also looked at. **Figure 7-8** shows that Florida's based aircraft are concentrated at the Regional, National, and Commercial Service Airports. Collectively, these airports account for 90 percent of the based aircraft in Florida. Local Airports accommodate approximately 10 percent of Florida's based aircraft fleet, while less than 1 percent of based aircraft are found at the remaining categories of airports.

Figure 7-8. Airports by NPIAS Role with Total of Based Aircraft



Source: FAA 5010 and National Based Aircraft Inventory

7.3.2 Annual Operations

The FDOT AO established performance indicators to track commercial service and air taxi operations compared with general aviation operations. As **Table 7-7** shows, the overwhelming majority of operations conducted annually systemwide are general aviation (close to 6.2 million). Districts 1, 4, and 5 have the highest number of GA operations, approximately 1.1 million, 1.3 million, and 1.6 million, respectively. Districts 2, 6, and 7 have approximately half as many. District 3 has approximately one-third as many GA operations as District 1.

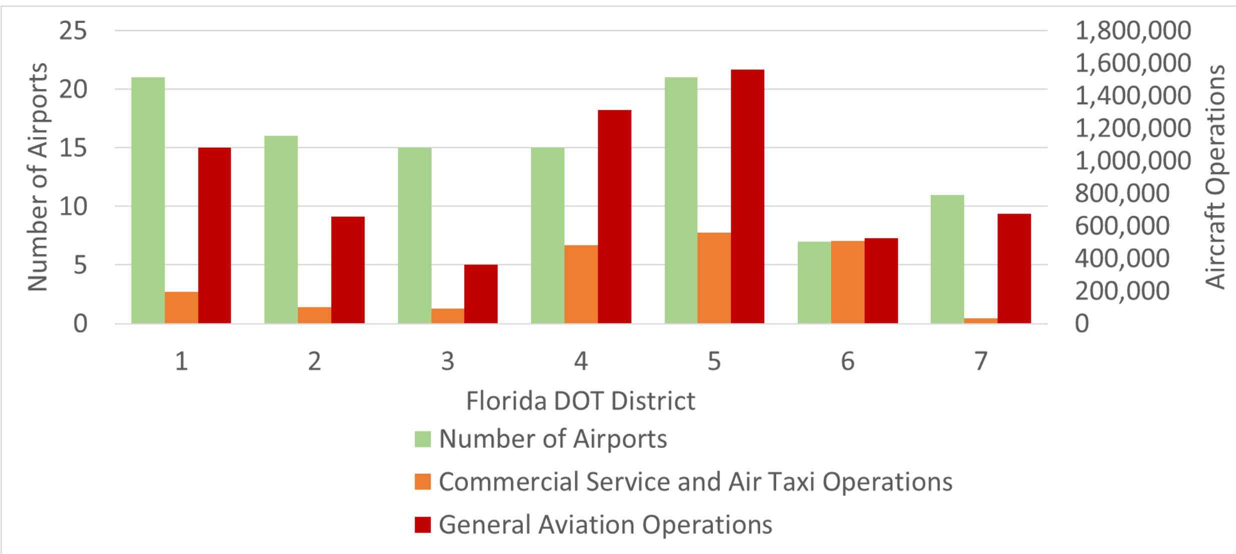
As far as commercial service and air taxi operations, a growing segment of markets at many airports, overall, Florida's system airports conduct close to 2 million of these operations annually (**Table 7-7** and **Figure 7-9**). The most operations are conducted at Districts 4 (over 480,000), 5 (roughly 560,000), and 6 (roughly 506,000). That number drops for District 1 (nearly 194,000), and further for Districts 2 and 3 (close to 99,000 and just over 90,000, respectively). District 7 conducts the least amount of these operations at about 33,000.

Table 7-7. Annual Commercial Service, Air Taxi and GA Operations

FDOT District	Number of System Airports in District	Commercial Service and Air Taxi Operations	General Aviation Operations
1	21	193,748	1,079,680
2	16	98,895	657,383
3	15	90,338	363,233
4	15	483,949	1,312,813
5	21	560,228	1,560,762
6	7	505,562	523,993
7	11	32,769	672,824
Total	**106**	**1,965,489**	**6,170,688**

Source: FAA TAF issued February 2023

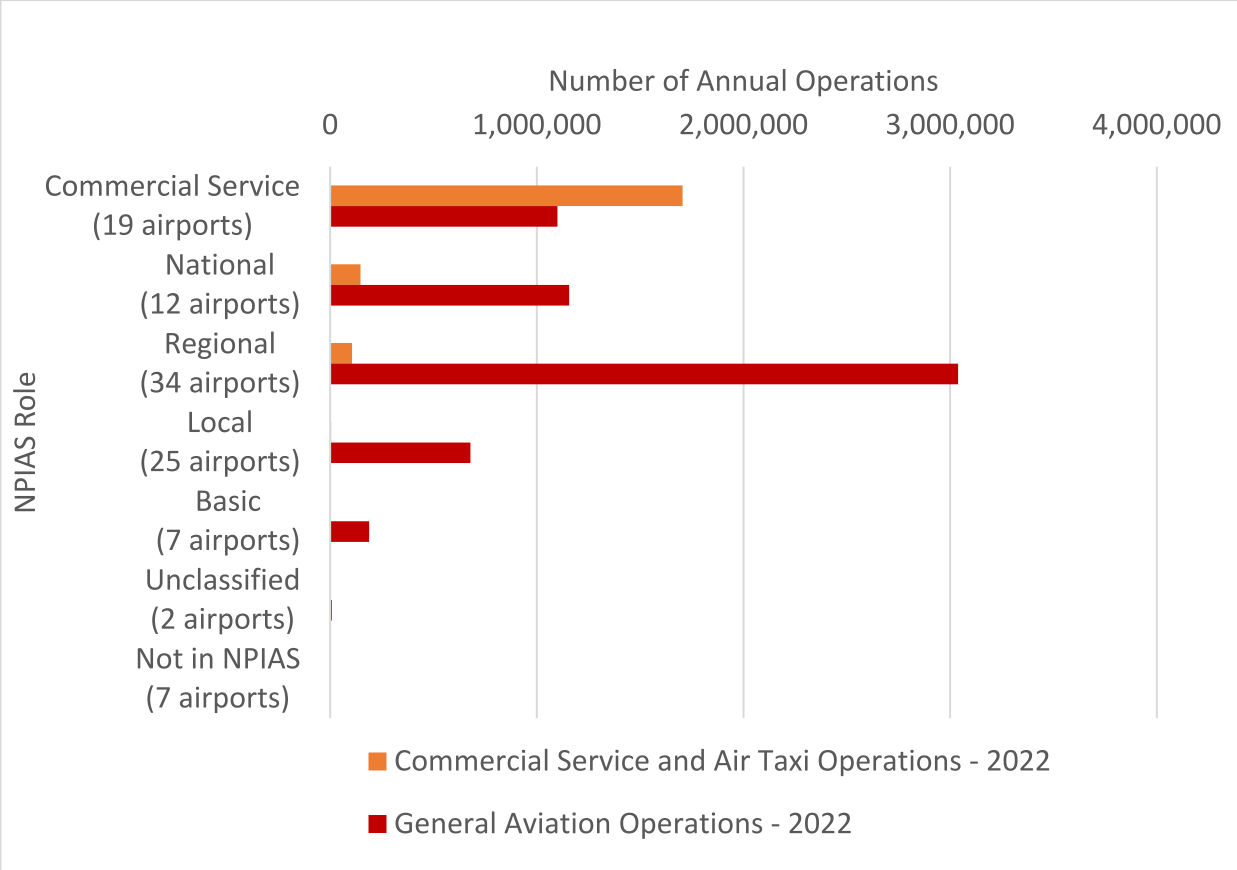
Figure 7-9. Annual Commercial Service, Air Taxi and GA Operations by Airport FDOT District



Source: FAA TAF issued February 2023

Figure 7-10 shows how the 2022 operations are distributed among the NPIAS roles. It should be no surprise that Commercial Service Airports handle most of the commercial service and air taxi operations. When combined with the general aviation operations that take place at Commercial Service Airports, there are 2.8 million annual operations occurring at these airports. Regional Airports in Florida handle even more operations, reporting more than 3.1 million annual operations. These two categories of airports account for nearly three-quarters of Florida's annual 8.1 million aircraft operations.

Figure 7-10. Annual Commercial Service, Air Taxi and GA Operations by Airport NPIAS Role



Source: FAA TAF issued February 2023

7.3.3 Annual Enplanements

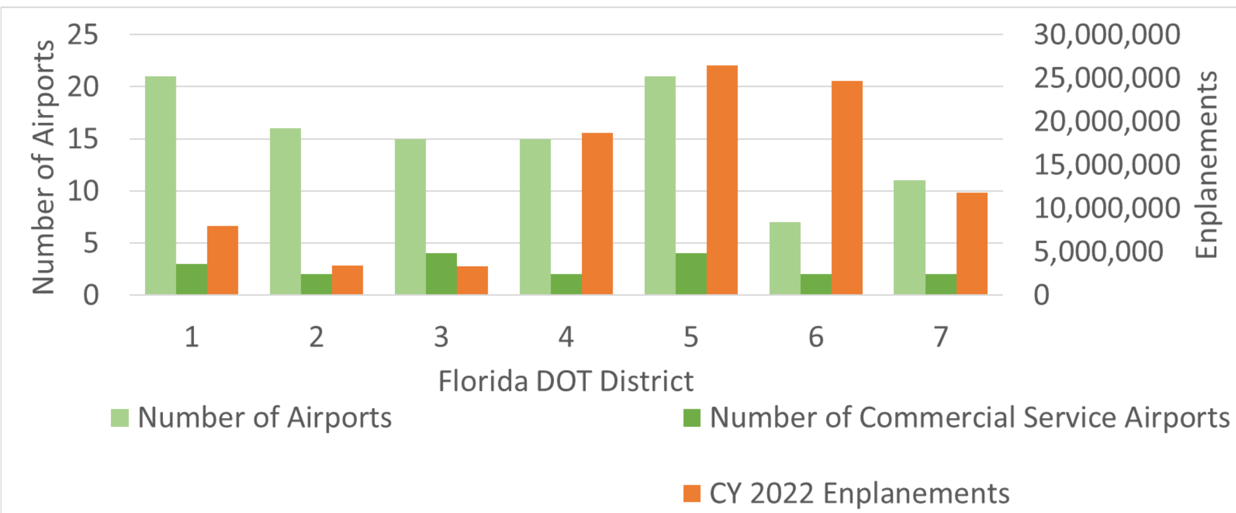
The FDOT AO established a performance indicator to document the number of annual enplanements at the commercial service airports. Enplanement data was collected for the calendar year of 2022. In District 5, 19 percent of its airports (4 airports) saw 26.5 million enplanements (**Table 7-8** and **Figure 7-11**), the highest number of enplanements for the system overall. This was followed closely by District 6, where 29 percent of its airports saw about 24.7 million enplanements.

Table 7-8. Calendar Year 2022 Enplanements at Commercial Service Airports

FDOT District	Number of System Airports in District	Number of Commercial Service Airports	CY 2022 Enplanements
1	21	3	7,965,366
2	16	2	3,443,742
3	15	4	3,345,837
4	15	2	18,637,797
5	21	4	26,457,343
6	7	2	24,658,699
7	11	2	11,760,579
Total	**106**	**19**	**96,269,363**

Source: FAA

Figure 7-11. Calendar Year 2022 Enplanements at Commercial Service Airports



Source: FAA

7.3.4 Tonnage of Air Cargo Shipped

The demand for air cargo in the age of e-commerce is here to stay and constantly growing. To anticipate existing maintenance needs and future capacity and infrastructure needs, the FDOT AO established a performance indicator related to tonnage of air cargo shipped within the Florida system. Overall, data in **Table 7-9** and **Figure 7-12** indicate that Florida system airports conduct significantly more inbound cargo shipping than outbound, with approximately 3.1 million tons of inbound compared to close to 419,000 tons of outbound cargo overall. An overwhelming majority of the inbound cargo operations (just under 2.8 million tons) occur in District 6, and District 4 airports conduct the lowest amount of inbound cargo operations (about 10,000 tons). For more detail regarding air cargo tonnage, refer to *The FDOT Source Book,* “Aviation Tonnage.”

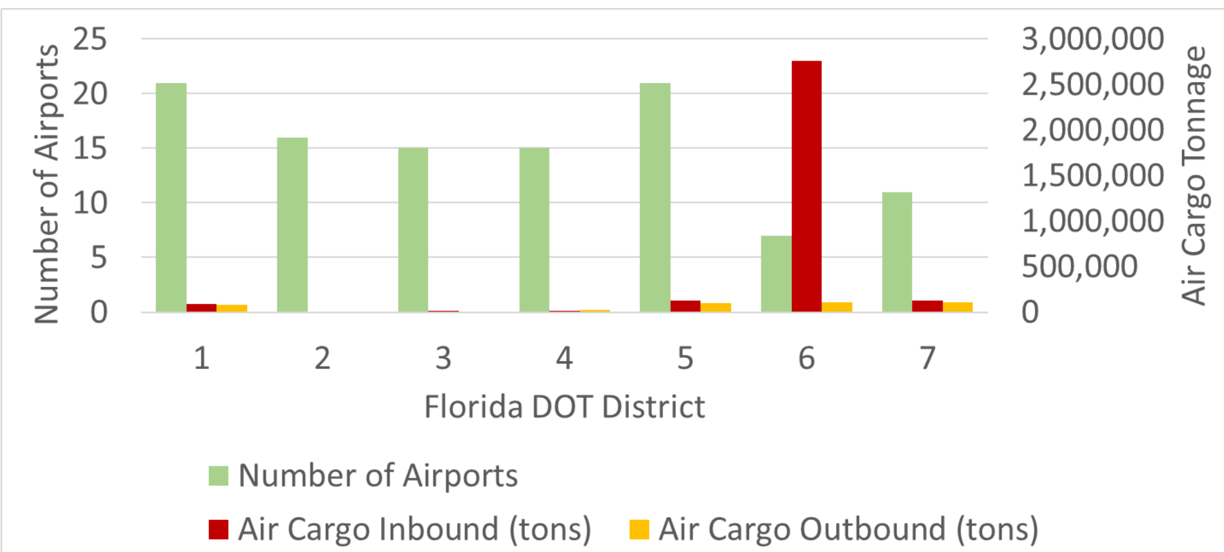
As far as outbound cargo operations go, Districts 5, 6, and 7 see close to the same amount, near or just over 100,000 tons. District 3 sees the lowest volume (7,078 tons). District 2 does not have any cargo operations, inbound or outbound, at any of its airports.

Table 7-9. Air Cargo Tonnage Shipped within Florida System

FDOT District	Number of System Airports in District	Air Cargo Inbound (tons)	Air Cargo Outbound (tons)
1	21	92,710	80,455
2	16	0	0
3	15	11,234	7,078
4	15	10,218	20,367
5	21	131,046	99,188
6	7	2,756,160	105,380
7	11	126,658	106,152
Total	**106**	**3,128,026**	**418,620**

Source: FASP 2043 Airport Survey

Figure 7-12. Air Cargo Tonnage Shipped within Florida System



Source: FASP 2043 Airport Survey

7.3.5 Airport Capacity Related Projects

Capacity-related improvements often are demanding in terms of schedules, staff hours, and overall cost. They require significant planning and coordination to make the best use of resources. As a result, the FDOT AO established a performance measure to gain a sense of the timing and volume of capacity improvements planned at system airports.

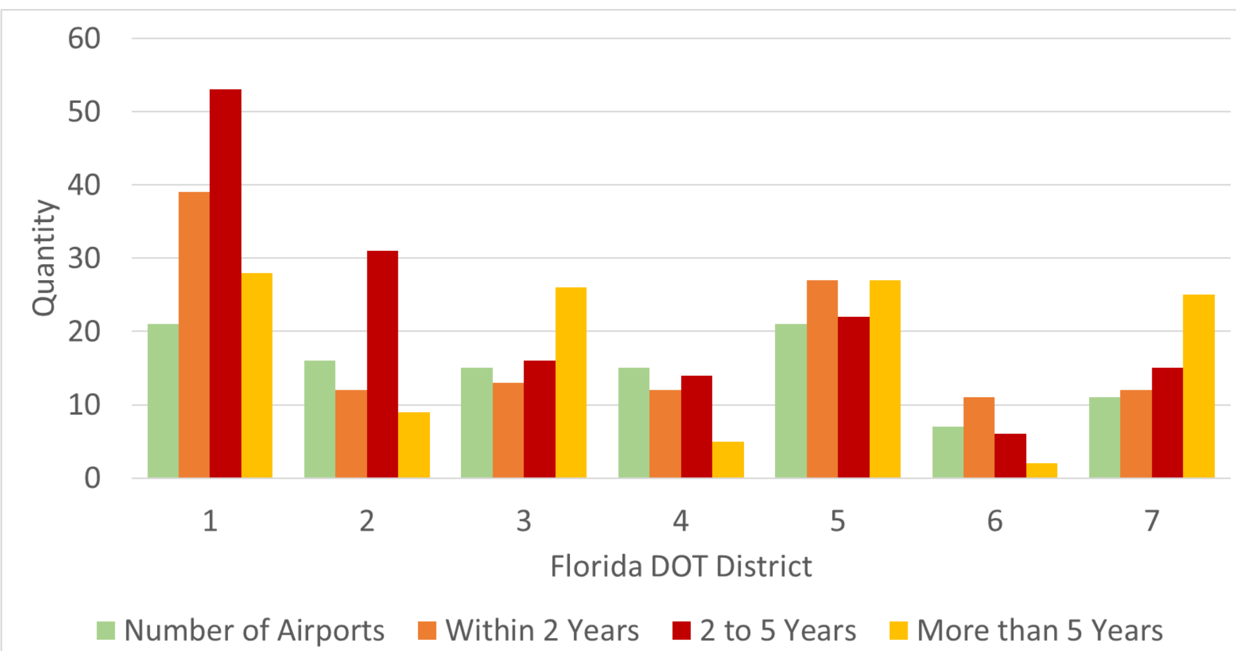
As **Table 7-10** and **Figure 7-13** show, the highest number of projects are planned within the next 2 to 5 years, with District 1 planning the highest number per district at 53 projects. The fewest are planned for 5 years out or more, with Districts 1 and 5 having the most planned at 28 and 27, respectively. District 6, which has the fewest airports overall, also has the fewest projects planned for each time period, with only 2 planned for five years out. District 1 has the highest number of projects planned to start within the next two years at 39 projects. District 5 has the next highest, at 27, and the remaining districts are pretty even ranging from 11 to 13 projects per district.

Table 7-10. Capacity-Related Projects Planned within the Next 2, 2 to 5, and More Than 5 Years

FDOT District	Number of System Airports in District	Within 2 Years	2 to 5 Years	More than 5 Years
1	21	39	53	28
2	16	12	31	9
3	15	13	16	26
4	15	12	14	5
5	21	27	22	27
6	7	11	6	2
7	11	12	15	25
Total	**106**	**126**	**157**	**122**

Source: Florida Aviation Database

Figure 7-13. Capacity-Related Projects Planned within the Next 2, 2 to 5, and More Than 5 Years



Source: Florida Aviation Database

7.3.6 Hangar Occupancy Rate

The maintenance and management of hangar inventory at airports supports development and revenue planning and projections. High occupancy rates indicate clear demand for additional development, particularly when viewed together with data such as based aircraft and associated waiting lists. The FDOT AO established a performance indicator to track the type and occupancy levels of hangars at system airports. Due to the critical nature of aircraft storage in Florida, the FDOT AO designated this issue as one of several important topics that warranted additional investigation. The results of that additional effort are found in **Chapter 8 – Aviation Office Initiatives**.

The data in **Table 7-11** and **Figures 7-14** and **7-15** clearly demonstrate the extremely high occupancy rates. At all district airports, box hangars and T-hangars are very close to max capacity. Box hangars show as 100 percent occupied, since only two units in District 3, one unit in District 5, and one unit in District 7 remain unoccupied (a total of 4 units empty out of a total of 1,106 units among the entire system).

The numbers come in marginally lower for T-hangar occupancy. The overall rate of occupancy is 99 percent. Districts 3, 4, and 6 have no vacancies (occupied at 100 percent). The remaining districts have a rate of 99 percent occupancy (a total of 41 empty units out of 5,992 units available among the entire system).

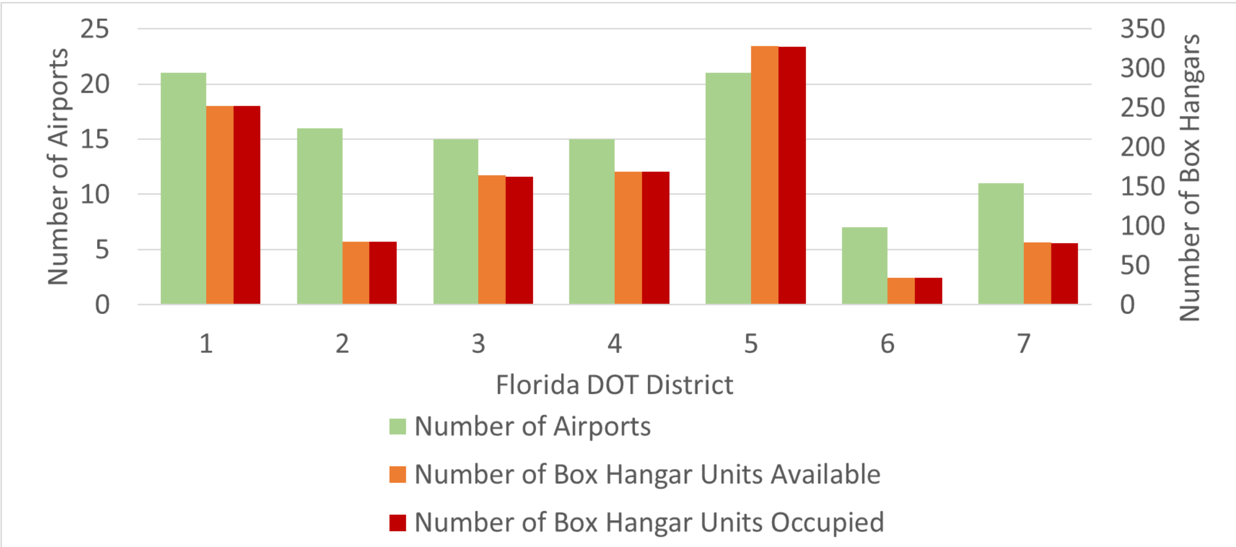
Table 7-11. Hangar Types and Occupancy Levels at System Airports by FDOT District

FDOT District	Number of System Airports in District	Box Hangar Units Available	Box Hangar Units Occupied	Box Hangar Occupancy Rate	T-Hangar Units Available	T-Hangar Units Occupied	T-Hangar Occupancy Rate
1	21	252	252	100%	1,657	1,637	99%
2	16	80	80	100%	581	578	99%
3	15	164	162	99%	557	557	100%
4	15	169	169	100%	979	979	100%
5	21	328	327	100%	1,231	1,221	99%
6	7	34	34	100%	170	170	100%
7	11	79	78	99%	817	809	99%
Total	**106**	**1,106**	**1,102**	**100%**	**5,992**	**5,951**	**99%**

Source: FASP 2043 Airport Survey

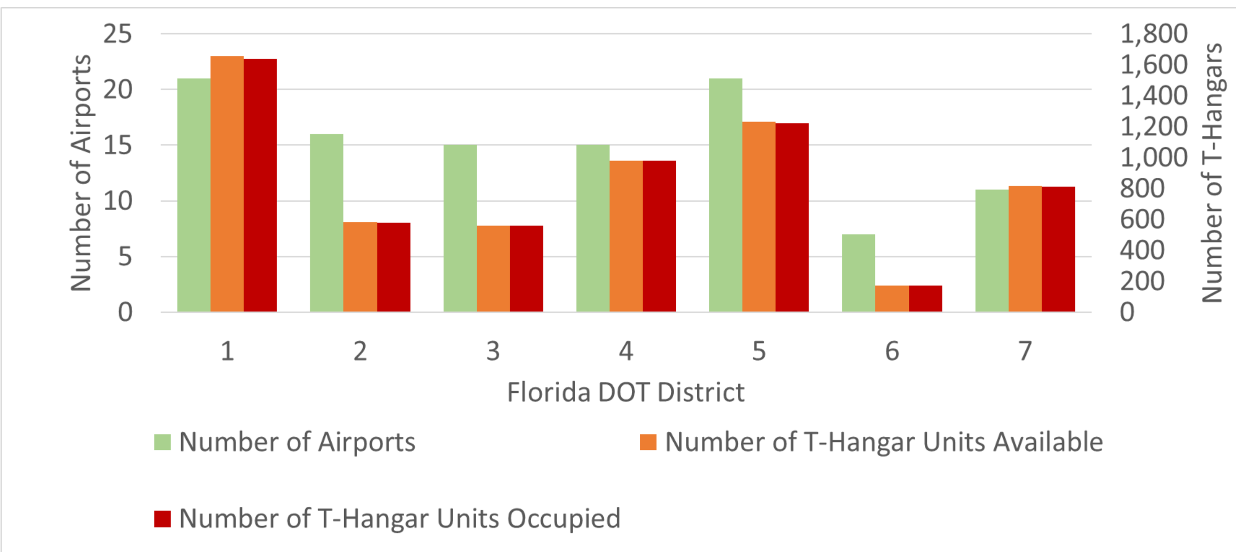
When looked at on the basis of NPIAS role, the lack of hangar vacancy is just as apparent. **Table 7-12** shows box hangar occupancy at 99 percent or higher across all NPIAS roles.

Figure 7-14. Box Hangar Occupancy Levels at System Airports



Source: FASP 2043 Airport Survey

Figure 7-15. T-Hangar Occupancy Levels at System Airports



Source: FASP 2043 Airport Survey

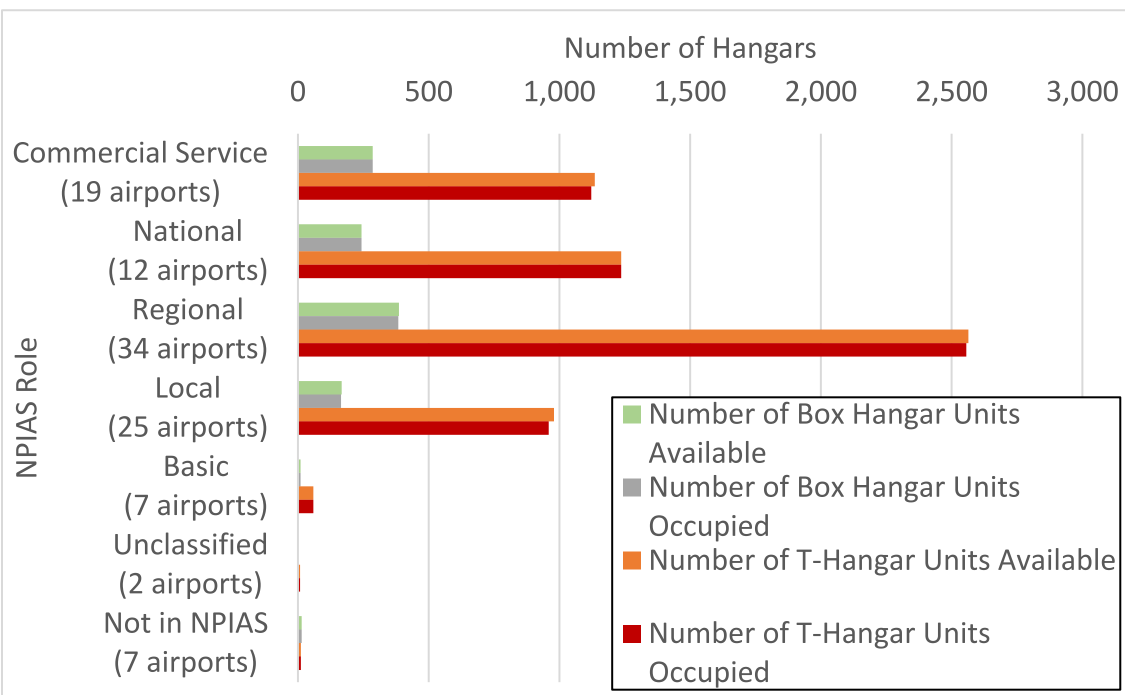
T-hangar occupancy rates are virtually the same, with Local Airports reporting a 98 percent T-hangar occupancy rate, while other airport categories are at 99 percent or higher. **Figure 7-16** illustrates the large inventory of T-hangars found at Regional Airports relative to the other airport roles.

Table 7-12. Hangar Types and Occupancy Levels at System Airports by NPIAS Role

NPIAS Role	Number of System Airports	Box Hangar Units Available	Box Hangar Units Occupied	Box Hangar Occupancy Rate	T-Hangar Units Available	T-Hangar Units Occupied	T-Hangar Occupancy Rate
Commercial Service	19	286	286	100%	1,135	1,122	99%
National	12	243	243	100%	1,236	1,236	100%
Regional	34	386	384	99%	2,564	2,556	100%
Local	25	167	165	99%	979	959	98%
Basic	7	10	10	100%	59	59	100%
Unclassified	2	0	0	Not Applicable	8	8	100%
Not in NPIAS	7	14	14	100%	11	11	100%
Total	**106**	**1,106**	**1,102**	**100%**	**5,992**	**5,951**	**99%**

Source: FASP 2043 Airport Survey

Figure 7-16. Hangar Occupancy Levels at System Airports by NPIAS Role



Source: FASP 2043 Airport Survey

7.4 Facility and Service Status Metrics

The Facility and Service Status Metrics focus on various infrastructure and typical aeronautical services found at Florida airports.

7.4.1 Airport Runway Surface Type

The type of runway surfaces are critical to safe airport operations. Florida's system airports have a wide range of primary runway surface types, identified in the column headings in **Table 7-13**.

Among the system airports, by far the largest share (80 percent) have primary runways paved with asphalt. All of District 7's airports have an asphalt surface for their primary runway. The remaining airports have a primary runway paved with concrete (about 8 percent), asphalt-concrete (about 6 percent), turf (about 4 percent), and two airports in District 5 are water (not paved).

7.4.2 Pavement Condition Index (PCI) of Primary Runways and Primary Taxiways

The condition of runway and taxiway pavements is essential for safe operations of aircraft. To facilitate the process of monitoring pavement condition, the FDOT AO manages the Statewide Airfield Pavement Management Program (SAPMP). The SAPMP enables the FDOT AO and the FAA to monitor the condition of the pavement infrastructure at Florida system airports, providing objective condition information needed to make informed decisions regarding capital investments. The SAPMP operates on a 3-year cycle and the next update will be available in 2026.

These pavements ideally are maintained to avoid deterioration and the potential for loose objects or cracks that could become a hazard for aircraft movement. The Pavement Condition Index (PCI) is a scale used during periodic inspections to rate the condition of the pavement from 0 to 100, with the highest scores representing pavement in the best condition. The FDOT AO established performance measures for the pavement condition of their system airports' primary runways and primary taxiways for the next 5-10 years to support prioritization of projects for the capital improvement programs. To gain the most complete picture of the conditions, the FDOT AO first looked at overall conditions in terms of whether pavement conditions were acceptable or not.

As **Table 7-14** and **Figure 7-17** show, about 74 percent of airports' primary runways rated as acceptable for pavement conditions. Breaking this down to the individual district levels, Districts 1 and 7 have the highest number, with District 7 having all 11 airports' primary runways in acceptable conditions. District 6 airports' primary runways are about evenly split, with 3 rating as acceptable, and the remaining ones requiring rehabilitation. Just under 6 percent of Florida airports have no pavement for their primary runway.

Table 7-13. Primary Runway Surface Types at District Airports

FDOT District	Number of System Airports in District	Asphalt	Concrete	Asphalt-Concrete	Turf	Water	Other Surface
1	21	19	0	0	1	0	1
2	16	12	2	1	1	0	0
3	15	10	3	1	1	0	0
4	15	13	1	1	0	0	0
5	21	16	0	2	1	2	0
6	7	7	0	0	0	0	0
7	11	8	2	1	0	0	0
Total	**106**	**85**	**8**	**6**	**4**	**2**	**1**

Source: FAA National Flight Data Center

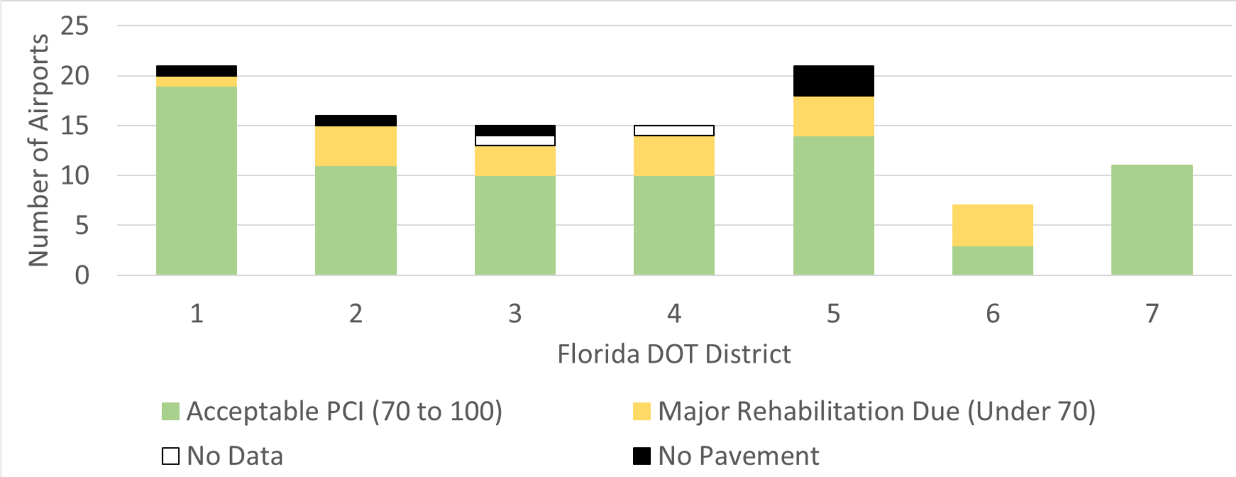
Table 7-14. Florida Airports Primary Runway Pavement Condition Index (PCI)

FDOT District	Number of System Airports in District	Acceptable PCI (70 to 100)	Major Rehabilitation Due (Under 70)	No Data	No Pavement
1	21	19	1	0	1
2	16	11	4	0	1
3	15	10	3	1	1
4	15	10	4	1	0
5	21	14	4	0	3
6	7	3	4	0	0
7	11	11	0	0	0
Total	**106**	**78**	**20**	**2**	**6**

Note: For airports giving a range of PCI values, the lowest value was used to present a conservative analysis.

Source: FASP 2043 Airport Survey and AVCON

Figure 7-17. Airports Primary Runway Pavement Condition Index (PCI)



Note: For airports giving a range of PCI values, the lowest value was used to present a conservative analysis.
Source: FASP 2043 Airport Survey and AVCON

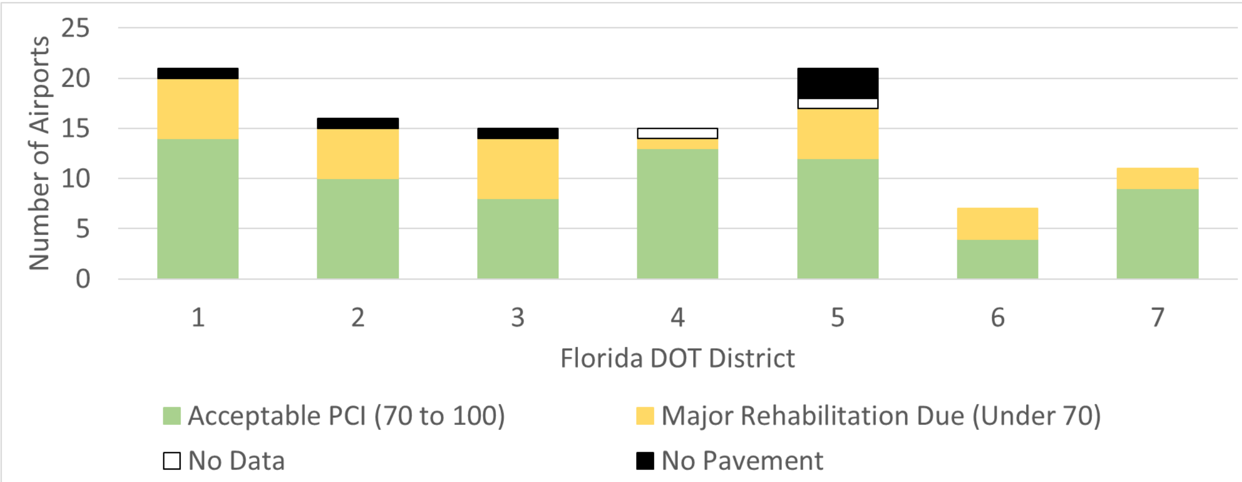
As **Table 7-15** and **Figure 7-18** show, Florida airports' primary taxiways are in similar condition. The overall percentage of airports with their primary taxiway in acceptable or better condition at 66 percent is slightly lower than the runway conditions; however, that is still two-thirds of all primary taxiways. The number with pavement rated as requiring major rehabilitation at 26 percent is higher than the same category for runways. Districts 1, 2, 4, and 5 have the most primary taxiway pavements in acceptable or better condition.

Table 7-15. Airports Primary Taxiway PCI

FDOT District	Number of System Airports in District	Acceptable PCI (70 to 100)	Major Rehabilitation Due (Under 70)	No Data	No Pavement
1	21	14	6	0	1
2	16	10	5	0	1
3	15	8	6	0	1
4	15	13	1	1	0
5	21	12	5	1	3
6	7	4	3	0	0
7	11	9	2	0	0
Total	**106**	**70**	**28**	**2**	**6**

Note: For airports giving a range of PCI values, the lowest value was used to present a conservative analysis.
Source: FASP 2043 Airport Survey and AVCON

Figure 7-18. Airports Primary Taxiway PCI



Note: For airports giving a range of PCI values, the lowest value was used to present a conservative analysis.
Source: FASP 2043 Airport Survey and AVCON

7.4.3 Airport Instrument Approach Procedures

The FDOT AO established performance measures to benchmark categories of instrument approach procedures (IAP) at system airports based on the best IAP found at each airport. Weather conditions can limit flight visibility, restricting pilots to using airports that have adequate IAPs. The FDOT AO is collecting this data for use in determining what the desired IAPs are for each airport and its development to meet current and future user demand. These performance measures track airports with a precision, non-precision or better, and no straight-in IAPs.

In the world of instrument flying, pilots favor precision IAPs because they provide both lateral and vertical guidance on a straight-in approach to a specific runway end. These IAPs include instrument landing systems (ILS) and global positioning system (GPS) approaches with vertical guidance (APV). The next step down from a precision IAP is a non-precision IAP that only provides lateral guidance to a runway end. The least favored IAP is a circling IAP because it does not provide guidance to a specific runway end. Instead, it guides the pilot to the airport environment where the pilot is expected to circle the airfield and align with a chosen runway end, all while avoiding obstructions and maintaining visual contact with the airfield in what are typically poor weather conditions. **Table 7-16** and **Figure 7-19** provide the reference data for the following sections.

The data in **Table 7-16** indicate a solid majority of Florida airports (82 percent) have a non-precision approach or better IAP to at least one runway end. This represents a strong level of service for a broad range of users. In five districts (Districts 1, 2, 4, 6, and 7), 80 percent of the airports or more have non-precision or better IAPs. All of the airports in District 6 have non-precision or better IAPs, with three airports having ILS approaches and four having GPS approaches with vertical guidance. Data also indicate (**Table 7-16**) that over two-thirds (about 69 percent) of Florida airports have a precision IAP to at least one runway end. Of those airports, about 42 percent have ILS approaches, and the rest have APV approaches.

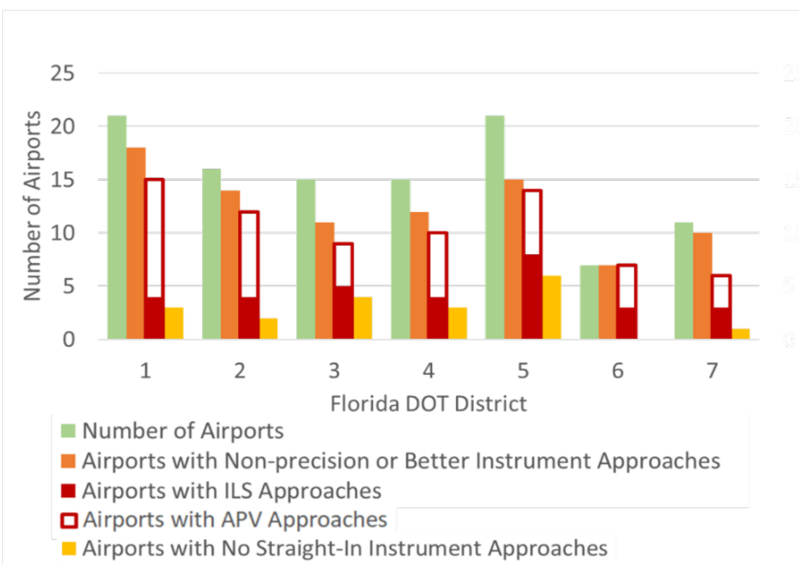
Less than 20 percent of Florida airports (19 airports) have no straight-in instrument approaches. These airports either have no IAPs, or their only IAP consists of a circling approach that does not guide the pilot to a specific runway end. **Figure 7-19** depicts this information graphically. It combines the number of ILS approaches with the number of APV approaches to show the number of airports with precision approaches.

Table 7-16. System Airports with Non-Precision or Better Instrument Approaches

FDOT District	Number (#) of System Airports in District	# of Airports w/Non-precision or Better IAPs	# of Airports w/Precision IAPs	# of Airports w/ILS Approaches	# of Airports w/APV Approaches	# of Airports w/ No Straight In IAPs
1	21	18	15	4	11	3
2	16	14	12	4	8	2
3	15	11	9	5	4	4
4	15	12	10	4	6	3
5	21	15	14	8	6	6
6	7	7	7	3	4	0
7	11	10	6	3	3	1
Total	**106**	**87**	**73**	**31**	**42**	**19**

Source: FAA Chart Supplement Southeast U.S. 10 AUG 2023 to 5 OCT 2023

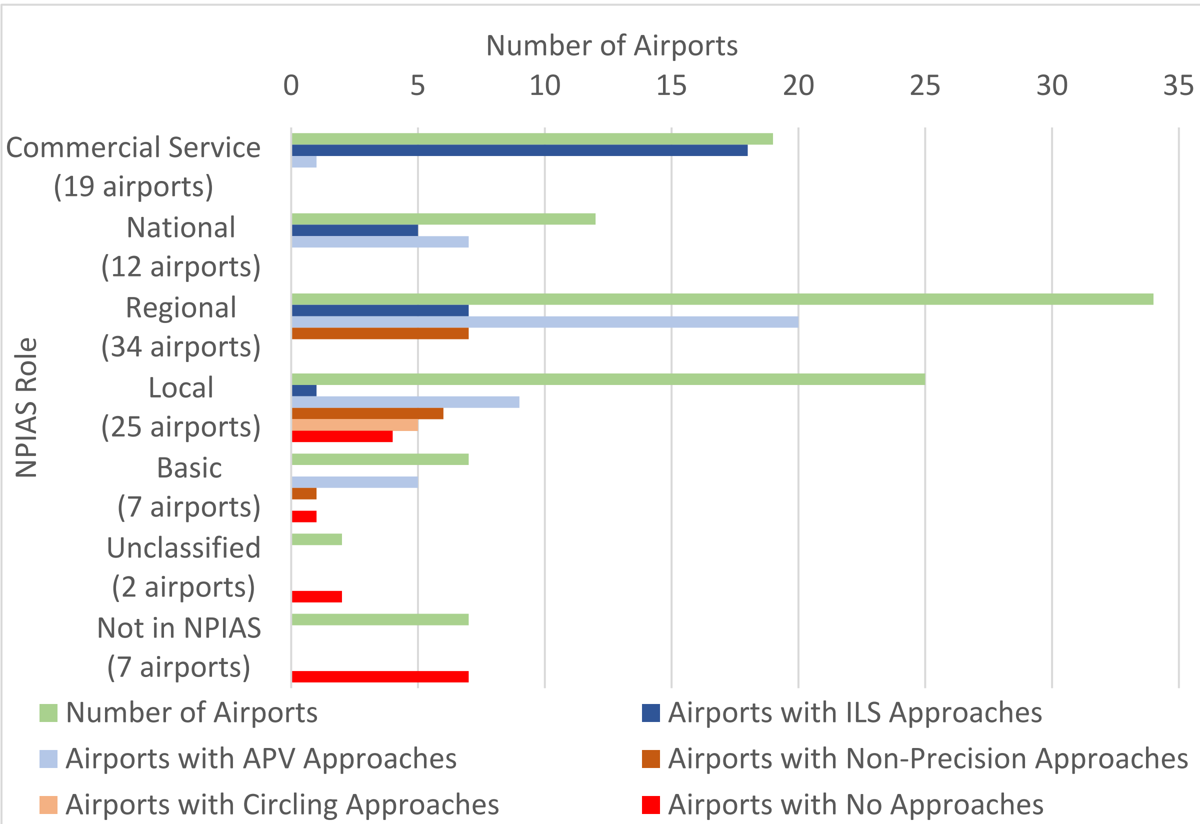
Figure 7-19. System Airports with Non-Precision or Better Instrument Approaches



Source: FAA Chart Supplement Southeast U.S. 10 AUG 2023 to 5 OCT 2023

Figure 7-20 displays the types of instrument approach procedures at Florida's system airports grouped by NPIAS role. Nearly every Commercial Service Airport has an ILS, the exception being Key West International Airport (EYW). National and Regional Airports also have a significant number of ILS approaches, complemented with even larger numbers of APV approaches. The Unclassified Airports and those not in the NPIAS do not have any instrument approaches.

Figure 7-20. Instrument Approach Procedures at System Airports by NPIAS Role



Source: FAA Chart Supplement Southeast U.S. 10 AUG 2023 to 5 OCT 2023

7.4.4 Airport Fueling

Continuing concerns about climate change and commitments to addressing it are leading to the adoption of sustainable aviation fuel (SAF) being used to power aircraft, although implementation is taking time relative to SAF availability. The FDOT AO established performance measures to see the types of fuel as well as the methods of delivery available at its system airports.

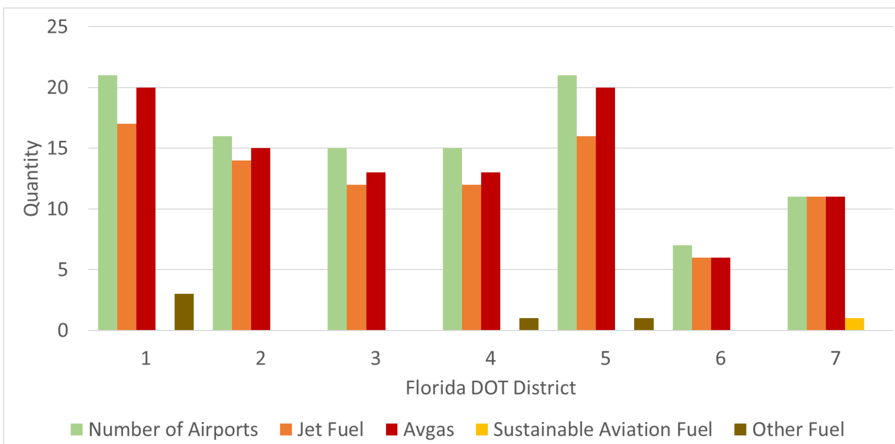
Table 7-17 and **Figure 7-21** show that 83 percent of Florida airports have jet fuel available, and 92 percent have avgas available. Districts 1 and 5 have the highest number of airports with these two types of fuel available. Proportionally, Districts 6 and 7 have the most airports with either of these types of fuel available. Only one airport in District 7 offers SAF, and a total of five airports (in Districts 1, 4, and 5) offer other fuel, which includes mogas and Swift 94UL fuel.

Table 7-17. Types of Fuel Available at District Airports

FDOT District	Number of System Airports in District	Jet Fuel	Avgas	Sustainable Aviation Fuel	Other Fuel
1	21	17	20	0	3
2	16	14	15	0	0
3	15	12	13	0	0
4	15	12	13	0	1
5	21	16	20	0	1
6	7	6	6	0	0
7	11	11	11	1	0
Total	**106**	**88**	**98**	**1**	**5**

Source: FASP 2043 Airport Survey

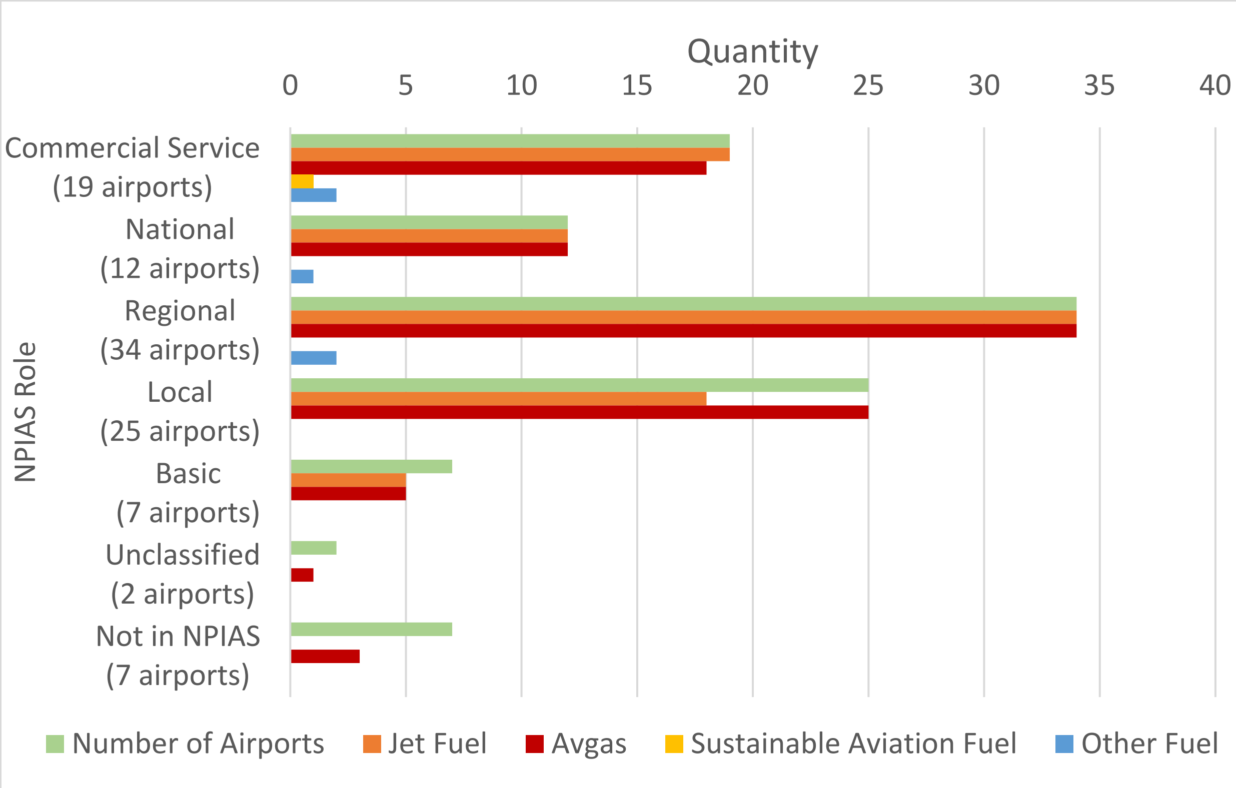
Figure 7-21. Types of Fuel Available at District Airports



Source: FASP 2043 Airport Survey

When assessed by NPIAS role, as shown in **Figure 7-22**, nearly every Commercial Service, National, and Regional Airport provide both jet fuel and avgas. The exception is Eglin Air Force Base/Destin-Ft Walton Beach Airport (VPS), which does not provide avgas. Every Local Airport provides avgas, and approximately three-quarters supply jet fuel. Five out of the seven Basic Airports provide both jet fuel and avgas, while half of the Unclassified Airports (one out of two), and three of the seven airports not in the NPIAS provide avgas.

Figure 7-22. Types of Fuel Available at System Airports by NPIAS Role



Source: FASP 2043 Airport Survey

As data in **Table 7-18** and **Figure 7-23** indicate, 48 percent of system airports offer full-service delivery for jet fuel, while 26 percent offer self-service and 71 percent provide jet fuel service with trucks.

Table 7-18. Jet Fuel Delivery Options at District Airports

FDOT District	Number of System Airports in District	Full Service	Self Service	Fuel Truck
1	21	12	9	14
2	16	5	5	12
3	15	7	5	10
4	15	10	1	11
5	21	10	5	13
6	7	5	2	4
7	11	2	1	11
Total	**106**	**51**	**28**	**75**

Source: FASP 2043 Airport Survey

Figure 7-23. Jet Fuel Delivery Options at District Airports

Source: FASP 2043 Airport Survey

For avgas, 67 percent of airports in Florida offer full service, with a slightly lower 64 percent providing self-service delivery and an also slightly lower 61 percent delivering avgas by fuel truck (**Table 7-19** and **Figure 7-24**).

Table 7-19. Avgas Fuel Delivery at District Airports

FDOT District	Number of System Airports in District	Full Service	Self Service	Fuel Truck
1	21	18	19	12
2	16	11	12	8
3	15	8	8	7
4	15	12	6	11
5	21	14	14	13
6	7	4	4	4
7	11	4	5	10
Total	**106**	**71**	**68**	**65**

Source: FASP 2043 Airport Survey

Figure 7-24. Avgas Fuel Delivery at District Airports

Source: FASP 2043 Airport Survey

Not surprisingly, with only a single airport having SAF available, numbers related to fuel delivery are low. No airports offer full service or fuel truck delivery, and the airport that offers SAF provides it as a self-service amenity (**Table 7-20** and **Figure 7-25**).

Table 7-20. Sustainable Aviation Fuel Delivery at District Airports

FDOT District	Number of Airports	Full Service	Self Service	Fuel Truck
1	21	0	0	0
2	16	0	0	0
3	15	0	0	0
4	15	0	0	0
5	21	0	0	0
6	7	0	0	0
7	11	0	1	0
Total	**106**	**0**	**1**	**0**

Source: FASP 2043 Airport Survey

Figure 7-25. Sustainable Aviation Fuel Delivery at District Airports

Source: FASP 2043 Airport Survey

Table 7-21 and **Figure 7-26** show that the five airports providing other types of fuel offer both full-service and fuel truck delivery, but only two of the five airports offer self-service for other types of fuel.

Table 7-21. Other Fuel Delivery at District Airports

FDOT District	Number of System Airports in District	Full Service	Self Service	Fuel Truck
1	21	2	1	3
2	16	1	0	0
3	15	0	0	0
4	15	2	0	1
5	21	0	1	1
6	7	0	0	0
7	11	0	0	0
Total	**106**	**5**	**2**	**5**

Source: FASP 2043 Airport Survey

Figure 7-26. Other Fuel Delivery at District Airports

Source: FASP 2043 Airport Survey

7.4.5 Broadband Access

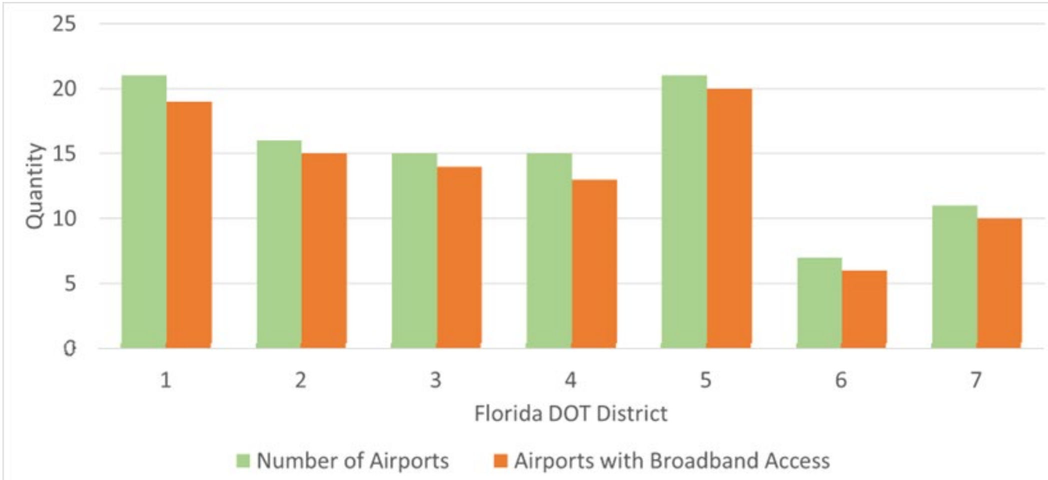
Access to the internet is a given in our society today. As a result, the FDOT AO established a performance measure to determine how many airports in the system have broadband access available for pilots and passengers to use the internet while at the airport. As **Table 7-22** and **Figure 7-27** show, approximately 92 percent of Florida's airports have broadband access. Districts 2, 3, 5, 6, and 7 all only have one airport remaining without broadband access, and Districts 1 and 4 have two left that do not have it yet.

Table 7-22. District Airports with Broadband Access

FDOT District	Number of System Airports in District	Airports with Broadband Access
1	21	19
2	16	15
3	15	14
4	15	13
5	21	20
6	7	6
7	11	10
Total	**106**	**97**

Source: FASP 2043 Airport Survey

Figure 7-27. District Airports with Broadband Access



Source: FASP 2043 Airport Survey

7.4.6 Backup Power for Terminals, Airfield Lighting, and Fueling

The greatest imperative at airports is universal – protect against operational disruptions. One factor that can critically affect an airport's ability to continue operations without interruption is having a constant power supply. One event that can threaten successful continuous power is a power outage for any reason. As a result, the FDOT AO established a performance measure to track the number of airports systemwide with a backup power source for the terminal, airfield lighting, and fueling operations.

Table 7-23 and **Figure 7-28** contain the data for system airports with backup power sources for the airport facilities essential to continuing operations. More than half of Florida airports (about 56 percent) have a backup power source for their terminal. That number increases to close to two-thirds (67 percent) when it comes to backup power for the airfield lighting. The number drops lower than half of airports systemwide (about 45 percent) for backup power for fueling.

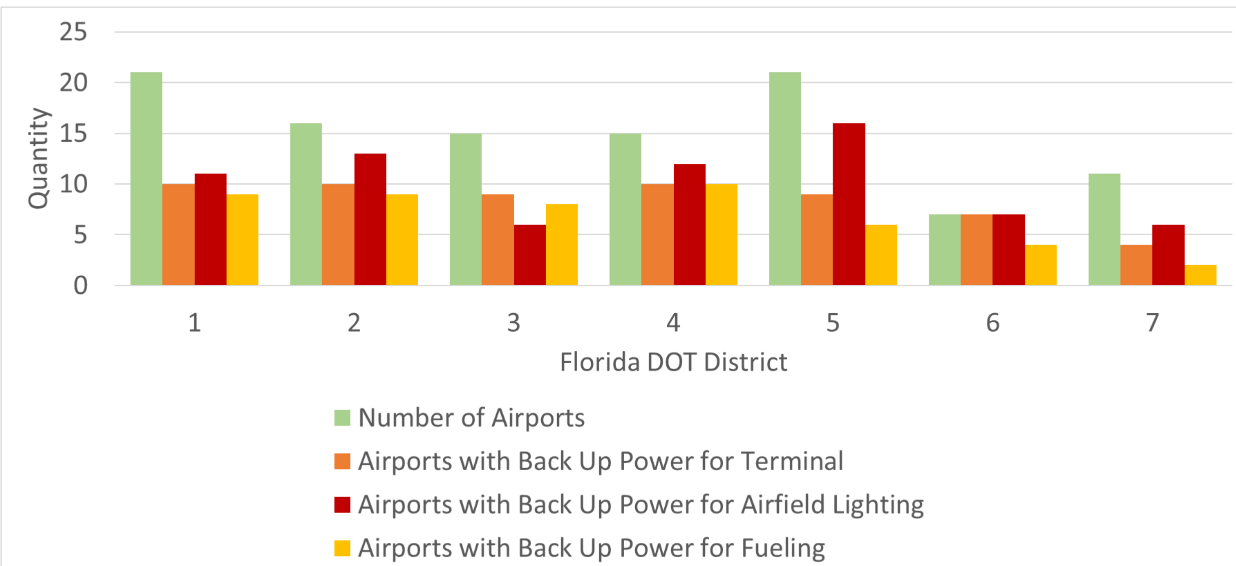
From a district standpoint, District 6 has backup power for the terminals as well as airfield lighting at every airport in the district, and backup power for fueling at over half of the airports (four airports). Another trend is that the majority of the airports in the districts have a higher number of airports with backup power for fueling than for terminal operations. Districts 1, 2, and 4 have the highest number of airports overall with backup power for the terminal, and Districts 2, 4, and 5 have the highest number of airports overall with backup power for airfield lighting. For fueling, Districts 1 through 4 have the highest number of airports overall with backup power.

Table 7-23. Airports with Backup Power for Terminals, Airfield Lighting, and Fueling

FDOT District	Number of System Airports in District	Airports with Backup Power for Terminal	Airports with Backup Power for Airfield Lighting	Airports with Backup Power for Fueling
1	21	10	11	9
2	16	10	13	9
3	15	9	6	8
4	15	10	12	10
5	21	9	16	6
6	7	7	7	4
7	11	4	6	2
Total	**106**	**59**	**71**	**48**

Source: FASP 2043 Airport Survey

Figure 7-28. Airports with Back Up Power for Terminals, Airfield Lighting, and Fueling



Source: FASP 2043 Airport Survey

7.4.7 Airports That Provide Alternative Weather Reporting

Airports equipped with alternative weather reporting offer users the advantage of understanding weather conditions in the event that the existing weather reporting system experiences some type of failure. In that event, the alternative method allows pilots to know what the conditions are as they are landing and taking off. As **Table 7-24** and **Figure 7-29** show, approximately 22 percent of Florida's airports have an alternative weather reporting system. District 1 has the most at 6, just under a third of its district airports. District 4 only has 1, and District 6 has no alternative weather reporting system.

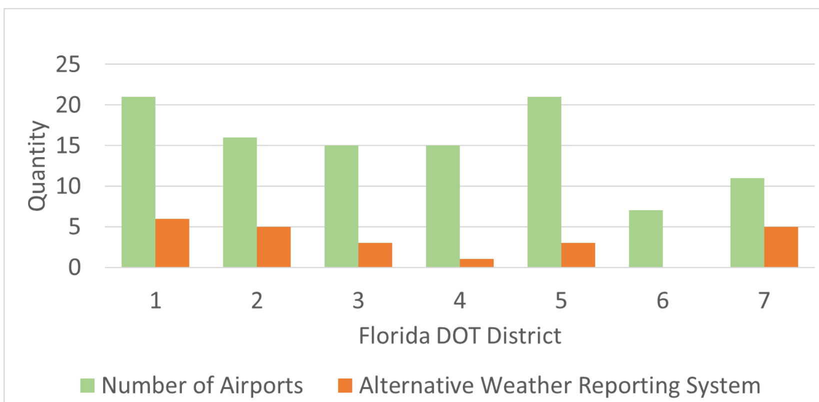
The FDOT AO designated automated weather reporting as one of four topics that were of particular importance to Florida airports. A more in-depth analysis of weather reporting was completed during Phase 2 with the results found in **Chapter 8 – Aviation Office Initiatives**.

Table 7-24. Airports with Alternative Weather Reporting Systems

FDOT District	Number of System Airports in District	Alternative Weather Reporting System
1	21	6
2	16	5
3	15	3
4	15	1
5	21	3
6	7	0
7	11	5
Total	**106**	**23**

Source: FASP 2043 Airport Survey

Figure 7-29. Airports with Alternative Weather Reporting Systems



Source: FASP 2043 Airport Survey

7.5 Planning and Administration Metrics

The metrics examining the planning and administration efforts of Florida's airports assessed how up to date airports kept various plans, studies, and regulations. In each case, the analysis focused on airports grouped by NPIAS role.

7.5.1 Airports Master Plans, Airport Layout Plans (ALPs), and Property Maps

Master planning projects enable airports to review the current conditions in light of goals and objectives for maintenance, growth and future development over the long term. During a master plan, an airport can conduct additional studies that contribute to the safety of the airfield, its users, and the community and to focus on sustainable development. Common planning efforts that fall under the master plan umbrella include airport layout plans (ALPs) and property maps. The FDOT AO established performance measures to determine what plans have been developed and the period of time they cover, as well as the status of Chapter 333 airport zoning. The FDOT AO also established a benchmark of 80 percent of airports having plans or studies that are no older than 10 years.

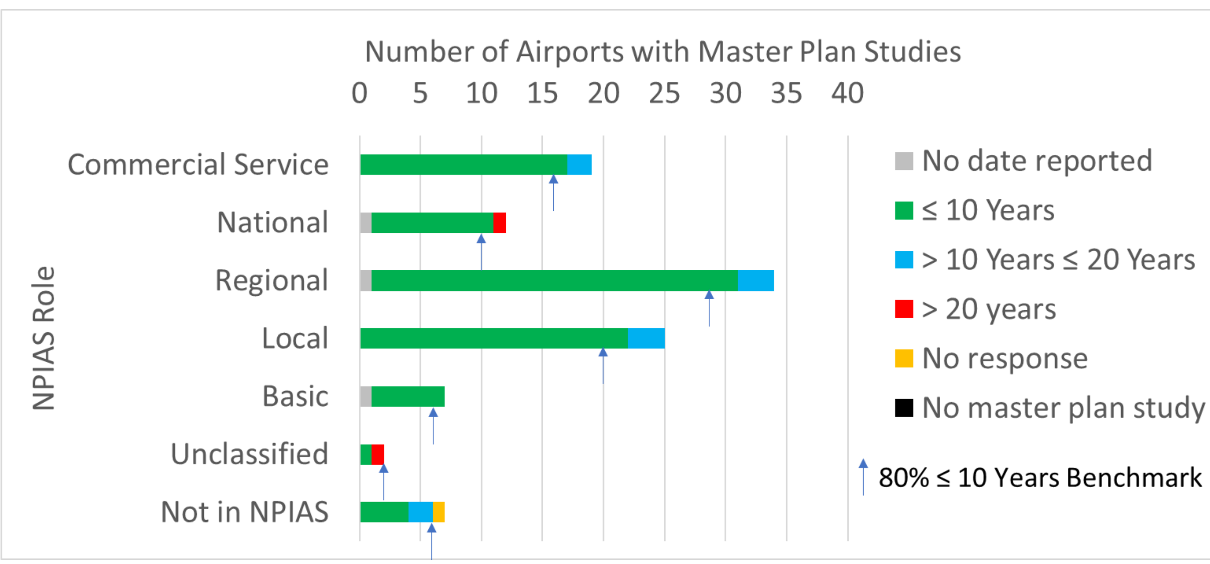
Table 7-25 and **Figure 7-30** break down how many airports have master plans updated within the past 10 years, 20 years, more than 20 years, or did not report the date of the master plan. The table and figure also show airports that do not have master plans or did not respond to the survey question. No Florida airport reported not having a master plan, and the majority of airports indicated their master plans are less than 10 years old.

Table 7-25. Airports with Updated Master Plans

Reporting Data	Commercial Service	National	Regional	Local	Basic	Unclassified	Not in NPIAS
Number of System Airports	19	12	34	25	7	2	7
No date reported	0	1	1	0	1	0	0
≤ 10 Years	17	10	30	22	6	1	4
> 10 Years ≤ 20 Years	2	0	3	3	0	0	2
> 20 years	0	1	0	0	0	1	0
No response	0	0	0	0	0	0	1
No master plan study	0	0	0	0	0	0	0

Source: FASP 2043 Airport Survey

Figure 7-30. Airports with Updated Master Plans



Source: FASP 2043 Airport Survey

Figure 7-30 also denotes the 80 percent mark with an arrow for each NPIAS role based on the number of airports in each group (rounded up). Other than the Unclassified Airports and those airports not in the NPIAS, every group of airports meets the 80 percent benchmark.

ALPs are a fundamental part of a master plan as they document visually what is currently in place at airports and what development is planned over the period of the master plan. Planned projects cannot receive federal grant funding without the FAA reviewing and approving the ALP. When master plans cover a longer period of time, often the ALP may have gone through one or more pen-and-ink updates to document improvements over time. The number of airports with ALPs updated within the past 10 years, 20 years, more than 20 years, or that did not report the date of the ALP were also evaluated. The FDOT AO established a benchmark of 80 percent of airports having an ALP that is no older than 10 years.

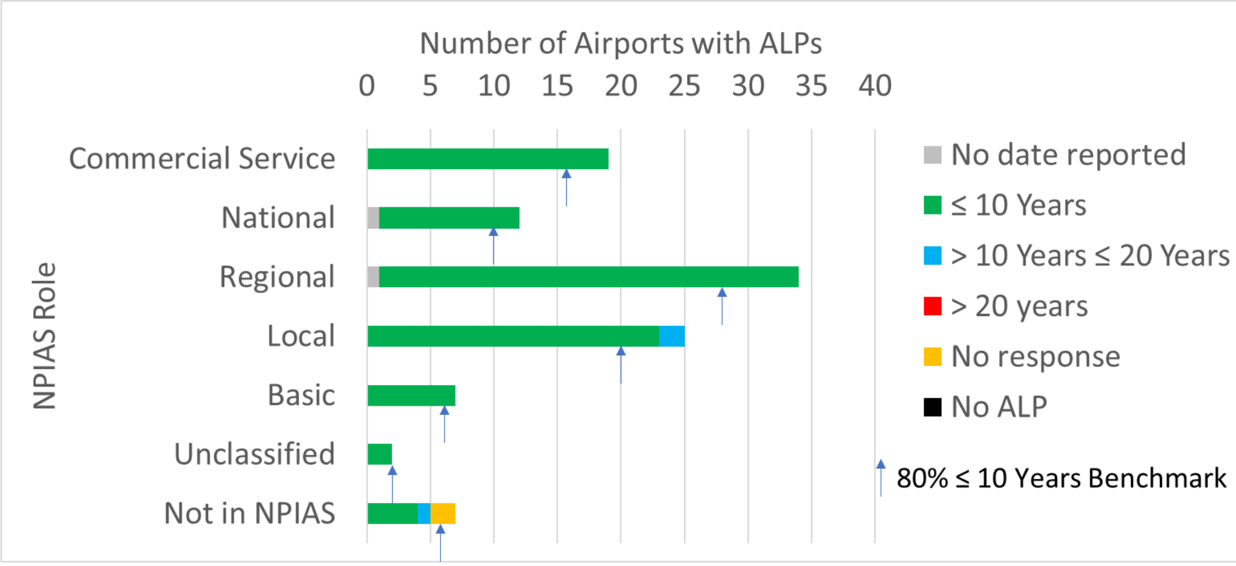
As **Table 7-26** and **Figure 7-31** show, the overwhelming majority of Florida system airports have an ALP that has been updated within the past 10 years. Every group of airports meets the 80 percent benchmark with the exception of those airports not in the NPIAS, as indicated by the arrows in **Figure 39**.

Table 7-26. Airports with Updated Airport Layout Plans (ALPs)

Reporting Data	Commercial Service	National	Regional	Local	Basic	Unclassified	Not in NPIAS
Number of System Airports	19	12	34	25	7	2	7
No date reported	0	1	1	0	0	0	0
≤ 10 Years	19	11	33	23	7	2	4
> 10 Years ≤ 20 Years	0	0	0	2	0	0	1
> 20 years	0	0	0	0	0	0	0
No response	0	0	0	0	0	0	2
No ALP	0	0	0	0	0	0	0

Source: FASP 2043 Airport Survey

Figure 7-31. Airports with Updated Airport Layout Plans (ALPs)



Source: FASP 2043 Airport Survey

Among other things, updated property maps support airport efforts to determine best use for airport property (aeronautical vs. non-aeronautical), see opportunities for development that is revenue-generating, and support efforts to proactively manage potential hazards in the form of obstructions. The FDOT AO established performance measures for the number of airports with an updated property map within the last 5, 10 or 20 years.

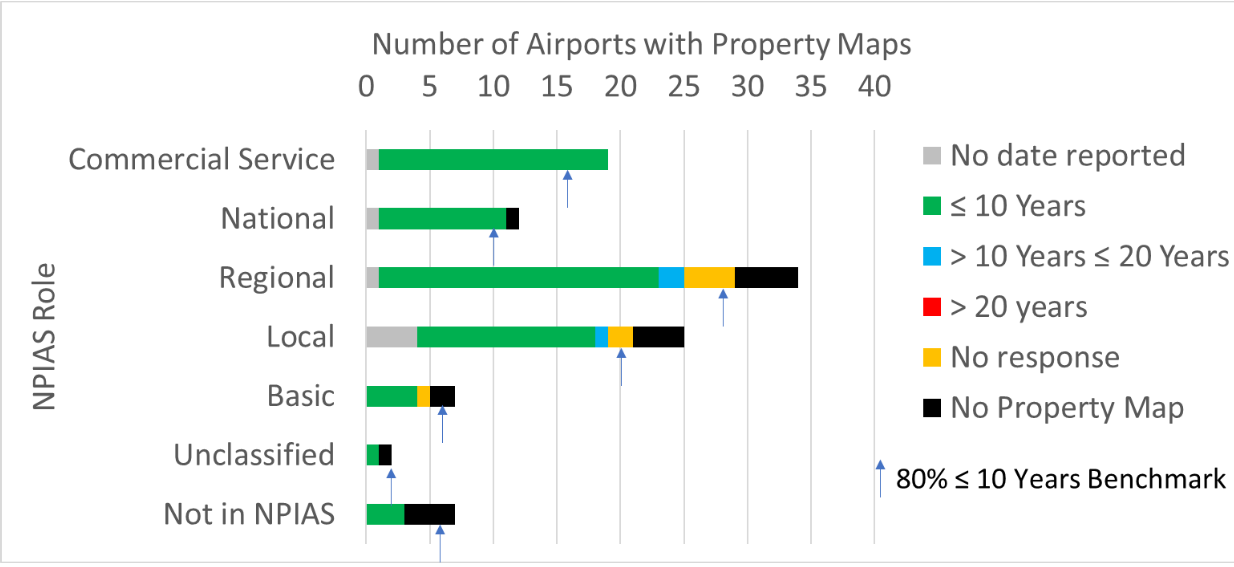
Table 7-27 and **Figure 7-32** show that, compared to master plans and ALPs, fewer Florida system airports have up-to-date property maps. With the exception of Commercial Service Airports, at least one airport in each NPIAS role lacks a property map. Furthermore, only Commercial Service and National Airports meet the benchmark of a property map updated within the last 10 years.

Table 7-27. Airports with an Updated Property Map

Reporting Data	Commercial Service	National	Regional	Local	Basic	Unclassified	Not in NPIAS
Number of System Airports	19	12	34	25	7	2	7
No date reported	1	1	1	4	0	0	0
≤ 10 Years	18	10	22	14	4	1	3
> 10 Years ≤ 20 Years	0	0	2	1	0	0	0
> 20 years	0	0	0	0	0	0	0
No response	0	0	4	2	1	0	0
No Property Map	0	1	5	4	2	1	4

Source: FASP 2043 Airport Survey

Figure 7-32. Airports with an Updated Property Map



Source: FASP 2043 Airport Survey

7.5.2 Airport Stormwater Management Plans (SWMP)

Another FDOT AO performance measure was airports that have SWMPs. The FDOT AO designated stormwater management as one of four topics that were of particular importance to Florida airports. A more in-depth analysis of airport SWMPs was completed during Phase 2, with the results found in **Chapter 8 – Aviation Office Initiatives**.

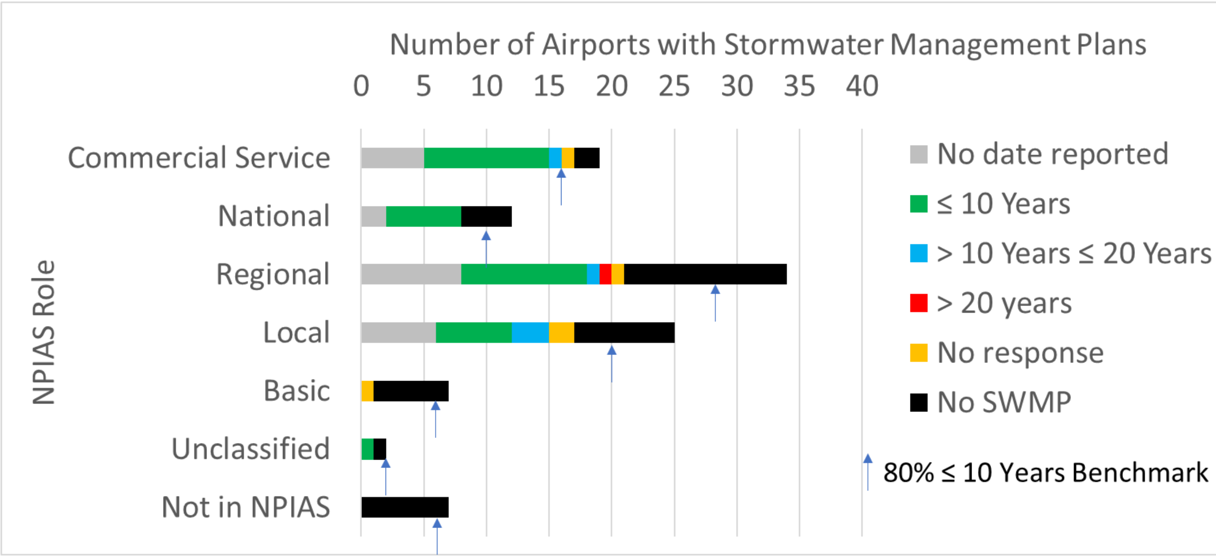
Table 7-28 and **Figure 7-33** show that overall, more than half of Florida airports (54 percent) have a SWMP. None of the NPIAS categories of airports meet the 80 percent benchmark for SWMP that have been updated within the past 10 years.

Table 7-28. Airports with Updated Stormwater Management Plans

Reporting Data	Commercial Service	National	Regional	Local	Basic	Unclassified	Not in NPIAS
Number of System Airports	19	12	34	25	7	2	7
No date reported	5	2	8	6	0	0	0
≤ 10 Years	10	6	10	6	0	1	0
> 10 Years ≤ 20 Years	1	0	1	3	0	0	0
> 20 years	0	0	1	0	0	0	0
No response	1	0	1	2	1	0	0
No SWMP	2	4	13	8	6	1	7

Source: FASP 2043 Airport Survey

Figure 7-33. Airports with Updated Stormwater Management Plans



Source: FASP 2043 Airport Survey

7.5.3 Airport Minimum Standards

Airports that accept federal grants become federally obligated and must uphold grant assurances. Minimum standards provide a safeguard to prevent violations of federal obligations, and routine updates uphold the requirements of the grant assurances. As a result, the FDOT AO established performance indicators to track how many system airports have current minimum standards that have been updated with a benchmark of having 80 percent of airports update their minimum standard within the past 10 years.

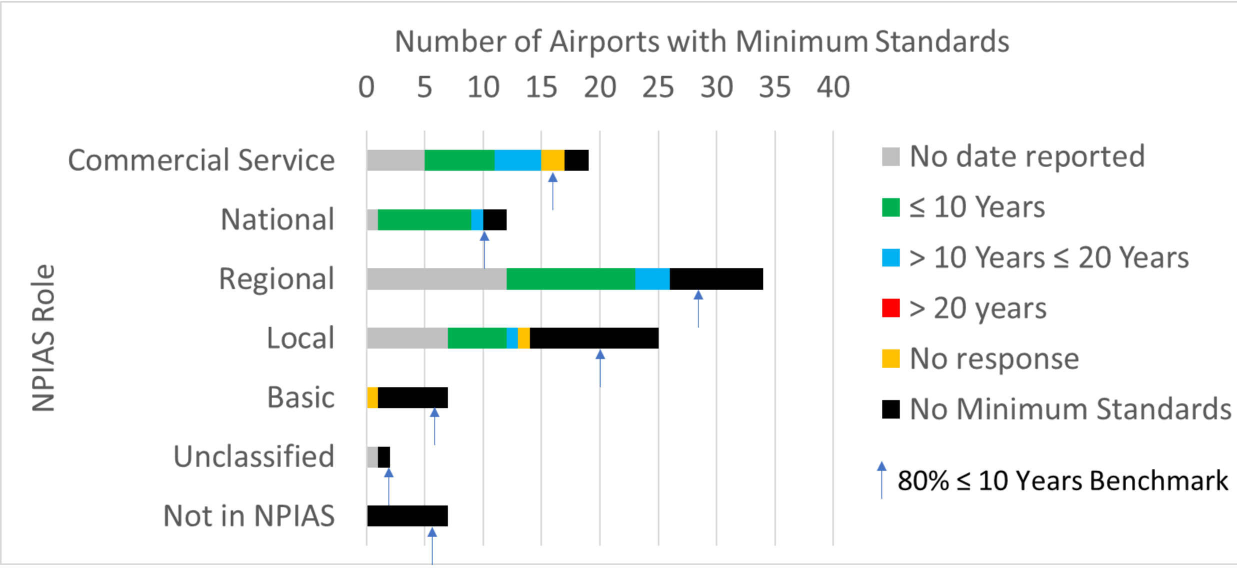
Table 7-29 and **Figure 7-34** show that 37 airports reported a lack of minimum standards, with at least one airport in every NPIAS role indicating no minimum standards. As demonstrated in **Figure 7-35**, none of the airport roles met the benchmark of 80 percent of airports having minimum standards updated in the past 10 years.

Table 7-29. Airports with Updated Minimum Standards

Reporting Data	Commercial Service	National	Regional	Local	Basic	Unclassified	Not in NPIAS
Number of System Airports	19	12	34	25	7	2	7
No date reported	5	1	12	7	0	1	0
≤ 10 Years	6	8	11	5	0	0	0
> 10 Years ≤ 20 Years	4	1	3	1	0	0	0
> 20 years	0	0	0	0	0	0	0
No response	2	0	0	1	1	0	0
No Minimum Standards	2	2	8	11	6	1	7

Source: FASP 2043 Airport Survey

Figure 7-34. Airports with Updated Minimum Standards



Source: FASP 2043 Airport Survey

7.5.4 Airport Rules and Regulations

Airports frequently establish rules and regulations to govern the safe and efficient operation of the airport. Periodic updates to these rules and regulations are necessary to reflect changes in legislation and technology.

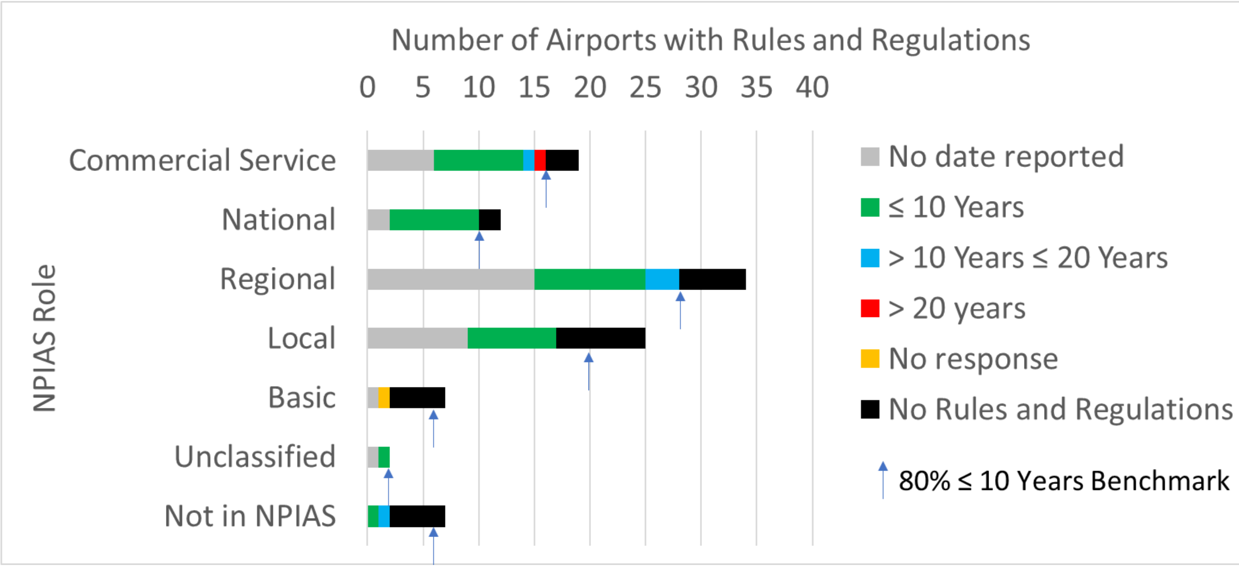
As **Table 7-30** and **Figure 7-35** show, a majority of Florida system airports reported having updated rules and regulations. However, 29 airports reported not having any rules and regulations, which means that less than 80 percent of Florida's system airports meet the benchmark of having rules and regulations that have been updated within the past 10 years.

Table 7-30. Airports with Updated Rules and Regulations

Reporting Data	Commercial Service	National	Regional	Local	Basic	Unclassified	Not in NPIAS
Number of System Airports	19	12	34	25	7	2	7
No date reported	6	2	15	9	1	1	0
≤ 10 Years	8	8	10	8	0	1	1
> 10 Years ≤ 20 Years	1	0	3	0	0	0	1
> 20 years	1	0	0	0	0	0	0
No response	0	0	0	0	1	0	0
No Rules and Regulations	3	2	6	8	5	0	5

Source: FASP 2043 Airport Survey

Figure 7-35. Airports with Updated Rules and Regulations



Source: FASP 2043 Airport Survey

7.5.5 Disadvantaged Business Enterprise (DBE) Plans

Working with DBEs yields benefits for airports and for the DBEs. The biggest benefits are diverse perspectives and contributions as well as the opportunity to support growing businesses as they help to improve airports by applying their expertise. These relationships build a pipeline of collaboration that helps lay the groundwork for stronger businesses, operations, and additional opportunities for future small businesses to gain experience and grow themselves. With a commitment to supporting these businesses and gaining such benefits in return, The FDOT AO established performance indicators to track airports within the system that have had a DBE plan updated recently.

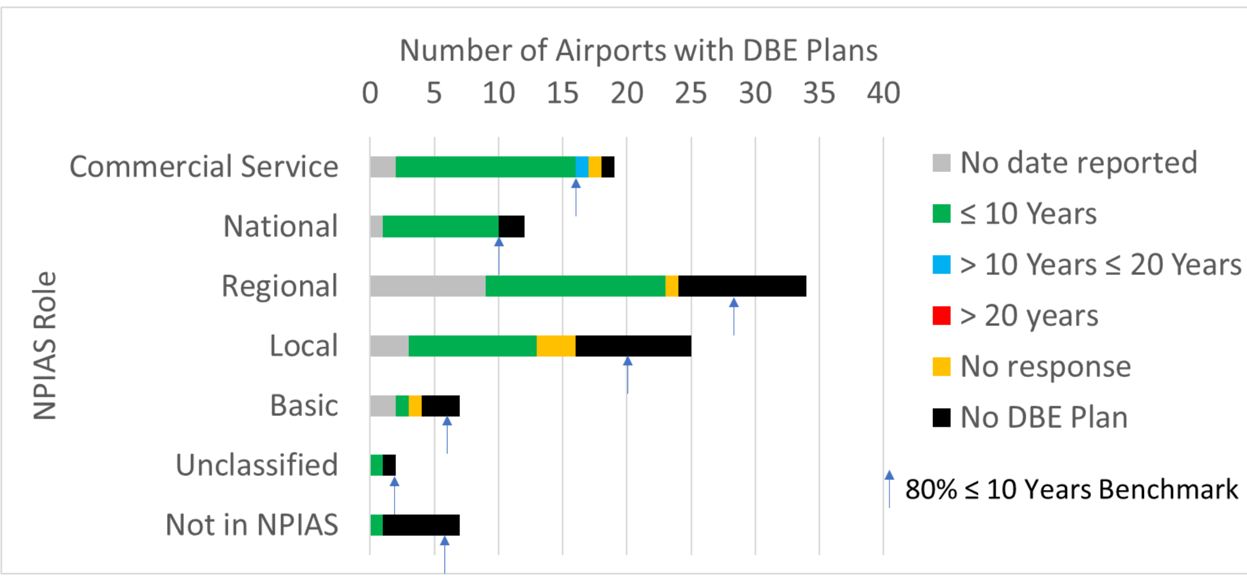
As **Table 7-31** shows, DBE plans are common among the Commercial Service and larger general aviation airports. Both the Commercial Service and National Airport roles meet the 80 percent benchmark of having updated a DBE plan within the last 10 years. DBE plans are not as prevalent among smaller general aviation airports, but those that do have them generally update them within 10 years, as indicated in **Figure 7-36**.

Table 7-31. Airports with Updated DBE Plan

Reporting Data	Commercial Service	National	Regional	Local	Basic	Unclassified	Not in NPIAS
Number of System Airports	19	12	34	25	7	2	7
No date reported	2	1	9	3	2	0	0
≤ 10 Years	14	9	14	10	1	1	1
> 10 Years ≤ 20 Years	1	0	0	0	0	0	0
> 20 years	0	0	0	0	0	0	0
No response	1	0	1	3	1	0	0
No DBE Plan	1	2	10	9	3	1	6

Source: FASP 2043 Airport Survey

Figure 7-36. Airports with Updated DBE Plan



Source: FASP 2043 Airport Survey

7.5.6 Wildlife Hazard Management Plan (WHMPs)

WHMPs contribute to safe operations by identifying potential hazards to aircraft operations. WHMPs are the tool airports use to manage these potential hazards or mitigate for any that already exist. The FDOT AO established a performance indicator that tracked how many system airports have recently updated their WHMP.

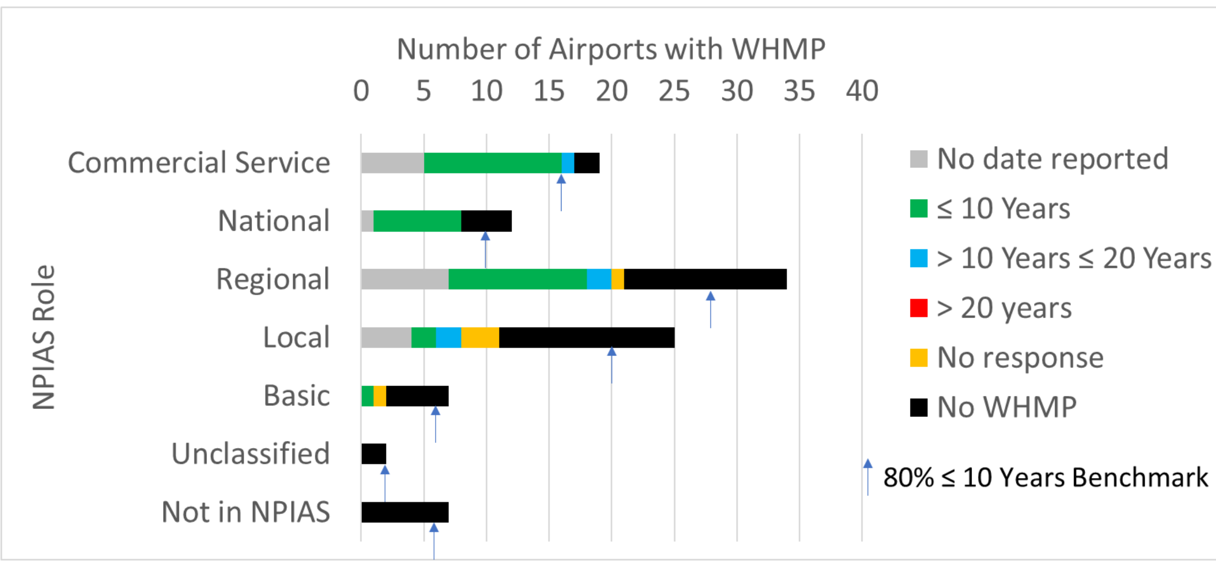
The data in **Table 7-32** and **Figure 7-37** indicates that only 30 percent of system airports (32 airports) have WHMPs updated in the last 10 years. More than 44 percent of Florida system airports (47 airports) lack a WHMP.

Table 7-32. Airports with Updated WHMPs

Reporting Data	Commercial Service	National	Regional	Local	Basic	Unclassified	Not in NPIAS
Number of System Airports	19	12	34	25	7	2	7
No date reported	5	1	7	4	0	0	0
≤ 10 Years	11	7	11	2	1	0	0
> 10 Years ≤ 20 Years	1	0	2	2	0	0	0
> 20 years	0	0	0	0	0	0	0
No response	0	0	1	3	1	0	0
No WHMP	2	4	13	14	5	2	7

Source: FASP 2043 Airport Survey

Figure 7-37. Airports with Updated WHMPs



Source: FASP 2043 Airport Survey

7.5.7 Florida Chapter 333 Airport Zoning

Florida State Statute 333 grants airports the authority to adopt and enforce airport zoning regulations intended to protect airports from encroaching development. The FDOT AO wants to encourage Florida airports to make use of this statute and monitors the use by Florida system airports.

As shown in **Table 7-33** and **Figure 7-38**, not all Florida system airports make use of this zoning statute. More than two dozen airports reported having an airport zoning regulation without indicating when it was last updated, possibly indicating that a considerable amount of time has passed since its last update. Commercial Service, National, and Regional Airports reported the greatest portion of airports with zoning protection, but even these groups had some airports without zoning.

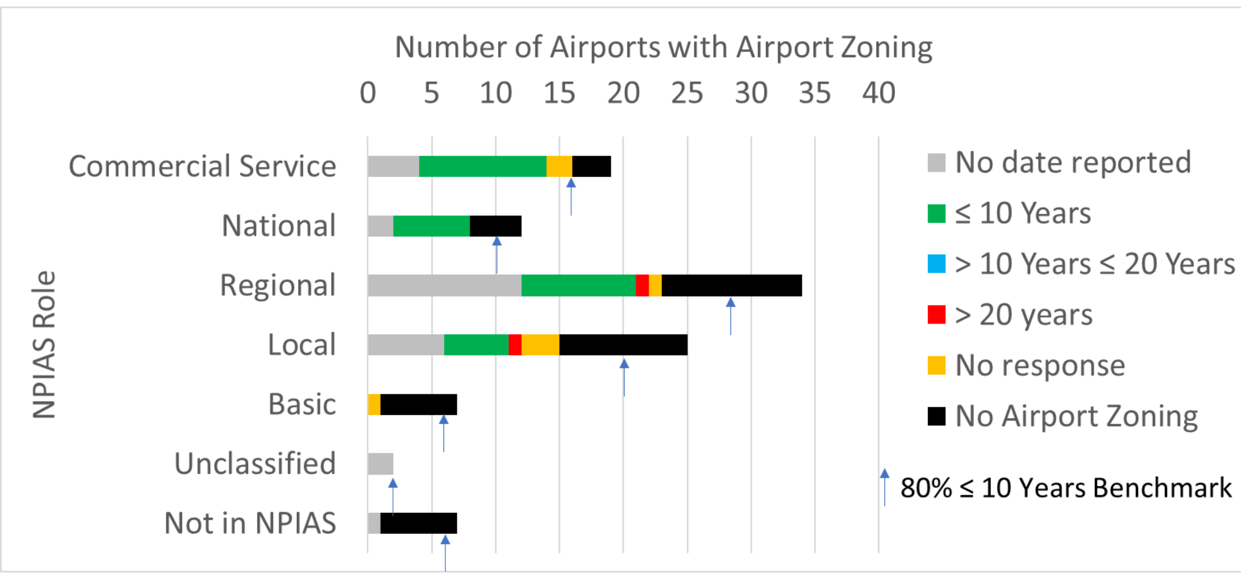
Furthermore, none of the airport groups met the benchmark of having 80 percent of their airports with updated zoning regulations in the past 10 years.

Table 7-33. Airports with Updated Airport Zoning Regulations

Reporting Data	Commercial Service	National	Regional	Local	Basic	Unclassified	Not in NPIAS
Number of System Airports	19	12	34	25	7	2	7
No date reported	4	2	12	6	0	2	1
≤ 10 Years	10	6	9	5	0	0	0
> 10 Years ≤ 20 Years	0	0	0	0	0	0	0
> 20 years	0	0	1	1	0	0	0
No response	2	0	1	3	1	0	0
No Airport Zoning	3	4	11	10	6	0	6

Source: FASP 2043 Airport Survey

Figure 7-38. Airports with Updated Airport Zoning Regulations



Source: FASP 2043 Airport Survey

7.6 Development Metrics

The FDOT AO established several metrics to gauge the opportunity for economic growth and sustainable operations at system airports. The following metrics evaluate these areas by looking at renewable energy sources and development opportunities at system airports.

7.6.1 Airports Using Renewable Energy Sources

The FDOT AO recognizes the role that airports and aviation operations play in impacts to the natural environment as well as opportunities to be a part of the solution by operating in a sustainable manner. As a result, the FDOT AO established two benchmarks related to sustainability: the number of airports using solar infrastructure on their airfield, and the number of airports using geothermal infrastructure on their airfield.

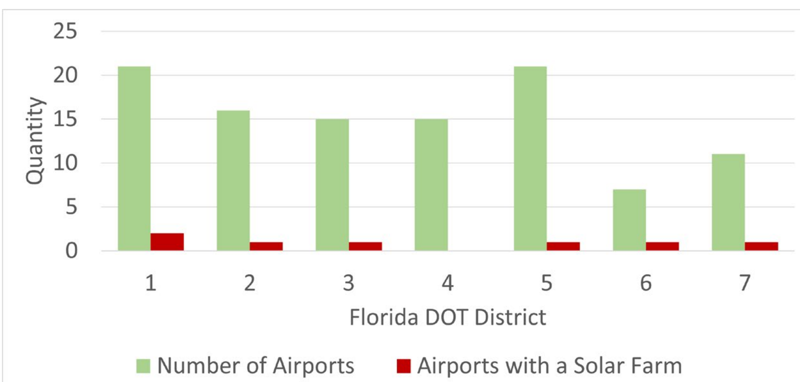
The data in **Table 7-34** indicate opportunities for growth in this area. All districts except for District 4 have at least one sustainable technology on their airfield. Only about 7 percent of Florida's airports report that technology being a solar farm (**Figure 7-39**), and none of Florida's airports report using geothermal infrastructure.

Table 7-34. Survey Data for Airports Utilizing Sustainable Energy

FDOT District	Number of System Airports in District	Airports Using Geothermal Energy Infrastructure	Airports with a Solar Farm
1	21	0	2
2	16	0	1
3	15	0	1
4	15	0	0
5	21	0	1
6	7	0	1
7	11	0	1
Total	**106**	**0**	**7**

Note: Belle Glade State Municipal Airport (X10) and Buchan Airport (X36) did not provide a survey response, so it was assumed neither used sustainable energy.
Source: FASP 2043 Airport Survey

Figure 7-39. Airports With a Solar Farm



Note: Belle Glade State Municipal Airport (X10) and Buchan Airport (X36) did not provide a survey response, so it was assumed neither used sustainable energy .
Source: FASP 2043 Airport Survey

7.6.2 Vehicle Charging Opportunities

With the ever-advancing call for charging capabilities for electric passenger vehicles, aircraft, and ground service equipment, the FDOT AO established a performance measure to track the status of the charging capabilities at its system airports. For each category, the number of airports that have implemented charging stations were recorded along with the number of airports planning to implement charging stations.

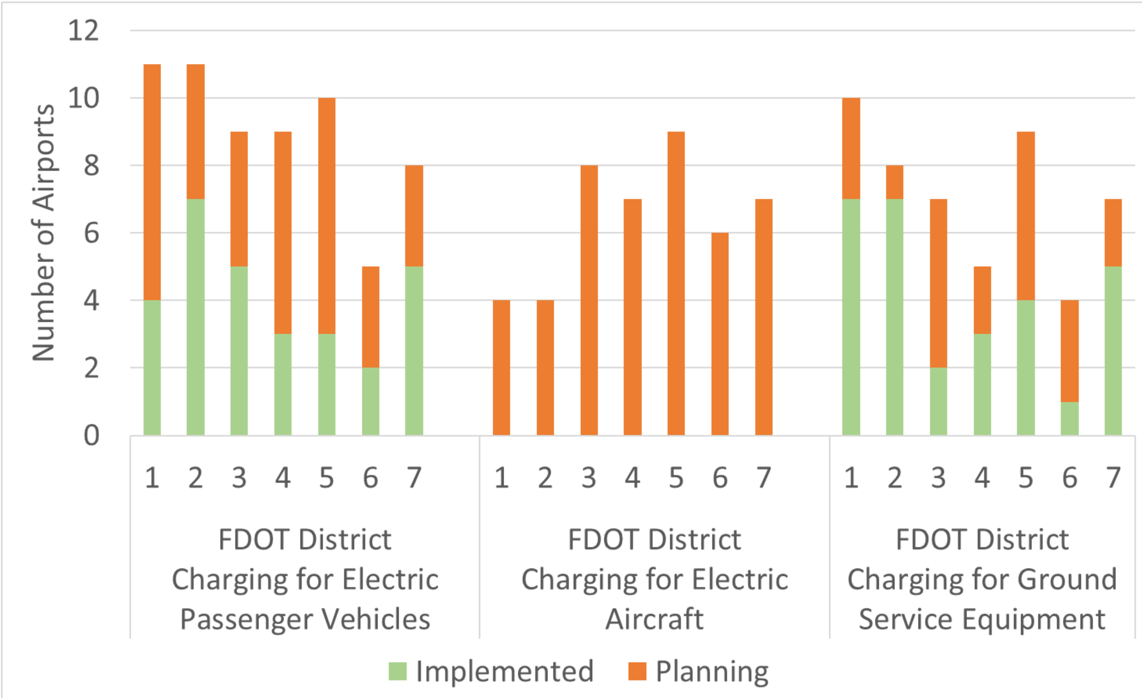
As **Table 7-35** and **Figure 7-40** show, for electric passenger vehicles, District 2 has the highest number of airports with charging stations implemented, and District 7, the lowest number. Districts 1 and 5 have the highest number of airports planning to add charging stations. Districts 2 and 3 have the lowest number with planned implementation in this category. Overall, 27 percent of system airports (29 airports) have already implemented charging stations for passenger vehicles, and 32 percent (34 airports) are planning projects for this.

Table 7-35. Airports with Charging Facilities for Passenger Vehicles, Aircraft, and GSE

FDOT District	Number of System Airports in District	Charging for Electric Passenger Vehicles		Charging for Electric Aircraft		Charging for Electric Ground Service Equipment	
		I*	P*	I*	P*	I*	P*
1	21	4	7	0	4	7	3
2	16	7	4	0	4	7	1
3	15	5	4	0	8	2	5
4	15	3	6	0	7	3	2
5	21	3	7	0	9	4	5
6	7	2	3	0	6	1	3
7	11	5	3	0	7	5	2
Total	**106**	**29**	**34**	**0**	**45**	**29**	**21**

Notes: *I=Implemented; P=Planning;
Source: FASP 2043 Airport Survey

Figure 7-40. Airports with Charging Facilities for Passenger Vehicles, Aircraft, and GSE



Source: FASP 2043 Airport Survey

For charging electric aircraft, no airports in any of the districts have implemented charging stations, but 45 airports system wide have plans to do so. Overall, that translates to slightly over 40 percent (42 percent) of system airports planning to implement charging stations for electric aircraft. District 5 has the highest number of airports (nine) with plans to implement, and Districts 1 and 2, the lowest number (four airports).

For charging electric ground service equipment, 27 percent of airports system wide (29 airports) have implemented charging stations, while approximately 20 percent (21 airports) have plans to do so. Among those who have already implemented, Districts 1 and 2 have the most (seven airports each) with District 6 having the fewest at a single airport. For the airports planning to implement charging stations for GSE, Districts 3 and 5 have the most at five airports each, with District 2 having the least at a single airport.

To better prepare for advancements in electrification, the FDOT AO designated this topic as worthy of additional investigation. Research was conducted on the progress of the development of electric aircraft, funding sources for airport electrification, and potential steps airports could take in preparation for future electric aircraft and vehicles. The findings from that research are in **Chapter 8 – Aviation Office Initiatives**.

7.6.3 Airports Development Sites

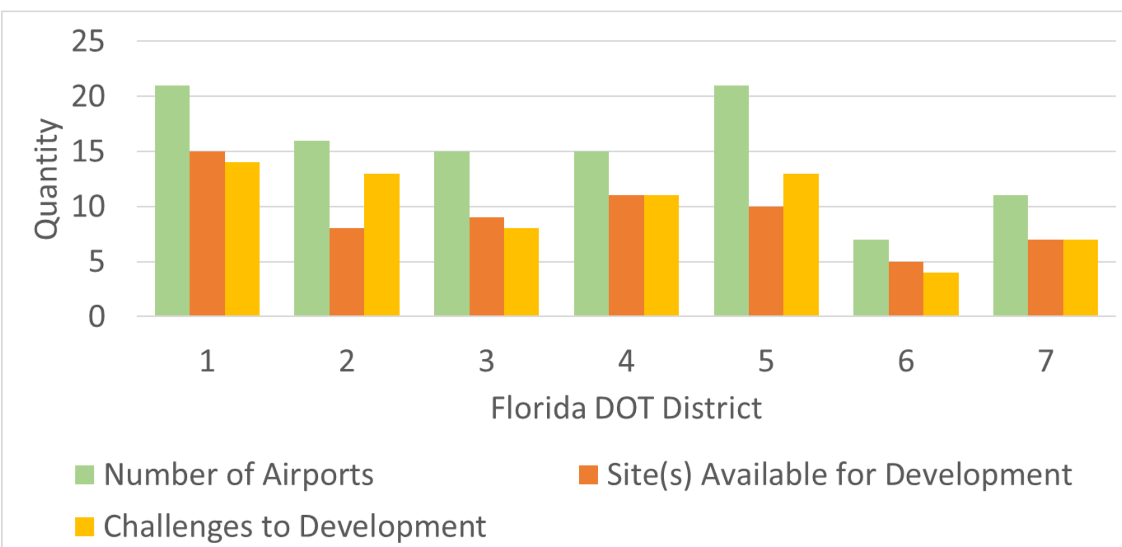
Airports often find themselves in the position of needing development but faced with challenges to planning the needed development. These challenges can be funding, land use, or regulatory, for example, but must be accounted for to proactively plan to accommodate growing demand and for the future of the airports in the system. Among the system's 106 airports, 65 sites are available for development, and notably, the number of challenges to development is 70 (**Table 7-36** and **Figure 7-41**). In other words, some sites have more than one challenge complicating the need for development. This is true for District 2, where eight sites are available with 13 known challenges, and District 5, where 10 sites are available with 13 known challenges. For Districts 1, 3, and 6, the number of sites available exceeds the number of challenges by one. For Districts 4 and 7, the number of sites available is equal to the challenges to their development.

Table 7-36. Airports with Available Sites and Identified Development Challenges

FDOT District	Number of System Airports in District	Site(s) Available for Development	Challenges to Development
1	21	15	14
2	16	8	13
3	15	9	8
4	15	11	11
5	21	10	13
6	7	5	4
7	11	7	7
Total	**106**	**65**	**70**

Source: FASP 2043 Airport Survey

Figure 7-41. Airports with Available Sites and Identified Challenges to Development



Source: FASP 2043 Airport Survey

7.6.4 Airport Inspection Corrective Actions

Annual safety inspections provide the opportunity to discover what areas are deficient, if any, and need correction. This performance measure allows the FDOT AO to track how many airports by district have deficiencies that have yet to be addressed to plan more effectively to address them as well as which deficiencies have carried over more than a single year. Ideally, the oldest deficiencies would be rectified before the newest ones, dependent of course on project priorities, funding available, and local sponsor decisions.

Table 7-37 and **Figure 7-42** show that the number of aging corrective actions still pending from the oldest reports reviewed (211 total corrective actions pending system wide) is greater than, but still close to, the number of new corrective actions needed (200 system wide) that have been identified in the newest report within the series. Those within the middle reports are about three fourths as many (167 corrective actions needed). District 6 has the fewest outstanding corrective actions identified in the oldest report or newest one (four noted in each report), but three times as many identified in the middle (12 noted).

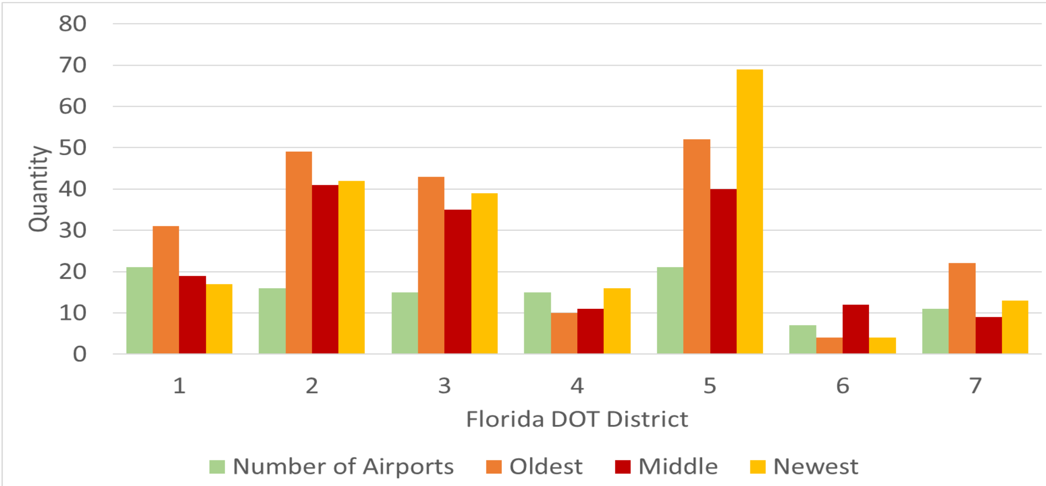
In terms of the oldest reported pending corrective actions, District 5 has the most (52), with Districts 2 and 3 just behind that (49 and 43, respectively). When analyzing the middle reported deficiencies in corrective actions, District 2 has the highest number (41), with District 5 a close second at 40 reported, and District 3, with 35. District 7 has the lowest number of deficiencies noted in the middle report (9 pending corrective actions). For the most recent noted corrective actions awaiting completion, District 5 hast the highest number (69), significantly more than the other districts. Next in line is District 2 with 42, and District 3 with 39. The District with the least, as mentioned previously, is District 6.

Table 7-37. Airports with Identified Deficiencies Pending Corrective Actions

FDOT District	Number of System Airports in District	Oldest	Middle	Newest
1	21	31	19	17
2	16	49	41	42
3	15	43	35	39
4	15	10	11	16
5	21	52	40	69
6	7	4	12	4
7	11	22	9	13
Total	**106**	**211**	**167**	**200**

Notes: The latest three inspection reports were reviewed to conduct this analysis (typically either 2021-2023 or 2020-2022). As a result, the column headings oldest, middle, and newest correlate to identified delinquencies within the reports in that sequence.
Source: Florida airport inspection reports

Figure 7-42. Airports with Identified Deficiencies Pending Corrective Actions



Source: Florida airport inspection reports

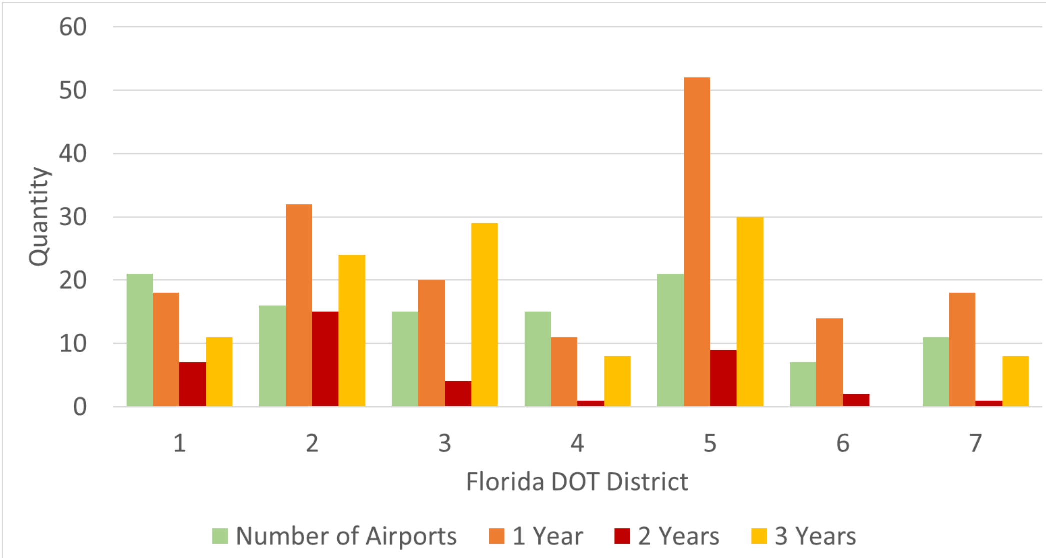
Table 7-38 and **Figure 7-43** show the number of deficiencies that only occurred in a single year (and therefore, also a single report) as well as those that appeared in two years of reporting (remained uncorrected from one year to the next), either the oldest and middle reports (2023 and 2022, or 2022 and 2021 reports). Note that the reporting numbers below are discrete—a pending corrective action is only counted once, whether it was identified in one report, over two reports, or appeared in all three.

Table 7-38. Deficiency Carry Over and Duration

FDOT District	Duration and Number of Deficiency Carry Overs*			
	Number of System Airports in District	Deficiencies occurred in only 1 year**	Deficiencies noted over some combination of 2 years^	Deficiencies noted over 3 years
1	21	18	7	11
2	16	32	15	24
3	15	20	4	29
4	15	11	1	8
5	21	52	9	30
6	7	14	2	0
7	11	18	1	8
Total	**106**	**165**	**39**	**110**

Notes: Numbers account for just those deficiencies that have repeated that number of times (i.e., a deficiency that has occurred for three years is not recorded as occurring for two years or one year).
*Carry Overs: the number of deficiencies repeated from one year to the next.
**The deficiency only appeared on one report and did not show up on the previous year or the next year.
^Two-year carry overs appear on either the oldest/middle pairing of reports or the middle/newest reports.
Source: Florida airport inspection reports

Figure 7-43. Deficiency Carry Over and Duration



Source: Florida airport inspection reports

The overall corrective actions pending that occurred within a year (single report) is highest of the three categories analyzed below. Among the districts, District 5 has the most uncorrected at 52, with the next highest reported in District 2. Districts 1, 3, and 7 were just under or at 20 reported corrective actions pending. District 4 has the lowest number (11 corrective actions). The next highest number overall system wide came in the three-year category (110 incomplete corrective actions).

At the district level, District 6 had no pending corrective actions for that reporting period that were carried over. Districts 5, 3, and 2 had the highest numbers (30, 29, and 24, respectively). The two-year category had the least number of carried over corrective actions overall at 39. District 2 had the highest number with 15, and Districts 4, 6, and 7 had only one or two.

7.7 Geographic System Analysis

Another dimension to the Florida airport system is the degree to which it provides access to the people and businesses of Florida. A drive time analysis measured the percent of Florida's 2023 population contained within a specified driving time of system airports. This analysis accounted for the road network and typical driving speeds in 2023. The coverage provided by both the entire Florida airport system and coverage by its other subsegments was evaluated.

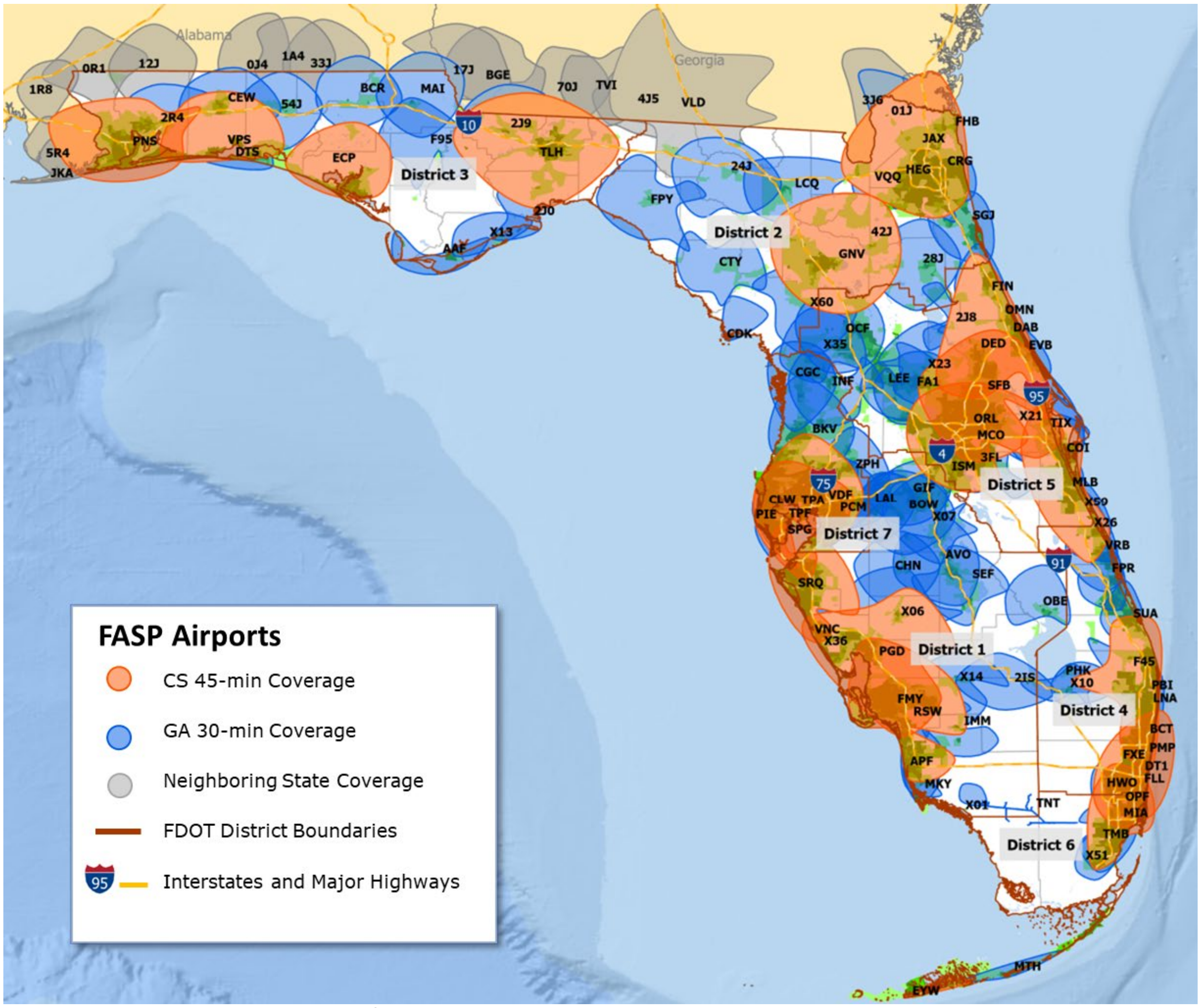
7.7.1 Full System Analysis

The analysis of the full Florida airport system used 30-minute drive times for the general aviation airports and 45 minutes for airports with commercial airline service. In a press release issued on March 18, 2021, entitled "Census Bureau Estimates Show Average One-Way Travel Time to Work Rises to All-Time High," the U.S. Census Bureau reported U.S. workers have a typical commute time of approximately 30 minutes, leading to selection of the 30-minute drive time. Users of GA airports generally put a premium on time, so the thought was that a typical market for GA airports would be people within average commuting time. This 30-minute drive time was also used for the other analyses.

For commercial service airports, the drive time was increased to 45 minutes to reflect the tendency of airline passengers to value cost over time savings. By driving a little further, air passengers may be able to take advantage of reduced fares.

Figure 7-44 shows that the vast majority of Florida's population falls within these drive times. Florida's GA airports cover 80 percent of the population, while the commercial service airports provide 45-minute access to 77 percent of the population. When combined, taking into account overlapping coverage, the entire Florida airport system covers 92 percent of Florida's population. Looking out to 2043, coverage by the system is forecast to remain unchanged at 92 percent.

Figure 7-44. Coverage by Florida Airport System



Note: Areas shown in green denote significant population densities.

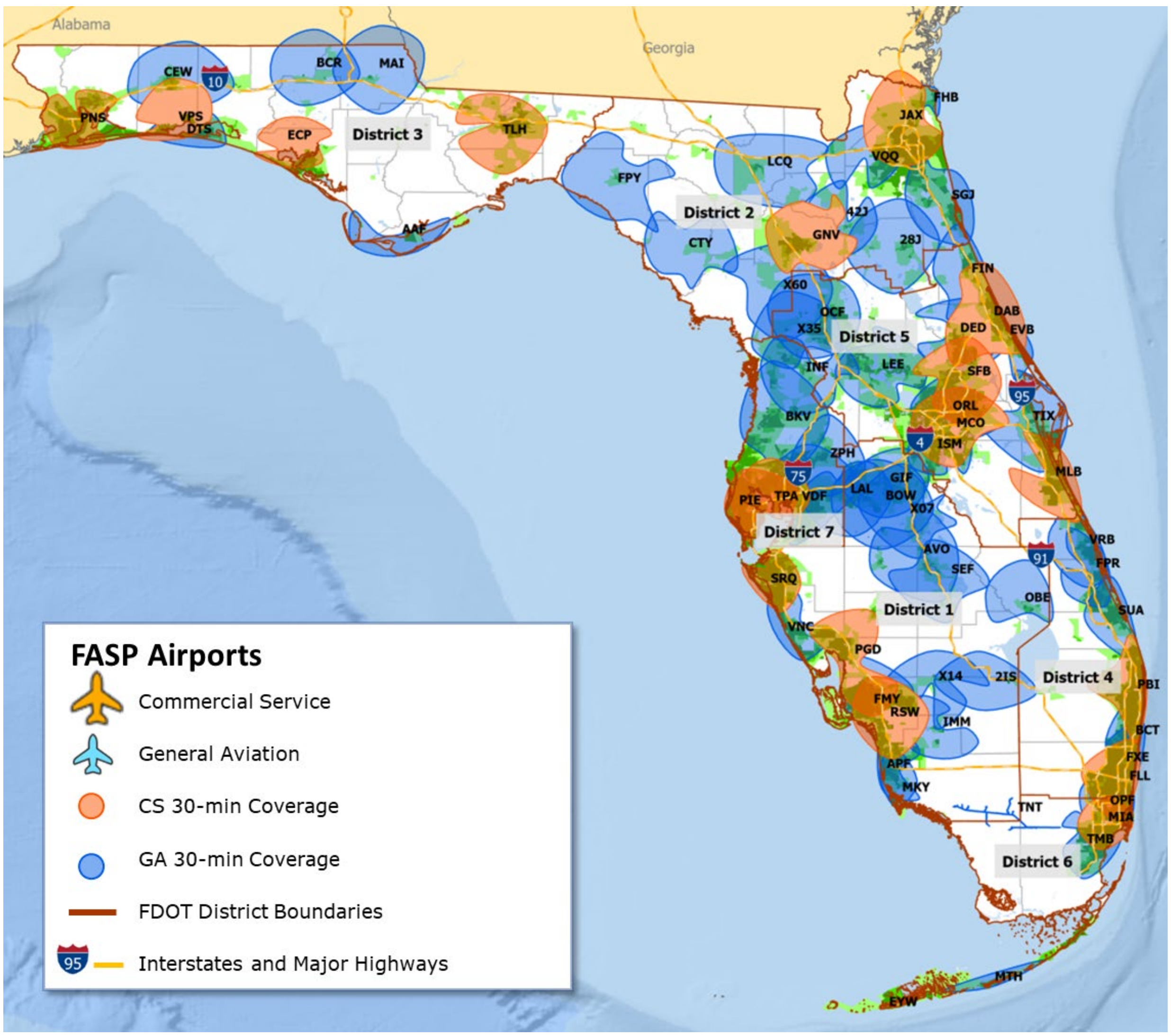
Source: Cignus

7.7.2 Airports with Runways of 5,000 feet or Longer

Airports with runways of at least 5,000 feet offer access to the bulk of aircraft in the GA fleet. For this reason, one geographic coverage analysis looked at the access that this subsegment of the Florida airport system provides.

Figure 7-45 shows the airports in Florida with runways 5,000 feet long or longer and their associated 30-minute drive times. Approximately 83 percent of Florida's population has access to airports fitting these criteria. Forecasts of population for 2043 show that this coverage is expected to remain steady.

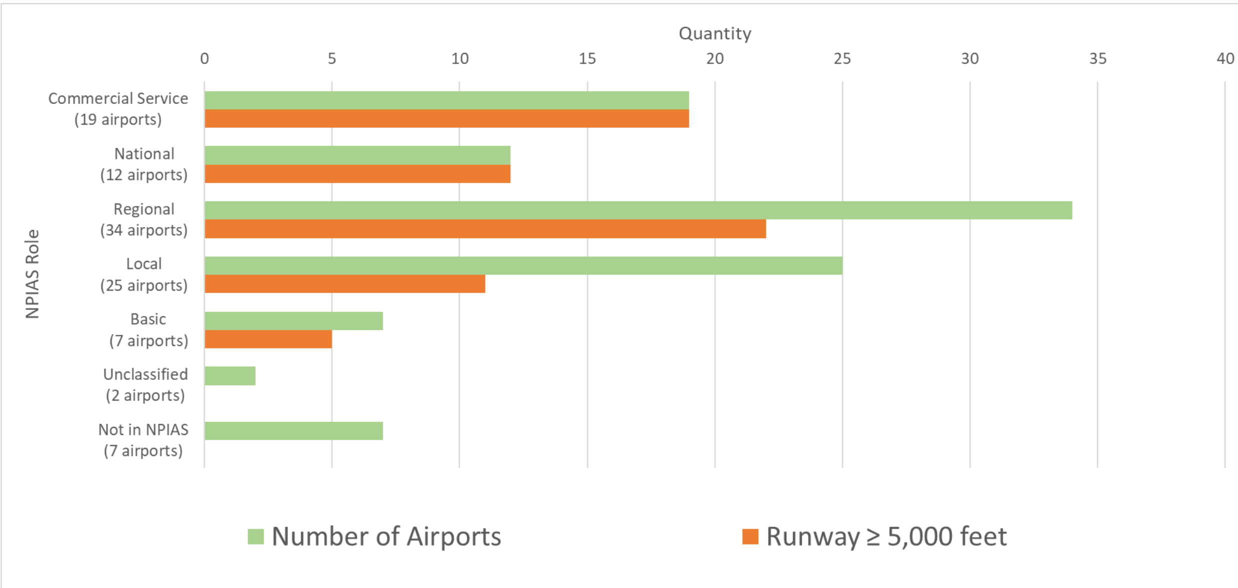
Figure 7-45. Coverage by Airports with Runways of 5,000 Feet or Longer



Note: Areas shown in green denote significant population densities.
Source: Cignus

Figure 7-46 summarizes the Florida system airports with runways of 5,000 feet or longer by NPIAS role. It shows that all of the Commercial Service and National Airports have runways of at least 5,000 feet. Regional, Local, and Basic Airports all have at least some of their airports equipped with 5,000-foot runways or longer. Only the Unclassified Airports and those airports not in the NPIAS do not have any airports with a 5,000-foot runway.

Figure 7-46. Airports with Runways of 5,000 Feet or Longer by NPIAS Role



Source: Mead & Hunt

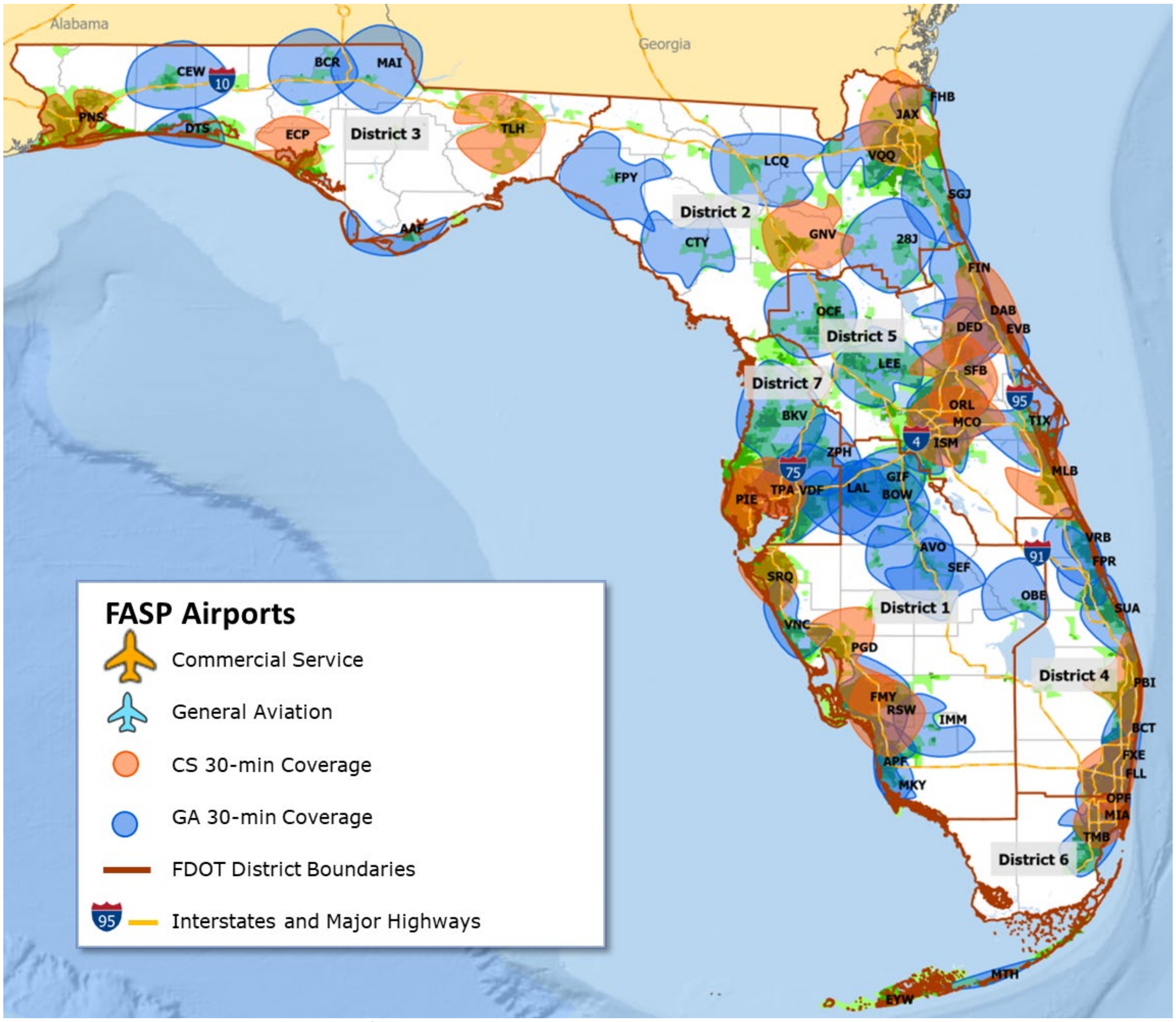
7.7.3 Commercial Business Aviation

With an interest in fostering economic growth, the FDOT AO looked at the coverage provided by airports regarded as suitable for serving commercial business aviation. This subsegment of the Florida airport system was defined as those airports with:

- A 5,000-foot runway or longer.
- Jet fuel available.
- Automated weather reporting.
- A precision instrument approach.

As shown in **Figure 7-47**, this group of airports covers significant portions of the state. Approximately 82 percent of Florida's population falls within the 30-minute drive times of these airports. No change in coverage is expected for the 2043 Florida population.

Figure 7-47. Coverage by Airports that can Serve Commercial Business Aviation

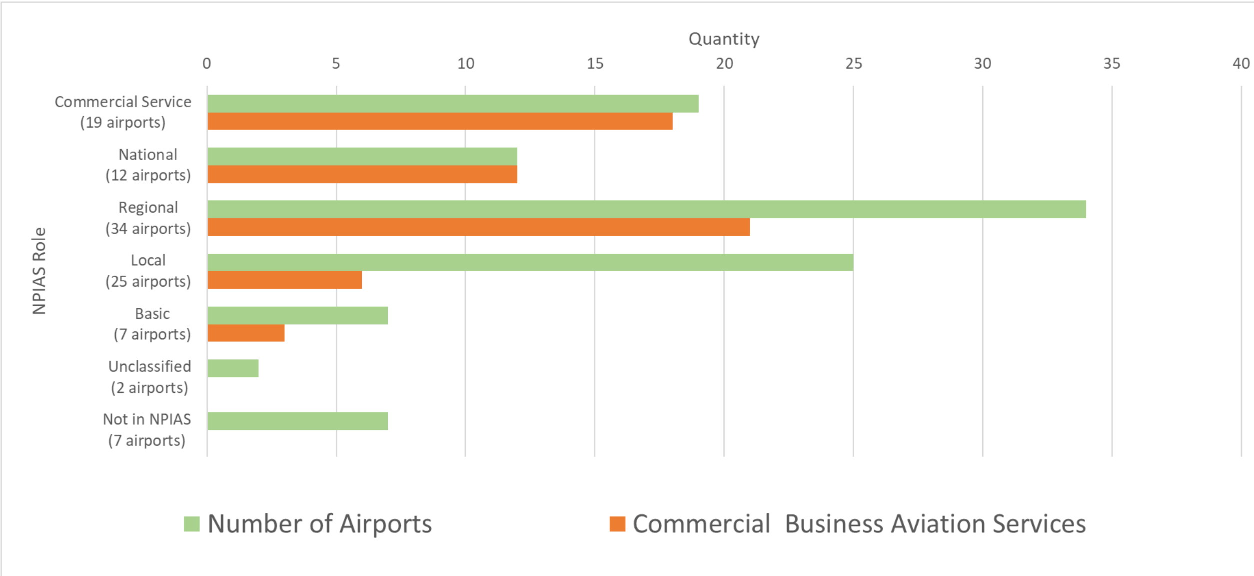


Note: Areas shown in green denote significant population densities.
Source: Cignus and FASP 2043 Airport Survey

Figure 7-48 shows the airports capable of serving commercial business aviation by NPIAS role. Nearly all of the Commercial Service and National Airports meet the criteria for serving commercial business aviation. The one exception in these groups is Eglin AFB/Destin-Ft Walton Beach Airport (VPS), which is restricted to military aircraft and civilian air carrier aircraft (i.e., general aviation business aircraft are not permitted).

The other NPIAS roles have some airports with the facilities to serve commercial business aviation, but the proportion drops off from Regional Airports to Local Airports, and again from Local Airports to Basic Airports. Unclassified Airports and the airports not in the NPIAS do not have any airports capable of serving commercial business aviation.

Figure 7-48. Airports that can Serve Commercial Business Aviation by NPIAS Role



Source: FASP 2043 Airport Survey

7.7.4 Airports with Instrument Approach Procedures

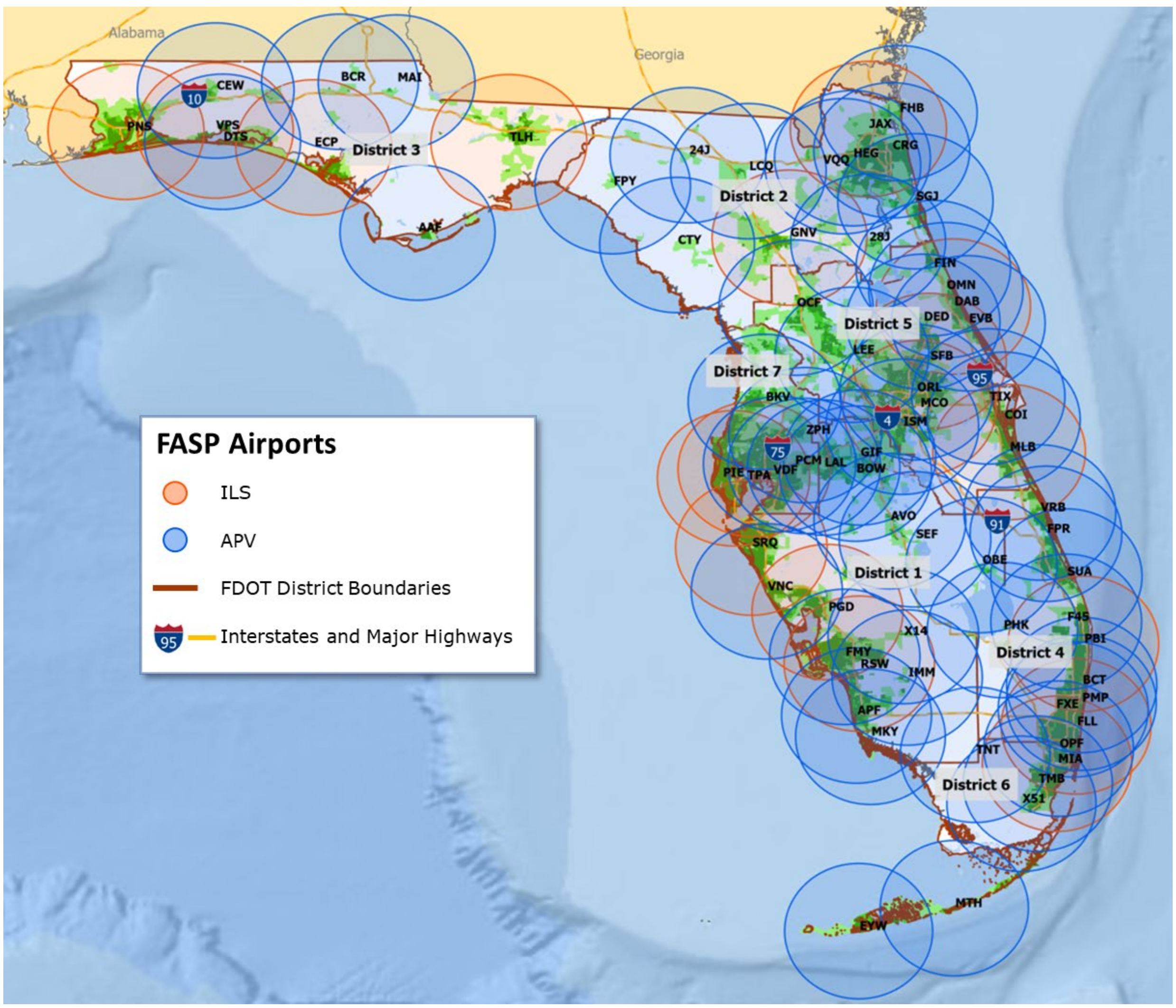
Airports with instrument approach procedures improve the accessibility to the region those airports serve. But, from a pilot's perspective, having access to instrument approach procedures at airports other than the destination is an important safety aspect. Unexpected weather, mechanical problems, or other in-flight emergencies can force a pilot to land at an airport other than the destination, which means that an airport system that provides good coverage for aircraft in flight is an important safety consideration for flight planning. This evaluation of coverage consisted of mapping 30-nautical mile circles around airports with instrument approaches. A distance of 30 nautical miles can be covered by most instrument-capable aircraft in no more than 15 minutes. More capable aircraft would cover that distance in less time. Essentially, this means that any instrument-capable aircraft within the area of coverage is always 15 minutes or less from an airport with an instrument approach.

Florida has a significant number of airports with instrument approach procedures, so it is not surprising that the coverage provided to flights is extensive. In fact, the coverage is so thorough that it is more useful to assess the coverage by different types of instrument approaches. The following geographic analysis looks at coverage provided by airports with approaches that offer some type of vertical guidance, and coverage by those airports with approaches that do not have vertical guidance.

Figure 7-49 depicts 30-nautical mile circles around those Florida airports with either instrument landing systems (ILS) or instrument approaches with vertical guidance (APV). Colors depict the type of approach. These types of approaches typically offer the most access to airports, enabling aircraft to land at airports during the most restrictive weather conditions. All airports with ILS or APV approaches also have non-precision approaches.

Those airports with ILS approaches cover 57 percent of Florida's land area, while those with APV approaches cover 93 percent. The extensive coverage from APV approaches is largely due to the high number of airports where APV approaches are available, which are less costly than ILS approaches.

Figure 7-49. Coverage by Airports with ILS or APV Instrument Approaches



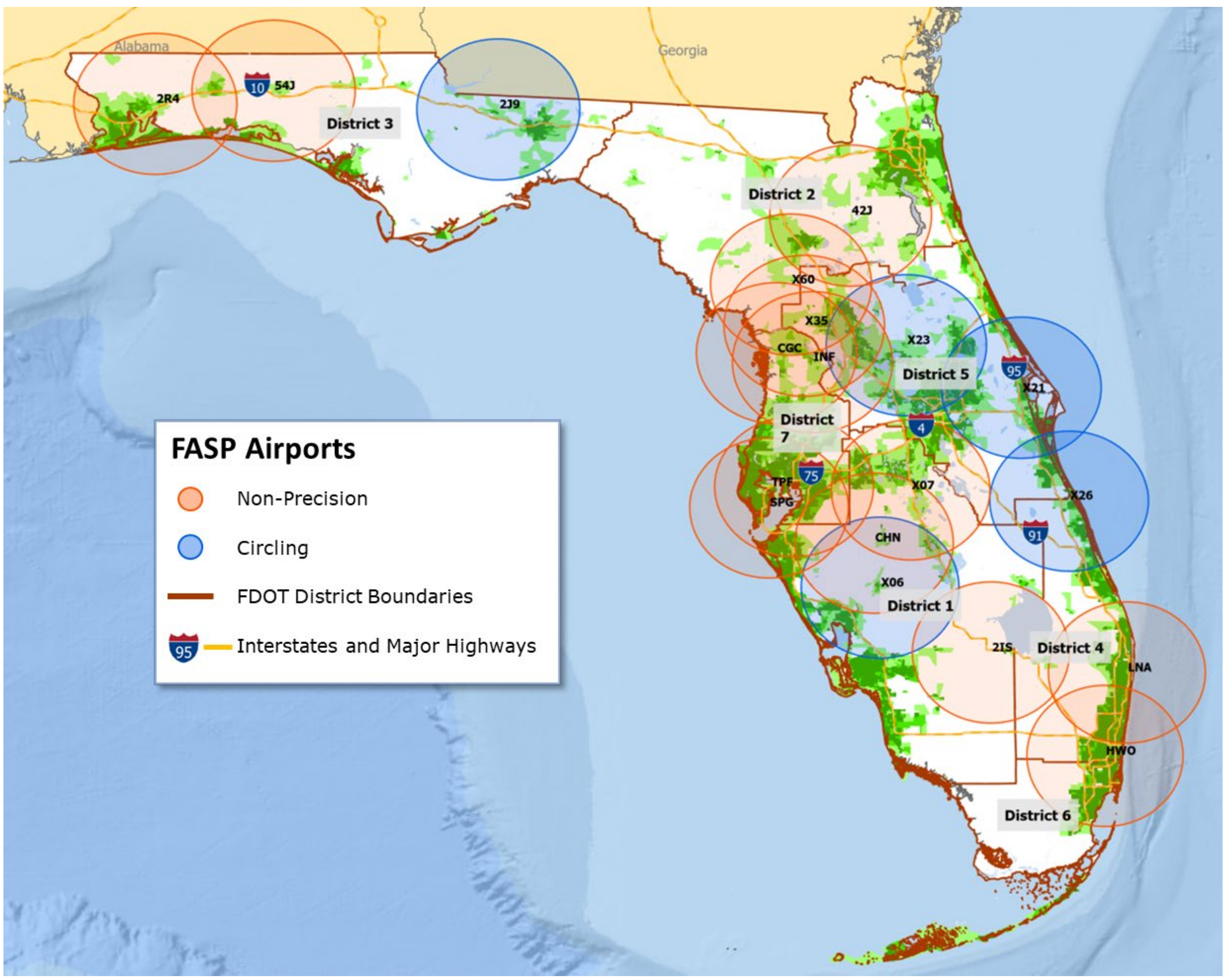
Note: Areas shown in green denote significant population densities.

Source: Cignus and FAA Chart Supplement Southeast U.S. 10 AUG 2023 to 5 OCT 2023

Figure 7-50 shows the coverage provided by airports with only non-precision or circling approaches. These types of approaches generally offer less utility than the ILS and APV approaches discussed previously. Non-precision and circling approaches typically have higher approach minimums, meaning they may not provide access to an airport during poor weather when a better approach, with lower approach minimums, could. However, these approaches do provide better access to airports than if there were no instrument approaches at all.

The airports with non-precision approaches provide coverage to 49 percent of Florida's land area. The handful of Florida airports that only have a circling approach cover 24 percent of Florida. These types of approaches provide less coverage than ILS and APV approaches simply because there are fewer of them.

Figure 7-50. Coverage by Airports with Only Non-Precision or Circling Approaches

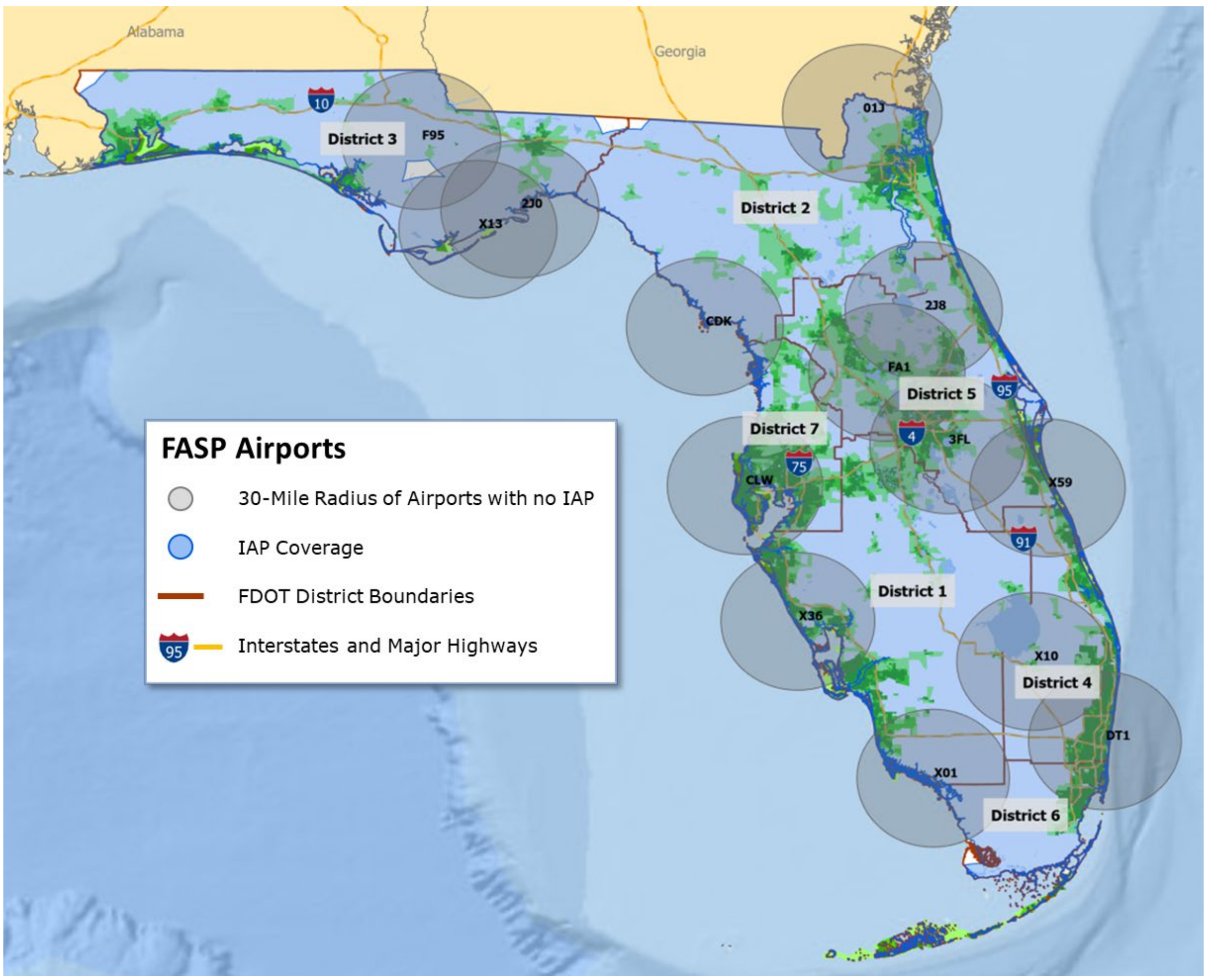


Note: Areas shown in green denote significant population densities.

Source: Cignus and FAA Chart Supplement Southeast U.S. 10 AUG 2023 to 5 OCT 2023

When all of these instrument approaches are combined, they provide coverage for 99 percent of Florida's land area. **Figure 7-51** depicts the coverage provided by every Florida airport with an instrument approach in light blue. Note that there are very few white spaces – areas beyond 30 nautical miles to the nearest airport with an instrument approach. The very few Florida system airports without any instrument approach have a dark blue, 30-nautical mile circle around them to demonstrate the additional coverage that an instrument approach could provide at each of these airports. Nearly all of these airports are in areas that already have instrument approach coverage. The one exception is Calhoun County Airport (F95), located in Florida's panhandle. Adding an instrument approach at F95 would provide coverage to the small parallelogram to the south of the airport.

Figure 7-51. Coverage by Airports with Instrument Approach Procedures and Airports Without Instrument Approaches



Note: Areas shown in green denote significant population densities.

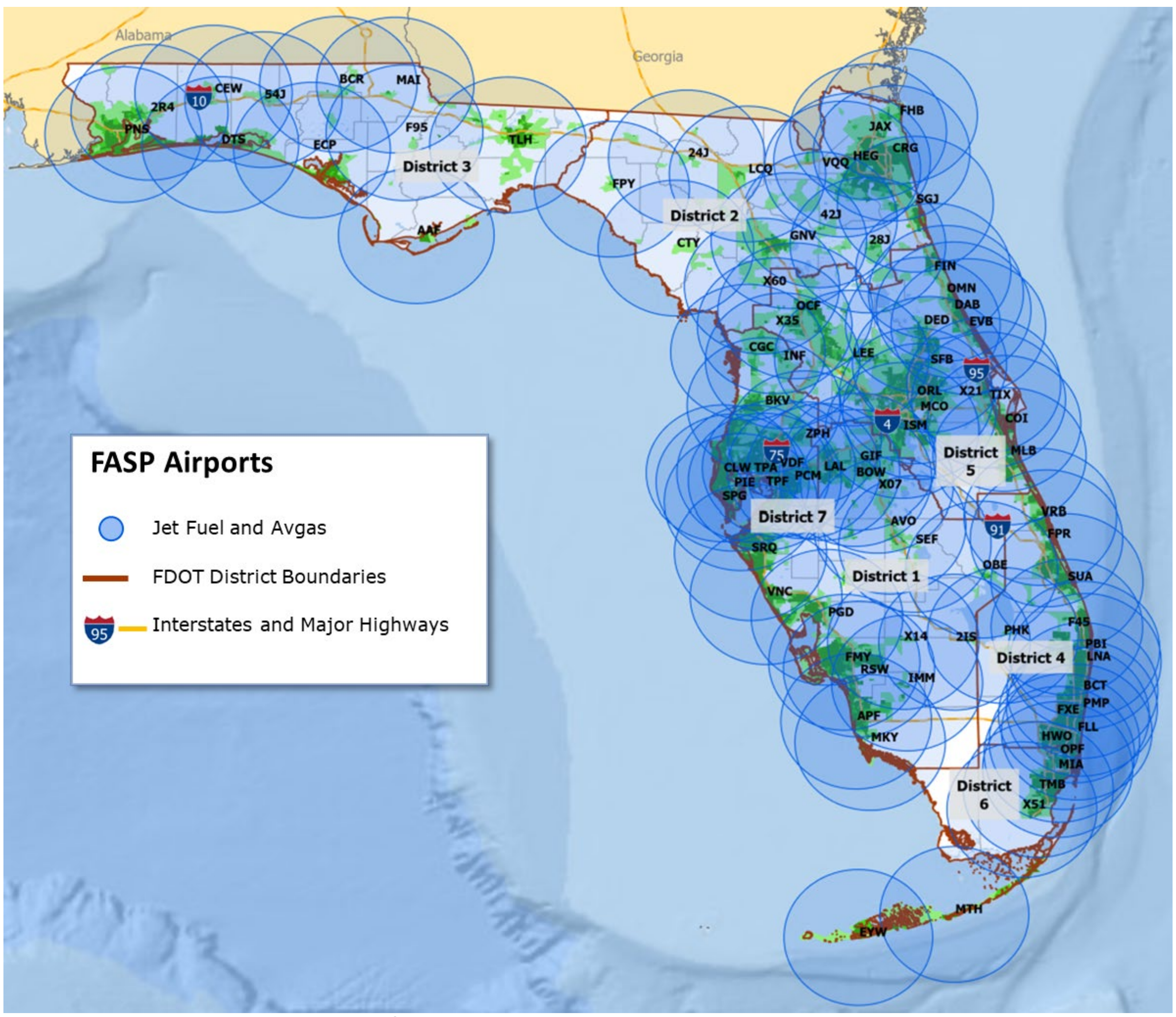
Source: Cignus and FAA Chart Supplement Southeast U.S. 10 AUG 2023 to 5 OCT 2023

7.7.5 Airports with Fuel Service

Similar to having ready access to an instrument approach, pilots also appreciate having easy access to fuel. Unexpected headwinds or other unforeseen circumstances can result in pilots needing to land short of their destination and having fuel available obviously factors into that decision. Airport systems that have significant fuel coverage minimize the diversion distance pilots need to travel, which is more efficient and safer. Similar to the instrument approach analysis, the following figures depict the flight coverage by airports in Florida with fuel service using 30-nautical mile circles.

Figure 7-52 shows the land area coverage by Florida system airports that provide both jet fuel and avgas. Most airports with fuel service have both fuels, providing coverage to 98 percent of Florida.

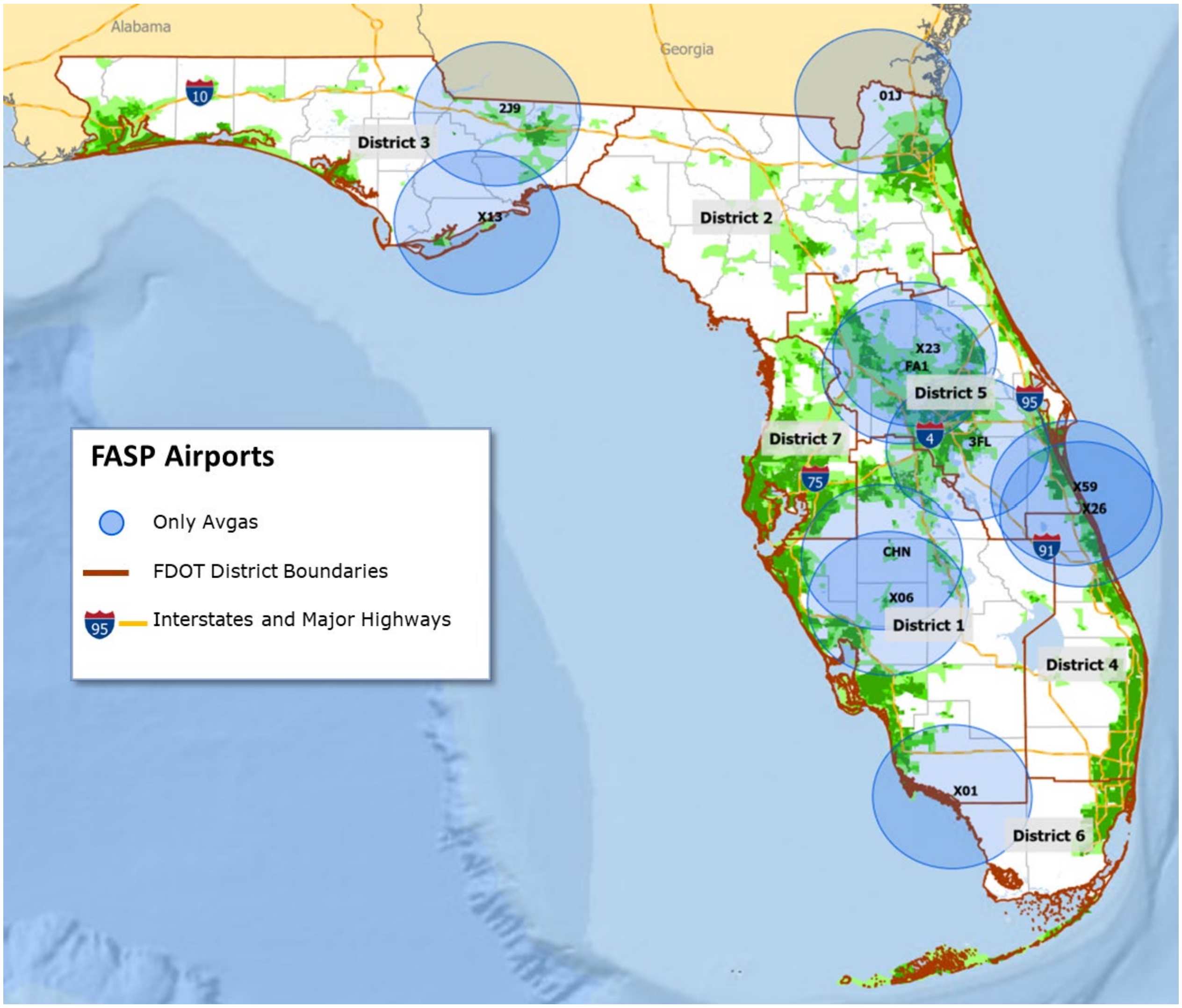
Figure 7-52. Coverage by Airports with Jet Fuel and Avgas



Note: Areas shown in green denote significant population densities.
Source: Cignus and FASP 2043 Airport Survey

Florida has a small number of airports that provide only avgas, as shown in **Figure 7-53**. Compared with **Figure 7-53**, these airports are generally in areas where nearby airports provide both avgas and jet fuel.

Figure 7-53. Coverage by Airports with Only Avgas

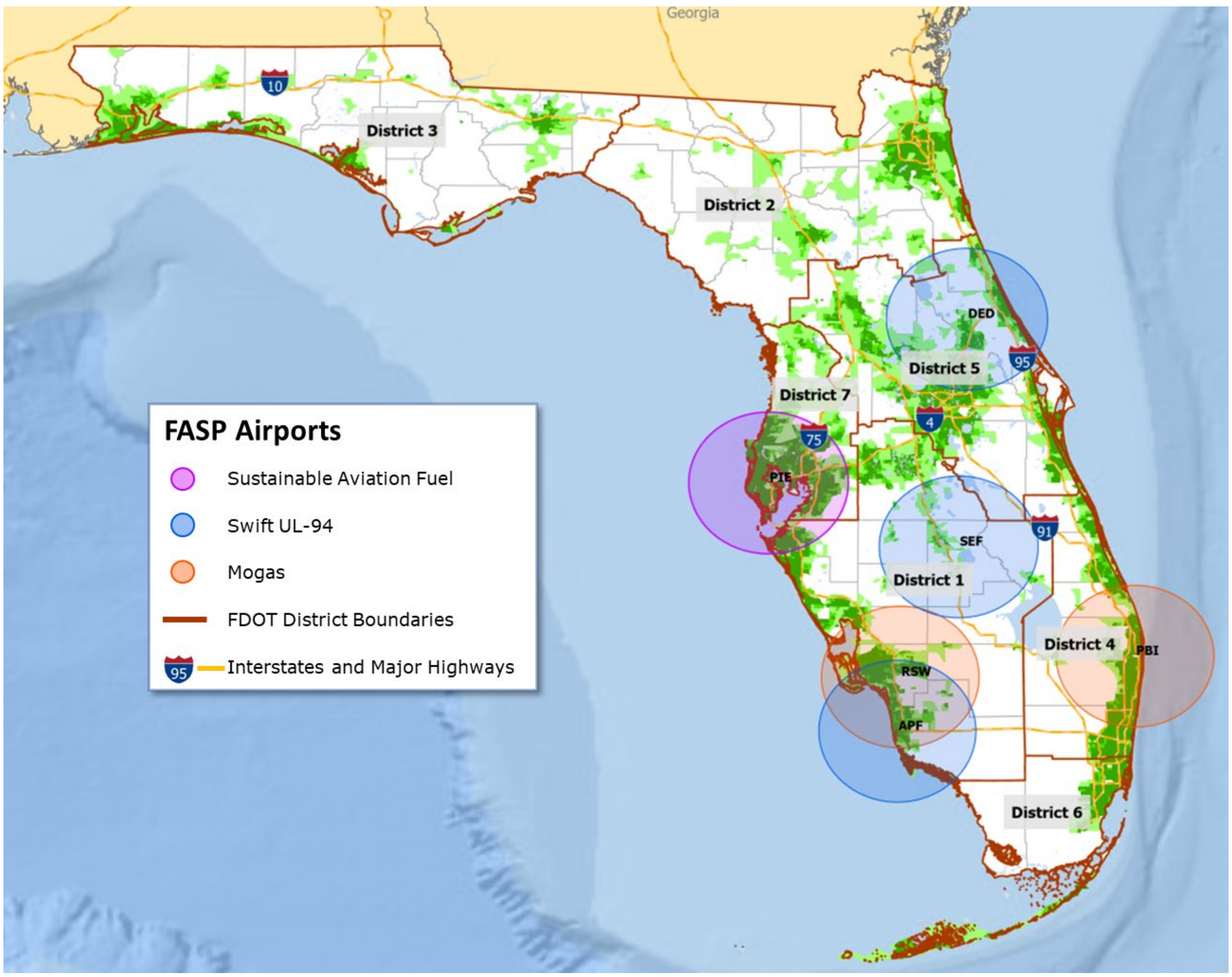


Note: Areas shown in green denote significant population densities.
Source: Cignus and FASP 2043 Airport Survey

One area that is emerging in Florida is alternative fuels. These consist of unleaded avgas fuels, such as mogas (ethanol-free automobile gasoline) and Swift UL-94, along with sustainable aviation fuel (SAF), a type of jet fuel produced from renewable feedstock.

Figure 7-54 shows the coverage provided by airports offering SAF and unleaded fuels, mogas and Swift UL-94. St. Pete-Clearwater International Airport (PIE) is the single Florida airport offering SAF, which provides coverage to 3 percent of Florida. Airports serving mogas provide coverage to 8 percent of Florida's land area, and Swift UL-94 is available at airports providing 15 percent coverage.

Figure 7-54. Coverage by Airports with Other Aviation Fuels

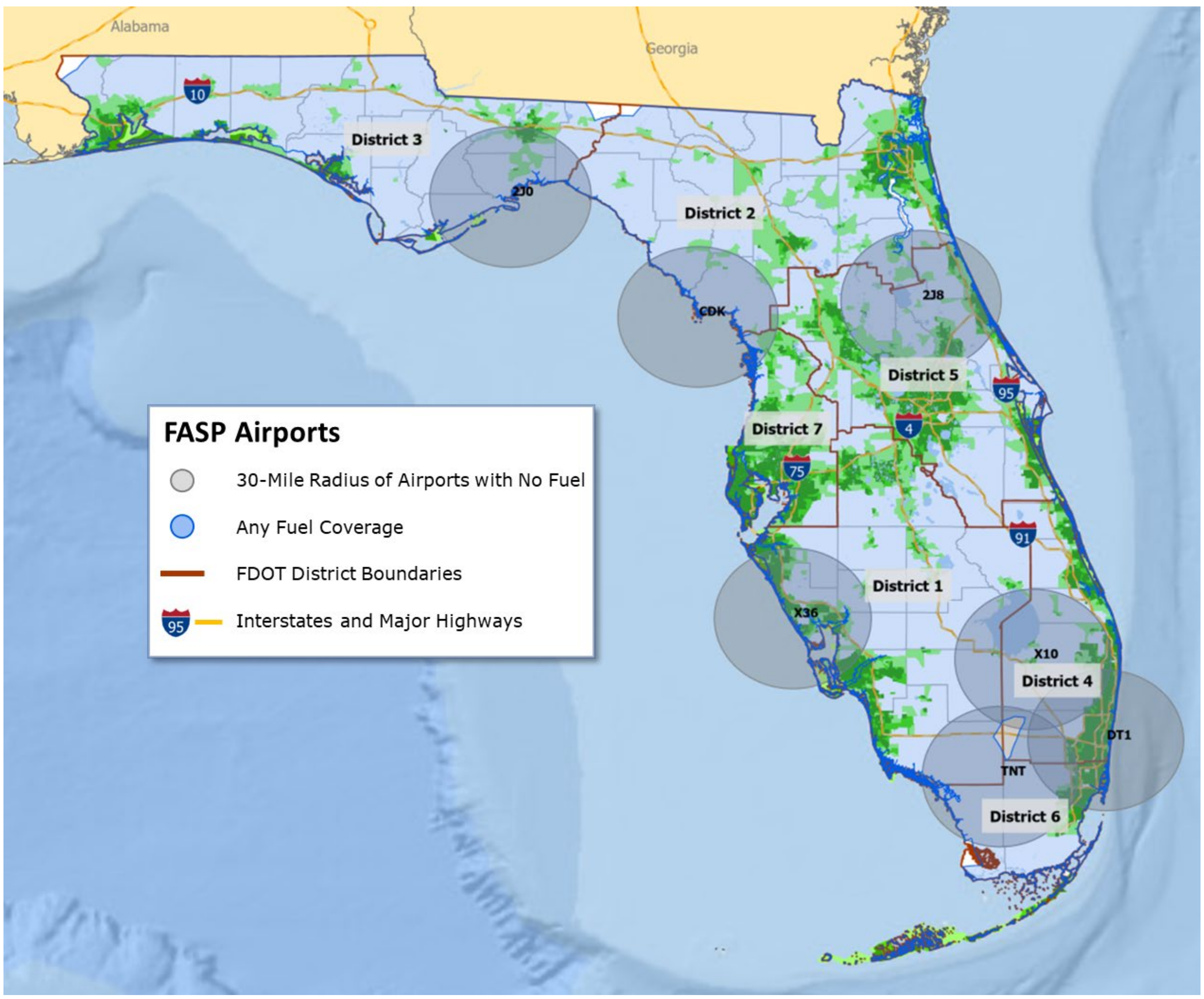


Note: Areas shown in green denote significant population densities.
Source: Cignus and FASP 2043 Airport Survey

When the overall fuel coverage provided by Florida's system airports is considered, more than 99 percent of Florida's land area has access to aviation fuel, as shown in **Figure 7-55**. Areas beyond 30 nautical miles from an airport with fuel service are shown in white in **Figure 7-56**. Those airports without fuel service, and the 30-nautical mile ring of additional coverage they could provide with new fuel service, are also depicted in **Figure 7-55**.

Of the seven airports without fuel service, only two would contribute additional flight coverage with the introduction of fuel service. Both are located in south Florida. Dade-Collier Training and Transition Airport (TNT) would completely cover the small area in the Everglades that currently lacks fuel service flight coverage. To the north of this area, fuel service at Belle Glade State Municipal Airport (X10) would partially cover this same area lacking fuel service flight coverage.

Figure 7-55. Coverage by Airports with Aviation Fuel

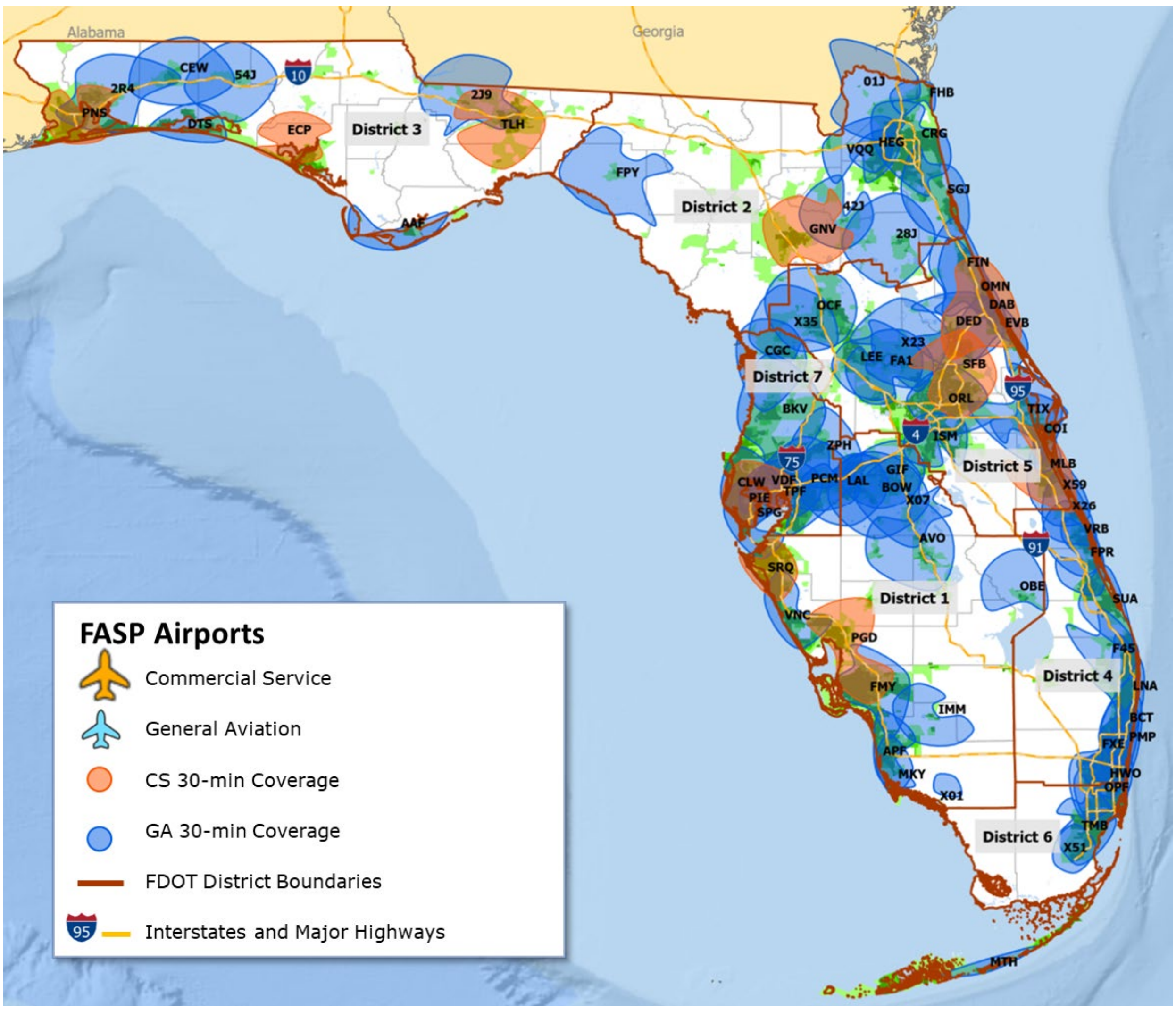


Note: Areas shown in green denote significant population densities.
Source: Cignus and FASP 2043 Airport Survey

7.7.6 Airports with Based Flight Training

With the shortage of commercial pilots expected to get worse, access to flight training that is conveniently available to Florida's population is important in helping Florida maintain its reputation as a center of excellence for aspiring pilots. **Figure 7-56** highlights the coverage provided by system airports that feature a flight training operation based at the airport. Approximately 83 percent of Florida's population is within 30 minutes of an airport that offers flight training. This percentage is forecast to remain constant out to 2043.

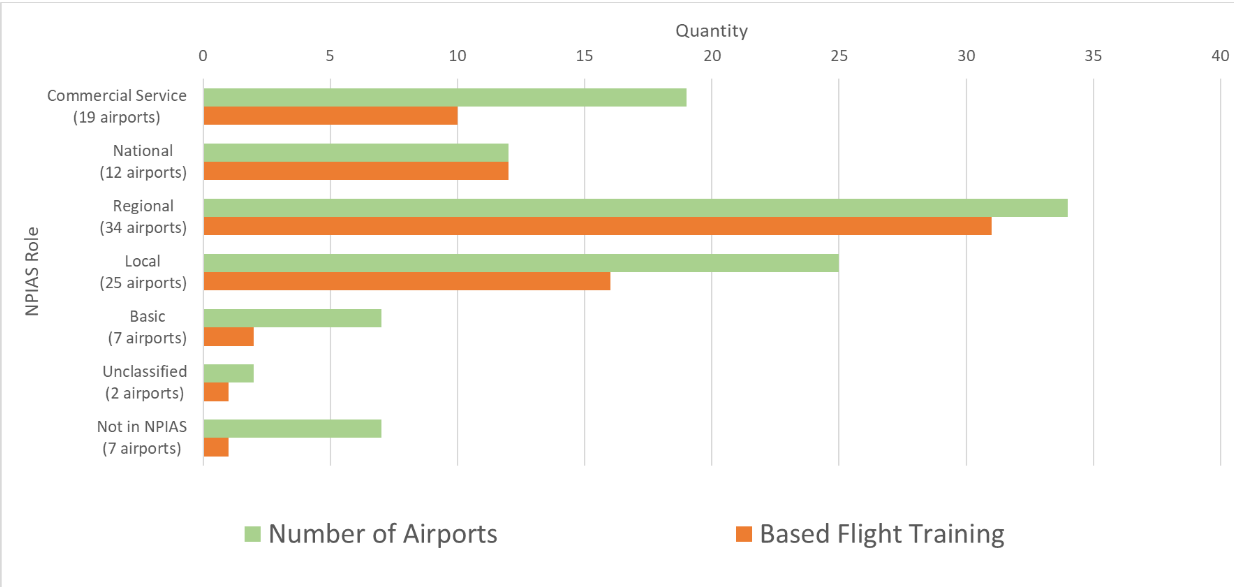
Figure 7-56. Coverage by Airports with Based Flight Training



Note: Areas shown in green denote significant population densities.
Source: Cignus and FASP 2043 Airport Survey

The airports with based flight training, grouped by NPIAS role, are shown in **Figure 7-57**. At least one airport in every group reports based flight training at their airport. The highest proportion of airports with based flight training are the National Airports, with all of them offering based flight training. Commercial Service, Regional, and Local Airports all reported more than half their airports feature based flight training.

Figure 7-57. Florida Airports with Based Flight Training by NPIAS Role



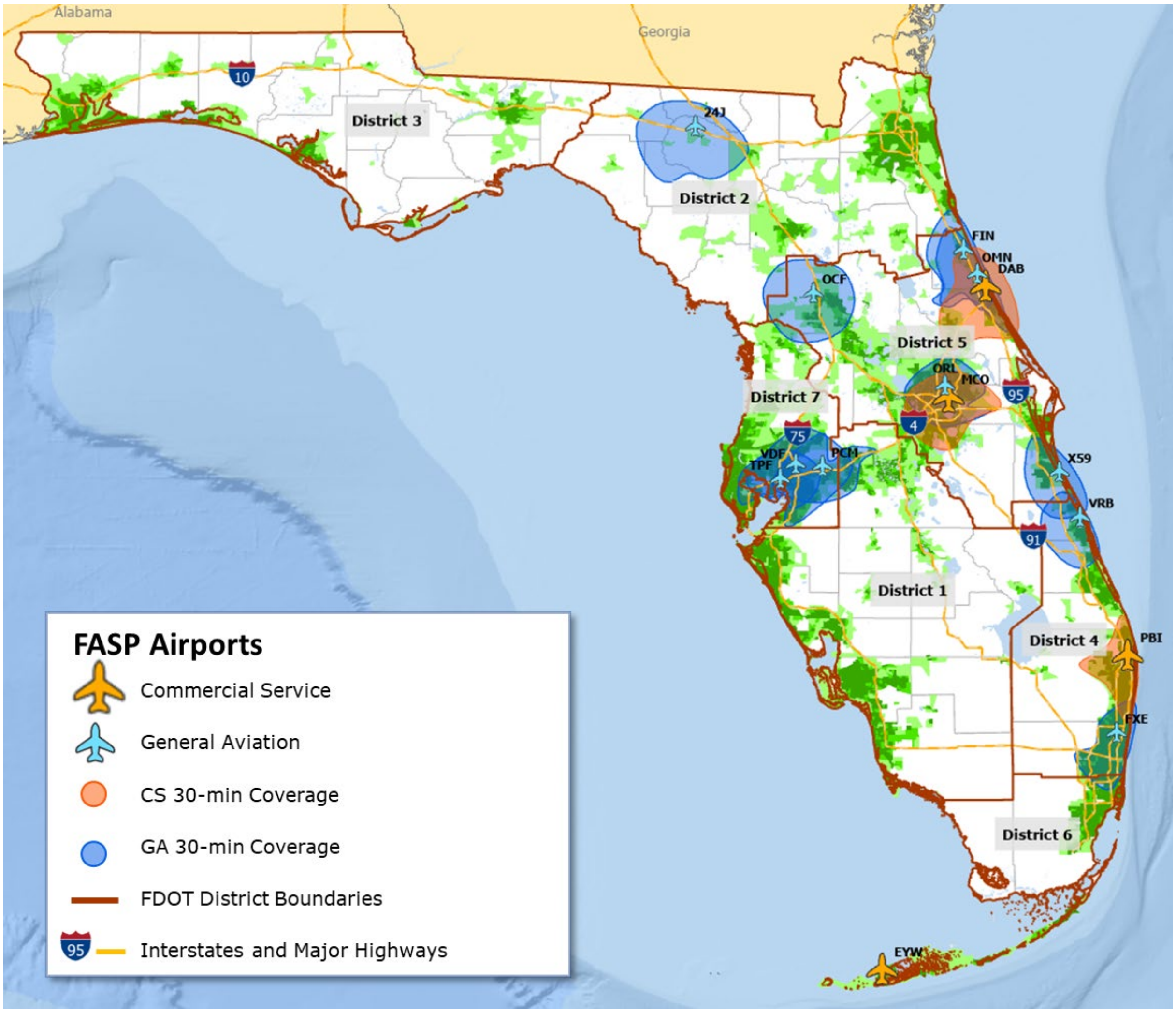
Source: FASP 2043 Airport Survey

7.7.7 Airports Expected to Serve Urban Air Mobility

This study explored planning for urban air mobility (UAM) by asking airports whether they expected to serve UAM during the planning period. As illustrated in **Figure 7-58**, airports that fit this description are generally found in areas with high population density. However, several urban areas, such as Fort Myers, Jacksonville, and Tallahassee, had no airports report plans to handle UAM operations.

For those airports reporting plans to serve UAM, approximately 37 percent of Florida's population falls within their 30-minute drive time markets.

Figure 7-58. Coverage by Airports Expecting to Serve UAM

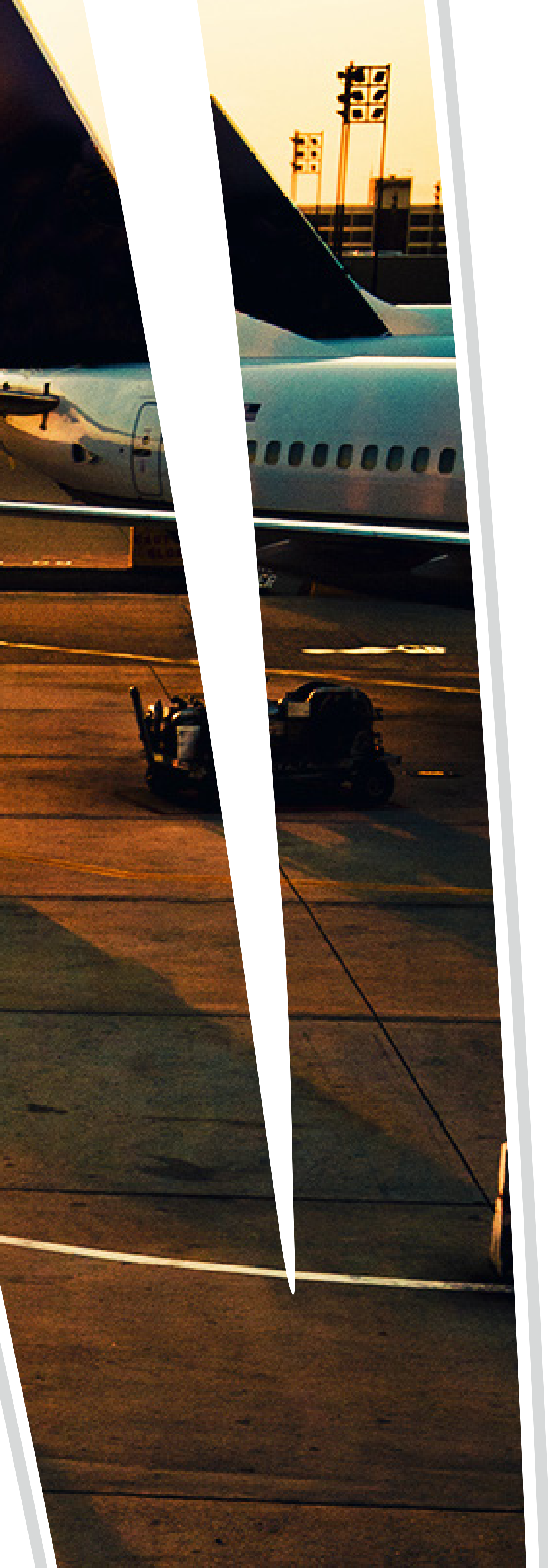


Note: Areas shown in green denote significant population densities.
Source: Cignus and FASP 2043 Airport Survey

7.8 Summary

This geographic analysis of Florida's airport system demonstrated that the people of Florida have excellent access to airport facilities, with 92 percent of the population having access to the system. Furthermore, analysis of subsegments of the system showed no less than 82 percent of the population is within easy driving distance of airports with specific facilities, such as those that can serve commercial business aviation or provide flight training. Airports planning to serve UAM are the only subsegment with room for improvement, which can be addressed as the emerging UAM industry evolves and the needs become better defined.

Florida also demonstrates that it operates a robust airport system in terms of making fuel and instrument approach procedures accessible to pilots.



8
Aviation Office Initiatives

2043 FASP
FLORIDA AVIATION SYSTEM PLAN

Chapter 8

FDOT AO Initiatives

As mentioned in **Chapter 5 – Data Collection and Inventory**, airport staff and managers participated in interviews and surveys during Phase 1 of the Florida Aviation System Plan (FASP) 2043. The emerging trends and technology portion of the airport survey was conducted to assist with focusing potential goals/objectives/PMs to support future development. In addition, the Florida Department of Transportation Aviation Office (FDOT AO) wanted individual airport perspectives on current aviation "hot" topics across the nation to gauge their relevance to the Florida aviation system.

Initially, several topics emerged as worthy of analysis and were evaluated as part of Phase 1. Based on the Phase 1 summary papers, the FDOT AO sought more in-depth analysis in Phase 2 on some of the topics. The topics which received evaluation in Phase 2 included:

- **Appendix F – Weather Reporting Systems Initiative**.
- **Appendix G – Airport Electrification Initiative**.
- **Appendix H – Hangar Demand Initiative**.
- **Appendix I – Stormwater Management Program Initiative**.

The other topics, evaluated in Phase 1, included:

- **Appendix J – Unleaded AvGas Emerging Trends**.
- **Appendix K – Sustainable Aviation Fuel Emerging Trends**.
- **Appendix L – Power Alternatives Emerging Trends**.
- **Appendix M – Resource Management Emerging Trends**.

Several emerging trends were studied, either in Phase 1 or Phase 2: electrification at airports*, alternative sources of power, resource management, sustainable fuels, unleaded aviation gas (avgas), hangar occupancy*, weather reporting alternatives*, and stormwater management*.

**Phase 2 analysis of these four topics was in greater depth.*

This chapter highlights the key takeaways from the Phase 2 topics.

8.1 Alternative Weather Reporting

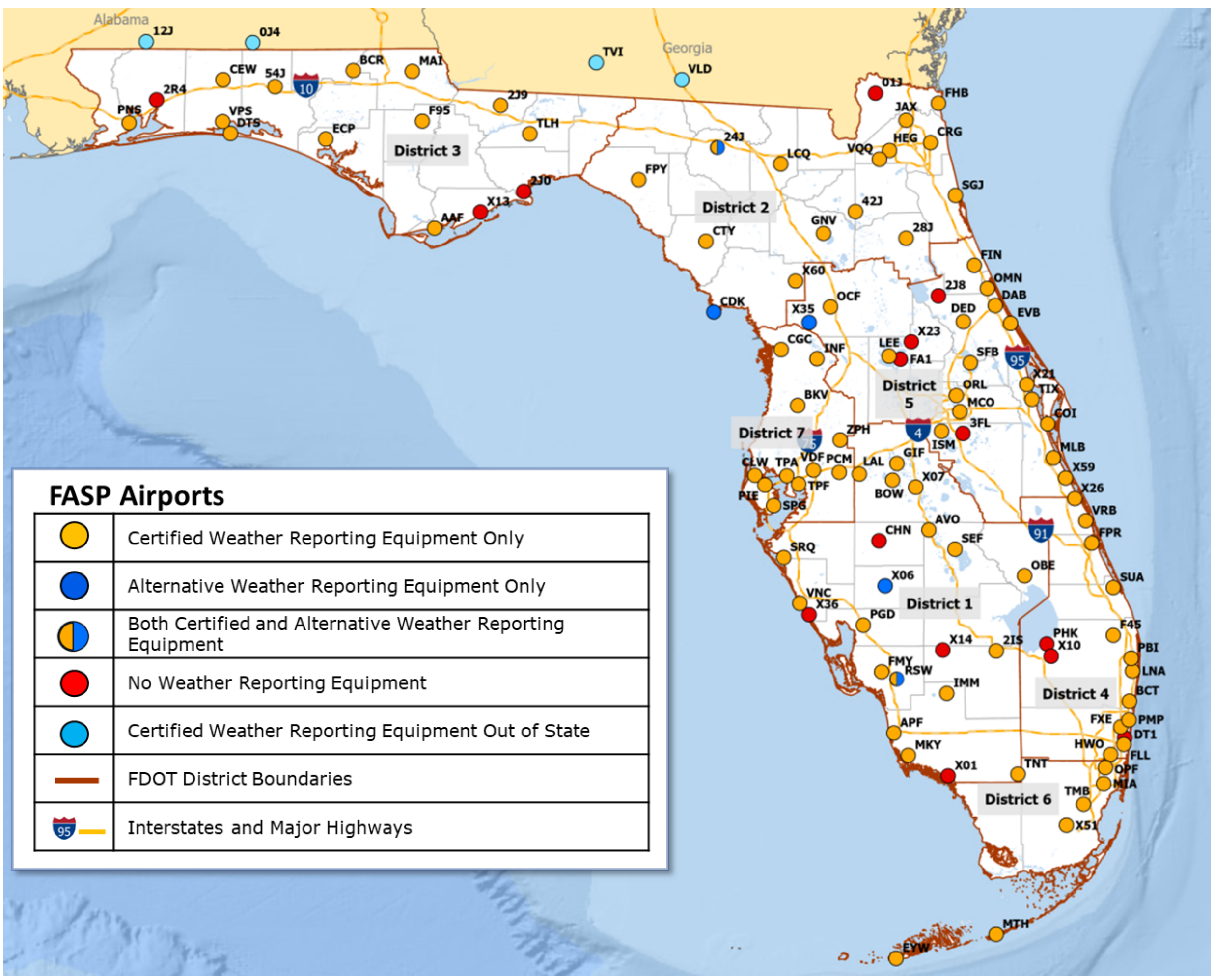
A comprehensive system of weather reporting that covers the state of Florida is beneficial to pilots in making informed flight planning decisions when flying in Florida's airspace. The analysis relied on data gathered through review of the Federal Aviation Administration's (FAA) Airport Data and Information Portal (ADIP) database and from a survey of airports that comprise the Florida Aviation System. The compiled data indicates Florida's system airports are equipped with both certified and non-certified emerging technology equipment. Certified systems are either automated weather observing systems (AWOS) or automated surface observing systems (ASOS).

8.1.1 Florida Aviation System Weather Reporting Coverage

Florida is well-covered with the robust system of FAA-certified and non-certified weather reporting systems at airports across the state (**Figure 8-1**). This includes airports with FAA-certified and non-certified emerging technology weather reporting systems. Generally speaking, weather reporting equipment is prevalent at the busier airports across Florida.

Four FAA-certified weather reporting systems just north of the Florida border in Alabama and Georgia also provide weather information for Florida's aviation system users. While located outside of Florida, their presence provides additional range of coverage for weather reporting conditions for Florida airports.

Figure 8-1. FASP Weather Reporting System Coverage



Source: 2043 FASP airport survey, 2023; Mead & Hunt, Inc., 2023

Out of Florida's 106 system airports, only 15 lack weather reporting capabilities (**Table 8-1**). Some of these 15 airports are in areas where weather reporting system coverage could be enhanced. Airports identified for automated weather reporting system improvements were selected based on a minimum distance (15 nautical miles) from the nearest airport with automated weather reporting to best increase the geographic area with weather reporting available to pilots.

Table 8-1. Florida System Airports Without a Weather Reporting System

Identifier	Airport	City	Nearest FAA-Certified Weather Station	Distance (nautical miles)
X10	Belle Glade State Municipal	Belle Glade	2IS – Airglades	21 miles
X36	Buchan	Englewood	VNC - Venice Municipal	6 miles
X13	Carrabelle-Thompson	Carrabelle	AAF - Apalachicola Regional	18 miles
DT1	Downtown Fort Lauderdale	Fort Lauderdale	FLL - Fort Lauderdale/Hollywood Intl	3 miles
X01	Everglades Airpark	Everglades	MKY - Marco Island Executive	18 miles
01J	Hilliard Airpark	Hilliard	JAX - Jacksonville International	16 miles
X14	La Belle Municipal	La Belle	IMM - Immokalee Regional	18 miles
PHK	Palm Beach County Glades	Pahokee	2IS - Airglades	19 miles
2R4	Peter Prince Field	Milton	PNS - Pensacola International	14 miles
2J8	Pierson Municipal	Pierson	DED - Deland Municipal	14 miles
3FL	St Cloud	St Cloud	ISM - Kissimmee Gateway	8 miles
FA1	Tavares	Tavares	LEE - Leesburg International	4 miles
X23	Umatilla Municipal	Umatilla	LEE - Leesburg International	10 miles
2J0	Wakulla County	Panacea	TLH - Tallahassee International	25 miles
CHN*	Wauchula Municipal	Wauchula	AVO – Avon Park Executive	19 miles

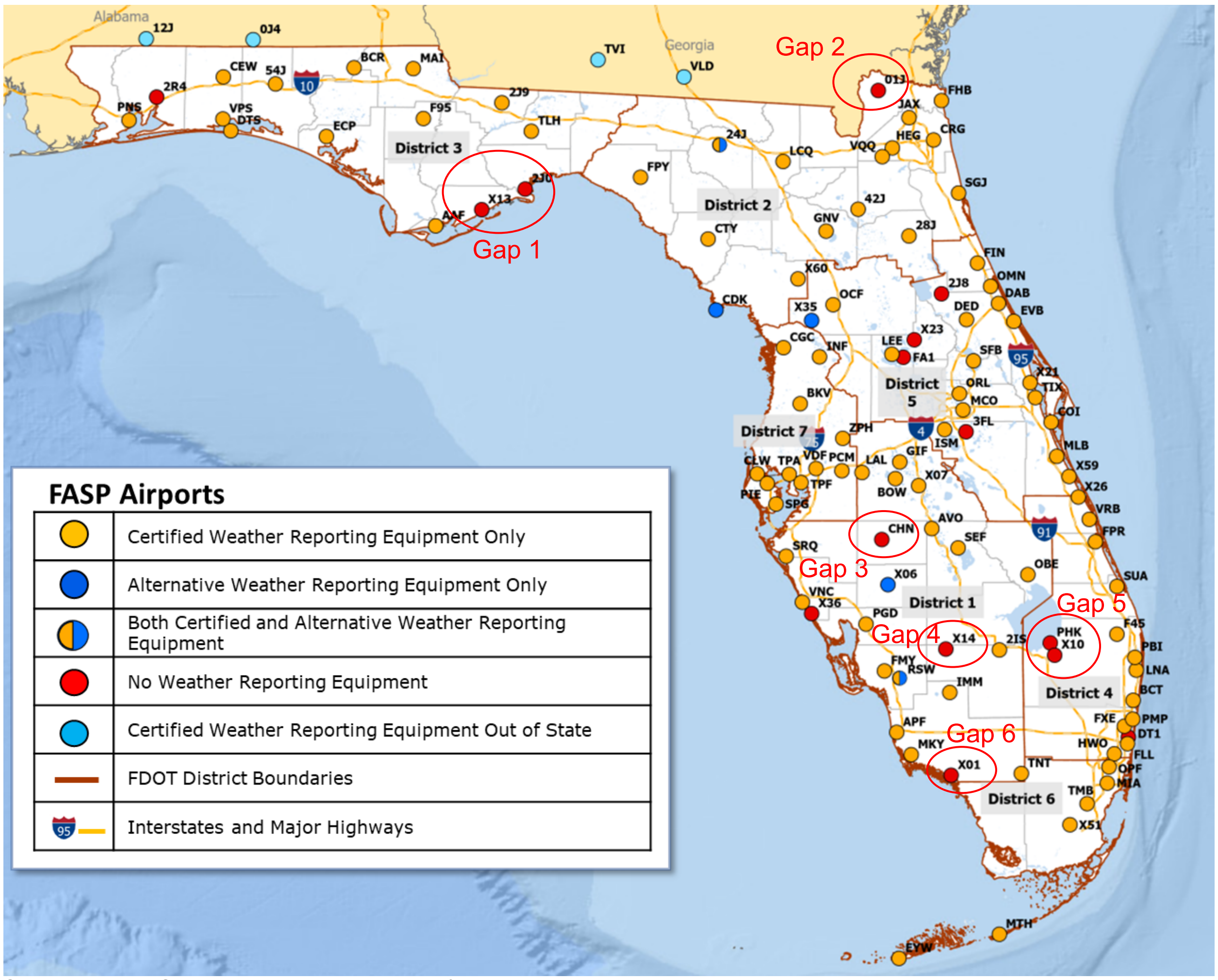
*Airport is in process of obtaining a weather reporting system.
Source: 2043 FASP airport survey, 2023

Figure 8-2 identifies gaps in weather reporting coverage and has red ovals around the airports recommended for automated weather reporting equipment suggesting locations to enhance coverage. Out of the 15 airports lacking automated weather reporting, eight are recommended candidates for automated weather reporting equipment based on their distance from the nearest airport with weather reporting. In all cases, these airports are more than 15 miles from the closest airport with weather reporting.

For those airports identified, an option to improve coverage is to install non-certified weather reporting emerging technology systems. Though these systems cannot be used for official flight planning, they do benefit users by providing weather information useful for preliminary flight planning decisions. Airports with smaller budgets and those not receiving Airport Improvement Program (AIP) funds often find installing FAA-certified AWOS and ASOS systems cost-prohibitive.

Even if only for preliminary flight planning purposes, non-certified emerging technology systems still have great value for the Florida aviation system to enhance weather reporting system coverage. Through these system enhancements, Florida can continue to provide timely and accurate weather information to the many users of its aviation system. For full analysis details, including a complete list of weather reporting systems found at airports in Florida, see **Appendix F – Weather Reporting Systems Initiative**.

Figure 8-2. Gaps in Weather Reporting System Coverage



Source: 2043 FASP airport survey, 2023; Mead & Hunt, Inc., 2023

8.2 Airport Electrification

Airport electrification can include energy generation, transmission, storage, and use cases that are not limited to aircraft. Traditionally, the conversation regarding electrification focused on ways to reduce electrical consumption such as the transition to more energy efficient lighting systems including LED lighting for runway and taxiway lights, navigational aids, and building lighting. Now, however, the conversation is taking on a whole new meaning regarding impacts to air and ground transportation.

Emerging technologies may have significant impacts to airports of all sizes. A global initiative to reduce environmental impacts has a focus on airports to replace air and ground transportation with electric aircraft and vehicles. This section focuses on the latest trends and technology involving electric ground transportation, electric aircraft, and information pertaining to electric capacity and demand for all modes of transportation.

8.2.1 Electric Ground Transportation

The easiest segment of electrification to observe is ground transportation since numerous use cases are already available with electric passenger vehicles in circulation and some airport ground support equipment (GSE) being electric vehicles or hybrids.

The electrification of automobiles on airports is divided into four general categories: airport service vehicles, passenger and employee vehicles, rental vehicles, and transit vehicles. For full details including a description of the technologies and market for each vehicle class and considerations for accommodating these vehicles, see **Appendix G – Airport Electrification Initiative**.

8.2.2 Electric Aircraft

Urban air mobility (UAM) is intended to use automated aircraft to carry goods and people to and from place to place. UAM includes a wide range of vehicle configurations powered by electric and other sustainable fuels.

There are several families of electric aircraft. One is electric conventional takeoff and landing aircraft (eCTOLs), and another family is electric vertical takeoff and landing aircraft (eVTOLs). A third family is typically grouped with eCTOLs, electric short takeoff and landing aircraft (eSTOLs).

Figure 8-3. Harbour Air ePlane, similar to eCTOL.

Source: https://harbourair.com/eplane-update/

Hybrid electric aircraft, which have the potential to increase flight range by comparison, are distinct from purely electric aircraft. Hybrid aircraft may run on conventional aircraft fuel, sustainable aviation fuel (SAF), or hydrogen fuel cells, in addition to battery power. For full details including a description of the technologies and market for accommodating these types of aircraft, see **Appendix G – Airport Electrification Initiative**.

8.2.3 Design Standards and Guidance

Siting and installing electrical charging infrastructure follows a similar process to any airport construction, including submission of FAA Form 7460-1 or a request via the FAA Obstruction Evaluation/Airport Airspace Analysis (OE/AAA) website, so that the FAA can perform an airspace review. FAA Advisory Circular (AC) 150/5300-13B, *Airport Design,* FAA AC 105/5390-2D, *Heliport Design,* and FAA Engineering Brief (EB) 105, *Vertiport Design* are examples of standards to be consulted during planning and design of electrification infrastructure.

An airport will likely want to consider the power supply source needed for improvements to the electrical supply infrastructure to enable fast charging. Staying current on design standards is critical, particularly for airspace surfaces associated with flight corridors, as they are subject to change in response to the evolving flight characteristics of electric aircraft.

To optimize turnaround times, the power to fast charge electric aircraft will be vital. Staying current with updates to design standards as they change with the advances in technology will also be critical.

8.2.4 Electric Vehicle and Aircraft Infrastructure

As airports prepare to meet increasing electrification demands, they will need to consider both ground vehicles, including passenger vehicles and airport vehicles, and aircraft needs. Selection of electric vehicle charging infrastructure for vehicles at airports depends on intended use and type of demand. **Table 8-2** compares the three levels of electric vehicle charging infrastructure for automobiles.

Table 8-2. Comparison of Charging Infrastructure for Automobiles

Characteristics of Charging Infrastructure	Levels of Automobile Charging Infrastructure		
	Level 1	Level 2	Level 3
Voltage	120 Volts	208 or 240 Volts	480 Volts
Power Demand	1.4 kilowatts [kW]	7.7 kW	50-350 kW
Description	Equivalent of a typical electrical receptacle	Most common charging stations due to use of existing infrastructure	Require installation of infrastructure to accommodate demand with a direct current converter
Cost to install (general)	Least expensive	Six times more expensive than Level 1	Most expensive to install
Charging time comparison (general)	Longest charging time	Faster than Level 1	Fastest

Electric aircraft, such as eCTOLs, have more similarities with conventional aircraft than they have differences. Although the design of some aircraft may appear different from traditional aircraft, electric aircraft require minimal changes in airport infrastructure to accommodate electric aircraft facilities. Charging infrastructure needed to support electric aircraft may vary widely based on the frequency and type of operations being conducted at each airport.

Applying levels to infrastructure development for charging electric aircraft, similar to that above for automobiles, has potential given the ongoing development of the electric aircraft and the associated charging infrastructure needs.

8.2.5 Electrification Trends at Florida Airports

One question on the airport survey in Phase 1 asked if individual airports had existing or future electrification plans for automobiles and aircraft. Responses noted in **Table 8-3** and shown in **Figures 8-4 through 8-6** indicate that electric charging stations for automobiles and GSE have established similar footholds at Florida airports, while charging stations for electric aircraft have yet to materialize. This is not surprising because electric aircraft development is still in its early stages. The certification requirements still under development are expected to slow the deployment of electric aircraft for several years, at least.

Two primary considerations for eCTOL and eVTOL aircraft: Does any of the existing physical infrastructure need to change to accommodate electric aircraft operations? What is necessary for the recharging of electric aircraft on the airfield?

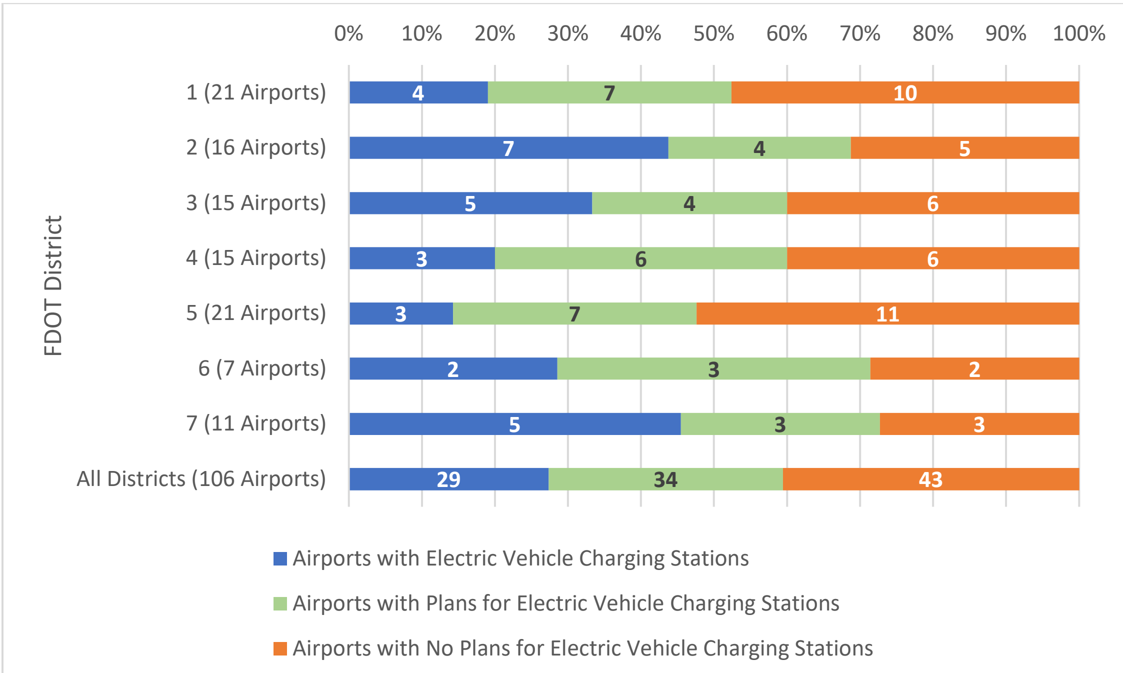
Table 8-3. Airports with Charging Facilities for Passenger Vehicles, Aircraft, and GSE

FDOT District	Number of Airports	Charging for Electric Passenger Vehicles		Charging for Electric Aircraft		Charging for Electric Ground Service Equipment	
		Implemented	Planning	Implemented	Planning	Implemented	Planning
1	21	4	7	0	4	7	3
2	16	7	4	0	4	7	1
3	15	5	4	0	8	2	5
4	15	3	6	0	7	3	2
5	21	3	7	0	9	4	5
6	7	2	3	0	6	1	3
7	11	5	3	0	7	5	2
Total	**106**	**29**	**34**	**0**	**45**	**29**	**21**

Source: FASP 2043 Airport Survey

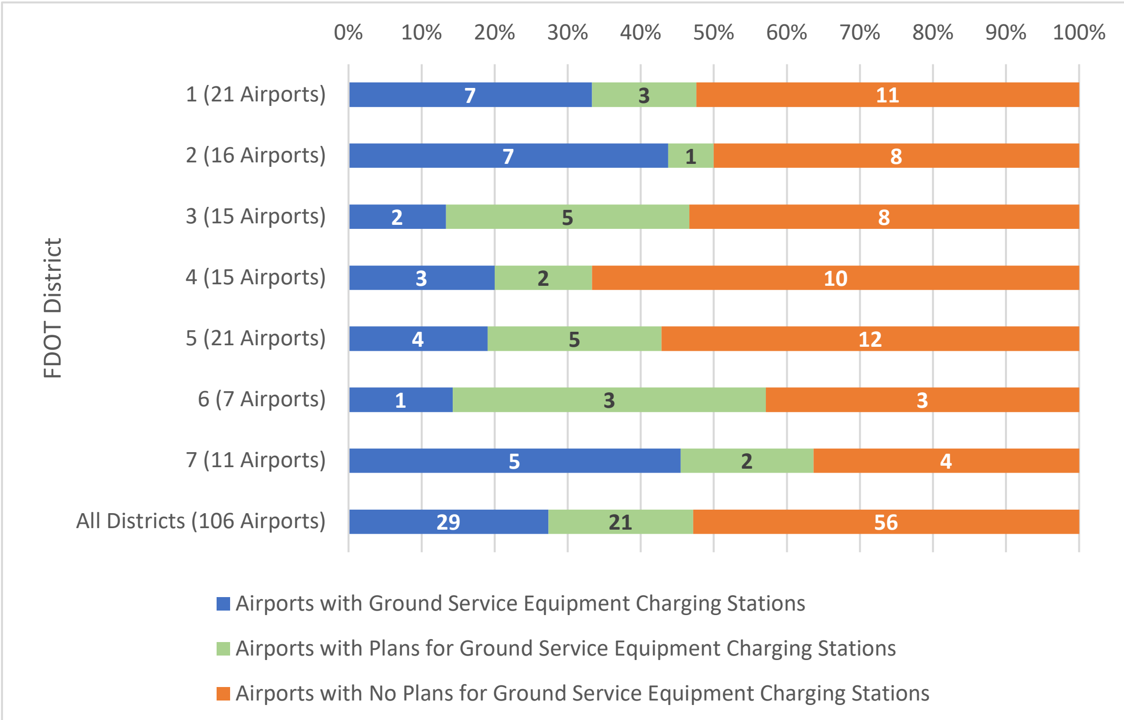
The data summarized in the table and figures indicate Florida's airports are primarily focused on serving electric vehicles, with more than half planning to or already providing charging stations. For charging stations for GSE and electric aircraft, slightly more than 40 percent of Florida's airports are planning to or already provide charging stations (in the case of GSE). For GSE, other forms of propulsion, such as propane powered tugs, may be diverting attention from electrification. For electric aircraft, airports may be waiting for FAA certification before implementing charging stations.

Figure 8-4. Electric Vehicle Charging Station Status at Florida Airports



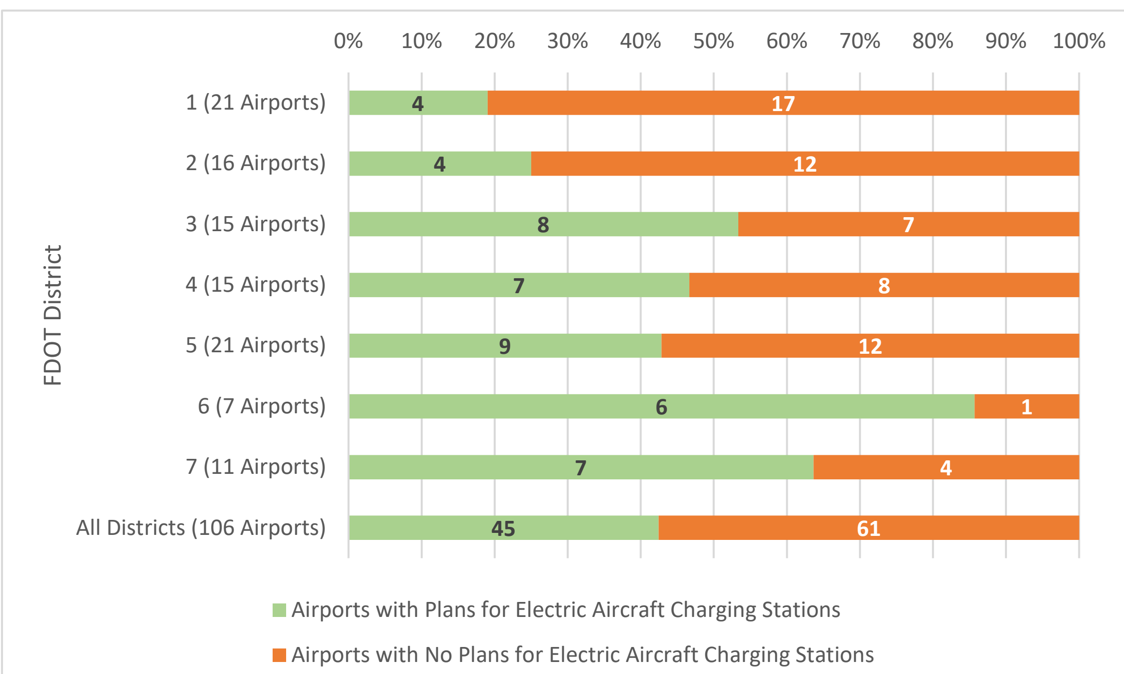
Source: Mead & Hunt, 2023

Figure 8-5. Ground Support Equipment (GSE) Charging Station Status at Florida Airports



Source: Mead & Hunt, 2023

Figure 8-6. Electric Aircraft Charging Station Status at Florida Airports



Source: Mead & Hunt, 2023

8.2.6 Sources of Funding

As with all development projects, three levels of funding sources – federal, state, and local - provide the means to carry out sustainable development.

At the federal level, the FAA has committed to make aviation cleaner, quieter, and more sustainable by 2050 through the *United States Aviation Climate Action Plan* established November 9, 2021. The plan identifies electrification as a way to achieve net-zero emissions and offset carbon. Typical electric projects at commercial airports include the electrification of gates, GSE, geothermal vehicles, and solar hot water systems. Several programs provide funding to airports within the National Plan of Integrated Airport Systems (NPIAS) to incentivize them to reduce emissions.

Potential federal funding sources:

- Voluntary Airport Low Emissions Program (VALE)
- Zero Emission Vehicle (ZEV) Program
- Energy Efficiency Program
- Sustainability Program

*For more details see **Appendix G** and the FAA website.*

8.2.7 Summary of FDOT AO and Electrification of Airports

Electrification is one of many solutions that airports can implement towards the FAA's Sustainability 2050 initiative. Other sustainable fuels like hydrogen and SAF are also options. The FDOT AO may encourage plans for electric aircraft and vehicle electrification through the following recommendations:

- Encourage and help airports plan for electrification infrastructure.
- Be involved with development of eVTOL airways and vertiport siting.
- Encourage airports to electrify vehicle fleets.
- Support initiatives to improve power transmission to airports.
- Evaluate the airport system's performance meeting electrical demands.

Florida airports may need to engage government agencies, the business community, educational partners, utility providers, nonprofit organizations, and residents to develop plans that benefit all stakeholders.

Planning for electrification should follow a process similar to other types of facility planning. The analysis provided as part of this system plan is the beginning. Additional planning entails taking an inventory of what exists, determining future demand, preparing a gap analysis, developing improvements to address deficiencies, and preparing a capital plan factoring in the expenditures and potential revenues. Electric aircraft and vehicles are already operating, and their popularity may continue to increase with time. To account for the lengthy lead time required to update electrical grids, airports and their neighbors should incorporate electrical studies into their planning documents. They should also engage with their stakeholders and utility providers during the planning and implementation processes.

The FDOT AO could assist by encouraging system airports to install electrification infrastructure and help initiate planning exercises to determine the level of demand. The FDOT AO could also help identify the power demands of airports in working with public utilities to understand the improvements in transmission infrastructure that may be needed. Finally, continually evaluating trends and how airports are accommodating the electrification demands will support efforts to focus resources to improve areas of deficiency, which allows Florida's airports to be well positioned to accommodate this growing emerging trend and align with the FAA's Aviation Climate Action Plan.

Additional references and sources for further research are available in **Appendix G – Airport Electrification Initiative.**

8.3 Hangar Vacancy

The availability of hangars for the storage of aircraft within the State of Florida has been talked about anecdotally for years. Everyone acknowledges an inherent need for space but until the FASP 2043, the actual problem has not been documented with an inventory of availability and demand. Based upon the findings of this study, the hangars at nearly every publicly owned (and public use) airport in Florida are at full capacity, leading to waiting lists for hangar storage at most airports. In an article for *Forbes*, Eric Tegler pointed out that prices for new GA aircraft have jumped exponentially between 1970 and 2021. Due to these extreme price increases, which are significantly above the typical rate of inflation, most aircraft owners today are keenly interested in an enclosed hangar to protect their aircraft/investment.

The price of a new Cessna 172 was $12,500 in 1970 and was $432,000 in 2021. Aircraft owners generally want to store their aircraft in an appropriate hangar to protect their investment.

8.3.1 Hangar Inventory

An inventory of the number of T-hangars and box hangars at the 106 publicly owned facilities included in the FASP (103 airports, two seaplane bases, and one heliport) was conducted as part of the survey efforts. The inventory also identified each facility's current T-hangars and box hangar occupancy, as well as the number of aircraft owners seeking hangar storage at each facility.

The results clearly indicate a significant deficiency across the board in available hangar storage. The deficiency will continue well into the future unless hangar development is rapidly accelerated.

8.3.2 Projected 20-Year Hangar Demand by FDOT District & Conclusions

Forecasts of based aircraft produced for the FASP 2043 appear in **Table 8-4**. To analyze the potential 20-year hangar demand for the sample of airports responsive to the survey, the existing number of T-hangar and box hangar units at each FDOT district were increased by the respective forecast average annual growth rate (AAGR) through 2043 (**Table 8-5**). The information in Table 8-5 only represents a cross section of Florida airports, which means it does not represent the potential hangar demand for all 106 facilities included in the FASP. Also, the forecast for hangar demand neither considers the immediate needs to construct hangars to satisfy based aircraft waiting lists, nor does it consider changing trends in based aircraft storage practices (i.e., the current T-hangar, box hangar, and apron tiedown storage preferences were held constant beyond 2023). The data collection methodology and results, including a detailed table that presents the hangar availability and occupancy for T-hangar units and box hangar units for all 106 airports in the FASP, are documented in greater detail in **Appendix H – Hangar Demand Initiative**.

Figure 8-7. New Smyrna Beach Municipal Airport Hangars – 100 Percent Occupancy

Source: New Smyrna Beach Municipal Airport

Table 8-4. FASP 2043 Forecast of Based Aircraft (2023-2043)

FDOT District	2023 Based Aircraft	2043 Based Aircraft	AAGR 2023-2043
1	2,425	3,062	1.17%
2	1,347	1,609	0.89%
3	777	888	0.67%
4	3,937	5,491	1.68%
5	2,346	2,947	1.15%
6	385	449	0.77%
7	1,412	1,673	0.85%
Total	12,629	16,119	1.23%

Notes: FDOT-Florida Department of Transportation, AAGR - Average Annual Growth Rate.

Source: AVCON, INC. and FASP 2043.

Table 8-5. Forecast of Additional T-Hangar & Box Hangar Needs by 2043

FDOT District	2043 New T-Hangar Units	2043 New Box Hangar Units
1	435	66
2	113	16
3	80	23
4	386	67
5	315	84
6	28	6
7	151	15
Total	1,509	276

Notes: FDOT-Florida Department of Transportation.
Source: AVCON, INC.

Based on this analysis, hangar demand is anticipated to be at least 1,509 T-hangar units and 276 box hangar units to accommodate based aircraft hangar demands by 2043, but the actual requirement is likely higher and more immediate considering the sample size of airports that were analyzed.

8.4 Stormwater Management Plans

The FDOT AO has a Statewide Airport Stormwater Management Program that is intended “to improve airport safety by reducing wildlife attractants, while meeting all state and federal water quality and water management requirements.” In support of the program, the FDOT AO conducted the Florida Statewide Airport Stormwater Study, a multi-year study completed in 2005 and revised in 2008, to evaluate stormwater systems at airports throughout the state. Following the 2008 revision, the FDOT AO prepared the *Statewide Airport Stormwater Best Management Practices Manual* (BMP Manual) in 2013 to identify effective strategies and procedures for managing and improving stormwater systems at airports.

8.4.1 Stormwater Management Plan Inventory and Data Collection Results

Over the years, several airports in Florida have developed Stormwater Management Plans (SWMPs) either as stand-alone documents or in conjunction with other planning and design efforts. By conducting an inventory of SWMPs for the FASP 2043, the FDOT AO gained a listing of all Florida airports that have recently updated SWMPs by FDOT district and by airport classification as identified in the FAA’s NPIAS or by non-NPIAS classification. No specific SWMPs nor their effectiveness were reviewed. This inventory also did not intend to provide recommendations for new best management practices for airports and consultants to consider in new SWMPs.

The data collection occurred through the airport survey effort during Phase 2. Responses were received from all 106 facilities, from which a total of 57 respondents indicated they have made recent updates to their SWMP. All 57 affirmative responses came from airport facilities included in the NPIAS (i.e., no non-NPIAS airports, no seaplane bases, and no heliports). The data indicates that 54 percent of all facilities included in the FASP have made recent updates to their SWMPs. **Table 8-6** breaks down Florida airports with SWMPs by NPIAS Commercial Service Airports, NPIAS General Aviation (GA) Airports, and Non-NPIAS Airports. **Table 8-7** presents a listing by district of airports that reported having recently updated SWMPs.

Table 8-6. Summary of Airports in Florida with SWMPs by NPIAS Classification

NPIAS Classification	Number of Airports	Number with SWMPs	% with SWMPs
NPIAS Commercial	21	16	76%
NPIAS GA	78	41	53%
Non-NPIAS	7	0	0%
Total	**106**	**57**	**54%**

Notes: GA-General Aviation, NPIAS-National Plan of Integrated Airport Systems, SWMP-Stormwater Management Plan.
Source: AVCON, INC.

Table 8-7. Summary of Airports in Florida with SWMPs by FDOT District

FDOT District	Number of Airports	Number with SWMPs	% with SWMPs
1	21	10	48%
2	16	6	38%
3	15	9	60%
4	15	7	47%
5	21	11	52%
6	7	6	86%
7	11	8	73%
Total	**106**	**57**	**54%**

Notes: FDOT-Florida Department of Transportation, GA-General Aviation, SWMP-Stormwater Management Plan
Source: AVCON, INC.

Table 8-8 separates the airports by NPIAS classification with recently updated SWMPs as reported in the FAA's 2023-2027 NPIAS; 100 percent of Primary Large Hub Commercial Service Airports and Primary Small Hub Commercial Service Airports have recently updated SWMPs. No non-NPIAS airports, seaplane bases, or heliports have recently updated SWMPs.

Table 8-8. Summary of Airports in Florida with SWMPs by NPIAS Classification

NPIAS Classification	Number of Airports	Number with SWMPs	% with SWMPs
Primary CS Large Hub	4	4	100%
Primary CS Medium Hub	3	1	33%
Primary CS Small Hub	8	8	100%
Primary CS Non Hub	4	2	50%
Commercial Service (CS) National	2	1	50%
Reliever National	5	3	60%
Reliever Regional	10	6	60%
Reliever Local	2	1	50%
GA National	5	4	80%
GA Regional	24	13	54%
GA Local	23	13	57%
GA Basic	7	0	0%
General Aviation (GA) Unclassified	2	1	50%
Non-NPIAS	7	0	0%
Total	**106**	**57**	**54%**

Notes: NPIAS-National Plan of Integrated Airport Systems, SWMP-Stormwater Management Plan.
Source: AVCON, INC.

8.4.2 Next Steps for SWMPs

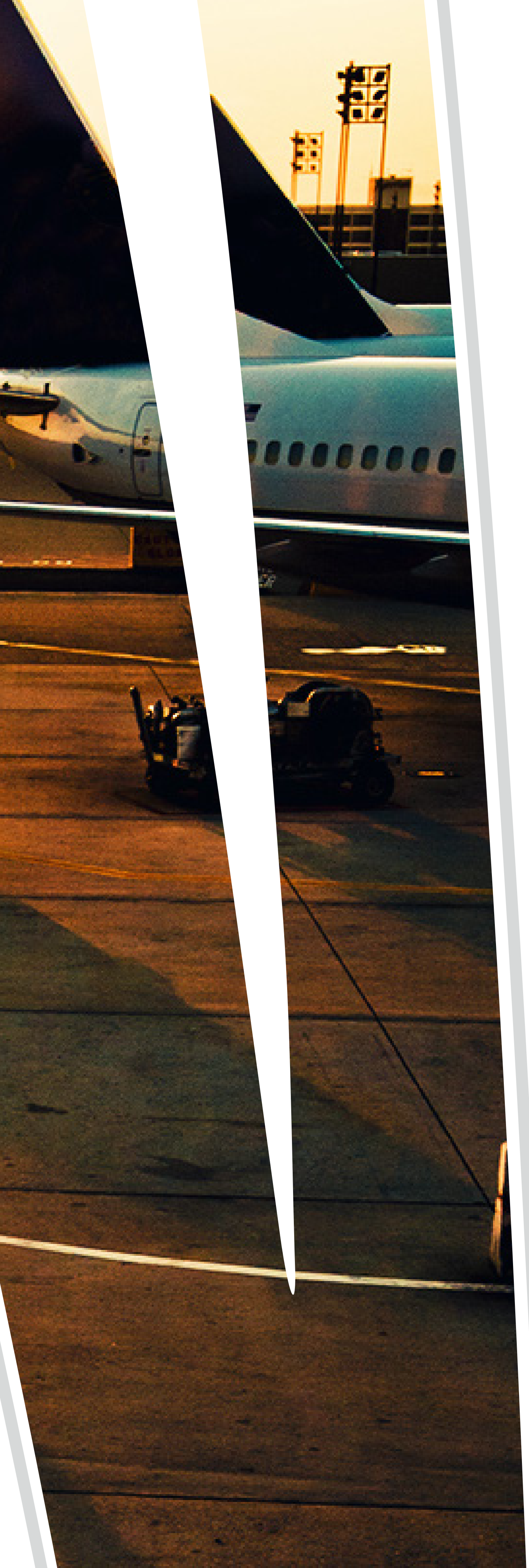
This inventory provides the FDOT AO with information to facilitate discussions with airport sponsors about future airport drainage improvements and updates to SWMPs. SWMPs are eligible for funding through the FAA's AIP as well as the FDOT's Aviation Grant Program. Because Florida is vulnerable to the negative impacts from stormwater, it is important that airports keep their SWMPs up to date and consider the potential long-term vulnerabilities in conjunction with the demand for future aviation development. Full details of the stormwater management plan inventory and analysis appear in **Appendix I – Stormwater Management Program Initiative**, including a table that shows all 106 facilities, and whether they have a recently updated SWMP as well as a date if such was provided**.**

Florida's extensive coastline, rainy summers, history of hurricane events, rapid growth, and low elevations make it vulnerable to negative stormwater impacts. Up-to-date SWMPs prepare airports to respond during catastrophic weather events.

8.5 Summary of Aviation Office Initiatives

Emerging and ongoing trends often represent significant impacts to safe and efficient operations as well as growth for airports. As the data collection efforts occurred for the FASP 2043, several topics surfaced frequently enough to be distinguished as a pattern and identified as trends worth further analysis and potential incorporation into the FASP 2043.

Initially, eight topics emerged, but through additional discussion with stakeholders and the FASP Input Team (FIT) team, the FDOT AO narrowed the list to the four trends discussed in this chapter. Each of these areas represents opportunities for Florida airports to pursue near-term improvements and development to enhance safety, efficiency of operations, and service to the population of Florida as well as its visitors. Full details of the analyses for all topics are available in **Appendices F through M**.



9 Funding

Chapter 9
Funding

Florida system airports have several means by which they can fund their capital and infrastructure projects. This chapter summarizes the principal forms of funding available to Florida's system airports, grouped by the source: federal, state, or local.

9.1 Federal Sources of Airport Funding

Several sources of federal funding are available to airports. This section summarizes available grant funding under the Federal Aviation Administration's (FAA's) Airport Improvement Program, a supplemental appropriation to the Airport Improvement Program, and the Bipartisan Infrastructure Law.

9.1.1 Airport Improvement Program (AIP)

AIP grants provide funding for 90 to 95 percent of eligible project costs at small hub primary, reliever, and general aviation airports.

The largest source of federal funding for airports is the AIP created by the *Airport and Airway Improvement Act of 1982*. The FAA administers AIP per Chapter 471 of Title 49 of the United States Code. The AIP is used to assist in the development of public-use airports served by air carriers, commuters, air cargo, and general aviation. The FAA awards AIP funding for eligible airport projects, including planning, airfield construction, navigational aids (NAVAIDs), and environmental mitigation. AIP grants provide funding for 90 to 95 percent of eligible project costs at small hub primary, reliever, and general aviation airports. At large and medium hub primary airports, AIP funds can cover 75 percent of eligible costs. The local sponsor is generally responsible for funding any remaining costs and must provide matching funds to receive an AIP grant.

AIP is awarded through two mechanisms based upon level of activity (entitlements) and project prioritization process (discretionary). Entitlement funding can be accumulated over a period of four years but must be spent by the end of the fourth year. An airport must return any unused, accumulated funds by the four-year deadline to the AIP program, and then the funds are awarded to other airports. The FAA awards discretionary funding, however, on a case-by-case basis. The FAA bases the decision on its priority formulas defined in the AIP handbook. Airports must compete with one another for a limited amount of available funding to acquire discretionary funds.

9.1.2 Supplemental Discretionary Grant Funding

In 2022, the FY2022 Appropriations Act provided additional supplemental discretionary grants for airports through two programs, the Supplemental Discretionary Grants and Community Project Funding.

The Supplemental Discretionary Grants program made more than $547 million in supplemental AIP grant funding available for airports. The FAA awarded $268.7 million with distribution taking place from FY2022 to FY2024. The FAA plans to award another $272.2 million through the FY 2025 timeframe.

Through Community Project Funding, the FAA awarded $279.2 million in grants in FY2022, of which Florida airports received $4 million. In FY2023, FAA awarded $283.6 million with $10 million going to Florida airports.

9.1.3 Bipartisan Infrastructure Law Funding

In addition to AIP funding, the FAA also administers three funding programs under the Bipartisan Infrastructure Law (BIL), started in FY2022 and authorized to continue until FY2026. The first of these is the Airport Infrastructure Grant (AIG) Program, which is aimed at projects eligible under AIP. The program has an annual allocation of approximately $2.89 billion. For FY2024, more than $252 million was allocated to Florida airports.

Under the five year BIL, the FAA administers three programs: the Airport Infrastructure Grant Program, the Airport Terminal Program, and the Contract Tower Competitive Grant Program.

The next program under BIL is the Airport Terminal Program (ATP), which funds terminal development, airport rail access, and improvements to airport-owned air traffic control towers, including relocating them. In FY2024, with approximately $1 billion available, more than $112 million was awarded to Florida airports, with $109 million going to commercial service airports, and $3.45 million going to general aviation airports.

The final BIL program is the FAA Contract Tower Competitive Grant Program. This program seeks to improve and modernize contract air traffic control towers in the U.S. In FY2023, two Florida airports received grant money from this program for a total of $825,000. In FY2024, the FAA plans to award $20 million under this program.

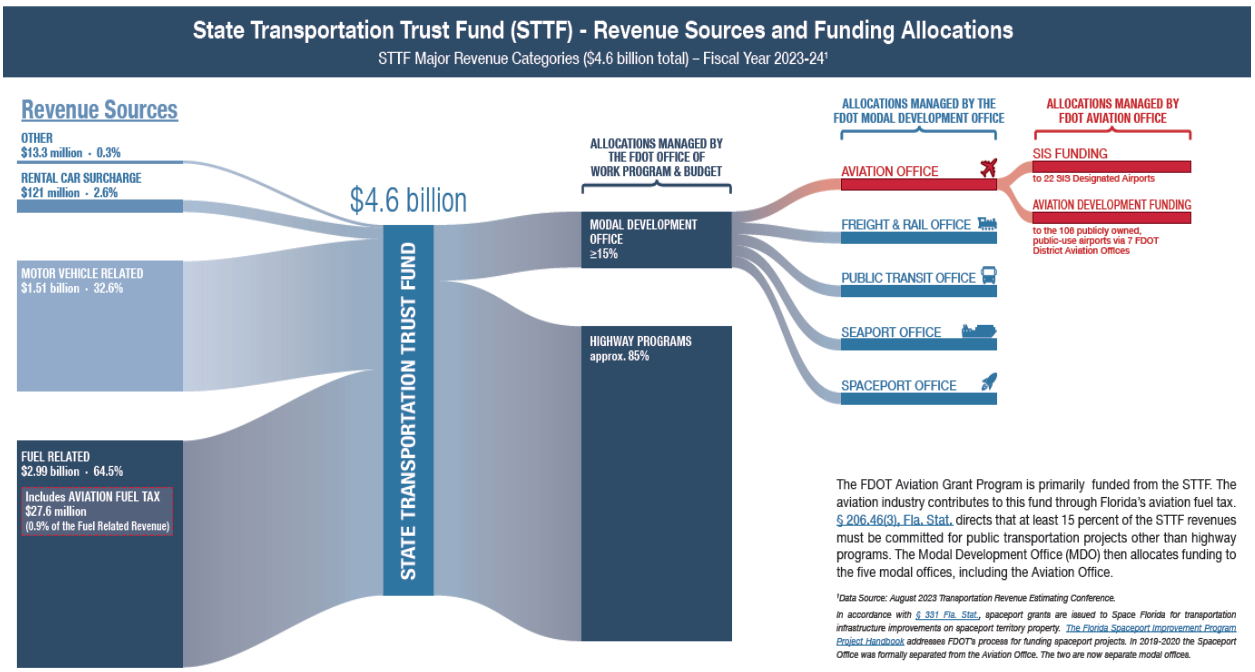
9.2 State Sources of Airport Funding

Florida has a number of funding programs to support airport development for both commercial service and general aviation airports. The primary source of state funding is the Florida Aviation Grant Program, run by the Florida Department of Transportation Aviation Office (FDOT AO). This program provides grants that assist airports to build and maintain runways and taxiways, remove airport hazards, protect the airspace around Florida airports, develop airport plans, acquire land for airports, purchase certain airport equipment, and build terminals and other airport facilities. The FDOT AO also administers grants awarded to airports in the Strategic Intermodal System (SIS). These programs, along with other programs outside of the FDOT AO, are also available to Florida airports, and are described below in more detail.

9.2.1 State Transportation Trust Fund (STTF)

As shown in **Figure 9-1**, the STTF provides funding for Florida's public transportation projects. Fuel and motor vehicle related taxes and fees are the primary revenue sources to the STTF. Approximately 85 percent of STTF funds are allocated to highway programs, and a minimum of 15 percent of STTF funds are allocated to the five modal offices, including the FDOT AO. Funding managed by the FDOT AO is first allocated to the FDOT Office of Work Program & Budget, and then the Modal Development Office before it is passed to the FDOT AO for distribution. With these funds, the FDOT AO distributes grants for the Florida Aviation Grant Program and SIS. Typically, the FDOT AO may provide up to 50 percent of project costs at commercial service airports, or up to 80 percent of project costs at general aviation airports. When FAA funding is involved with the project, these percentages apply only to the remaining non-federal share of the project costs.

Figure 9-1. State Transportation Trust Fund

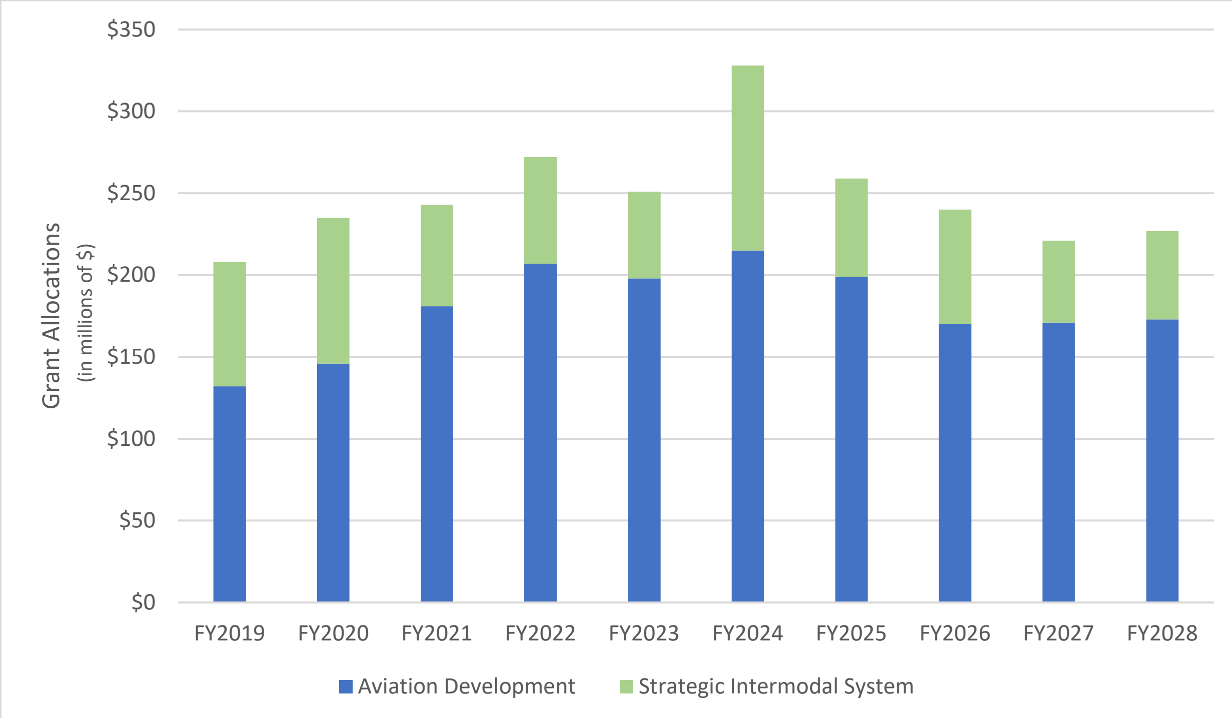


Source: 2024 Florida Aviation Project Handbook

A tax of 4.27 cents per gallon on aviation fuel helps to fund the STTF. Most of this aviation fuel tax revenue, 92 percent, goes to the STTF. The other 8 percent is deposited in the general revenue fund.

Figure 9-2 shows that from FY2019 projecting to FY2028, the Florida Aviation Grant Program will distribute between $132 million and $215 million annually. The SIS program is expected to allocate between $50 million and $113 million annually during that same time period.

Figure 9-2. FDOT Aviation Grant Allocations, FY2019 to FY2028



Source: 2024 Florida Aviation Project Handbook

9.2.2 State Infrastructure Bank (SIB)

The SIB can provide loans, but not grants, to airports for eligible projects through two separate accounts. The federal account uses federal money matched with state money to provide capital for lending to airports. The state account uses state funds and state bond proceeds to capitalize the loans made.

9.2.3 Transportation Regional Incentive Program (TRIP)

The TRIP provides state matching funds for projects that improve regionally significant transportation facilities. TRIP funds can match up to 50 percent of the non-federal share of public transportation project costs.

9.2.4 Economic Development Transportation Fund (EDTF)

The EDTF, also called the "Road Fund," is intended to assist with incentivizing high-wage industries to come to Florida or to remain in the state. The funding is used for improving transportation facilities, including airport infrastructure, that are bottlenecks to the expansion or relocation of a desired company.

9.2.5 Rural Economic Development Initiative (REDI)

The REDI funds certain rural counties and communities. Airports located in these rural counties and communities may request a reduction in their local match requirements for projects.

9.2.6 Secure Airports for Florida's Economy (SAFE) Funds

The SAFE program funds security-related projects at Florida system airports. Training costs for airport security personnel and airport management are also eligible under this program.

More information on Florida airport grant funding can be found on FDOT's Aviation Grant Funding webpage (www.fdot.gov/aviation/flpub.shtm/aviation-grant-program), which also has a link to the *FDOT Aviation Project Handbook*.

9.3 Local Sources of Airport Funding

Sources of local airport funding depend upon the type of airport, with commercial service airports generally having better access to funding mechanisms than general aviation airports.

9.3.1 Passenger Facility Charges (PFCs)

Commercial airports are able to generate local funding through the imposition of PFCs. Under the Aviation Safety and Capacity Expansion Act of 1990 and Title 14 of the Code of Federal Regulations (CFR), Part 158, commercial service airports are authorized to collect a fee from each enplaned passenger to be used towards AIP-eligible projects.

PFCs are collected from enplaning passengers and are used to finance all or portions of capital improvements that are approved by the FAA through an application process. To be eligible for PFC funding, FAA requirements state that a project must preserve or enhance safety, security, or capacity of the national air transportation system; reduce or mitigate airport noise from an airport; or provide opportunities for enhanced competition between or among air carriers. This funding mechanism helps an airport raise local funds for improvement projects that can be used with other federal and state resources. Federal regulations allow an airport to collect a PFC fee of up to $4.50 per enplaned passenger.

All 19 commercial service airports in Florida collect a PFC. With the exception of Eglin AFB/Destin-Ft. Walton Beach (VPS), all of these airports impose the maximum of $4.50 PFC allowed. VPS is one of the few airports in the U.S. that imposes a $3.00 PFC. More information is available on the FAA's website at www.faa.gov/airports/pfc.

All 19 commercial service airports in Florida collect a passenger facility charge.

9.3.2 Airport Generated Revenue

Any revenue generated by the airport can only be used for airport-related projects. Generally, airport revenue is first used to pay for day-to-day operational expenses, and any excess revenue can be put toward capital projects. At commercial service airports, these sources of revenue include rents from air carriers, concessionaires, Fixed Based Operators (FBOs), and hangar tenants as well as landing fees from aircraft operations and automobile parking charges. Funds generated from these sources are not subject to federal or state requirements limiting their applicability and can be used to fund all improvement projects at an airport. Revenue available from these sources is most beneficial for projects that are not eligible to receive federal or state funding as well as those that are only able to take advantage of a limited portion of available federal or state funds.

General aviation airports tend to have fewer revenue sources than commercial airports, and, as a result, often do not have excess revenues after paying for operating expenses. It is not unusual for a general aviation airport to need an operating subsidy from its sponsor.

9.3.3 Bonds

Commercial service airports also may have the option of raising capital by issuing bonds. Typically, these bonds are secured by the airport's revenues, either of the entire airport, or a specific revenue stream if the bonds are for a particular project. Referred to as revenue bonds, there are some cases where the airport uses its PFC revenue to guarantee a revenue bond, thereby leveraging the PFC revenue to make it all available up front instead of using it only after it gets collected.

General aviation airports generally do not make use of revenue bonds because they usually do not have sufficient excess revenues to cover the interest and principal payments for a bond.

For airports owned by municipalities, the taxing authority of the municipality can be used to guarantee the bond. This type of bond, called a general obligation bond, is also available to general aviation airports owned by municipalities, although it is not commonly used.

9.3.4 Sponsor Funding

For airports that are owned by sponsors that can draw on other sources of revenue (typically municipalities), they have the option of turning to their sponsor for local funding of capital projects. This is very common for general aviation airports and can be the case for smaller commercial service airports.

9.4 Florida Airports Funding Needs

Florida system airports are required to maintain a list of requested capital projects in the Joint Automated Capital Improvement Program (JACIP) for these projects to be eligible for grant funding. **Table 9-1** shows the amounts requested by Florida system airports for 2024 to 2028. When airports submit these requests in JACIP, they indicate the sources from which they are requesting the funding to cover the costs of each project-–federal, state, and/or local. As indicated in **Table 9-1**, the combined requests from federal, state, and local funding sources comprise the total airport development needs of the Florida airport system. These needs range from $1.7 billion to nearly $3.0 billion per year over the next five years.

Table 9-1. Florida System Airports Funding Requests, 2024 to 2028

Requested Funding Source	2024	2025	2026	2027	2028
Federal Grant Funding	$1,120,306,871	$1,457,642,769	$1,075,933,388	$625,065,400	$1,170,912,628
State Grant Funding	$550,354,662	$441,542,916	$376,908,843	$481,110,784	$362,906,384
Local Share	$1,081,043,288	$1,058,424,262	$957,094,628	$596,281,293	$390,675,592
Total Cost of Airport Development Needs	**$2,751,704,821**	**$2,957,609,947**	**$2,409,936,859**	**$1,702,457,477**	**$1,924,494,604**

Source: JACIP

Meeting these needs depends on the funding available from each source. While future allocations from federal and local sources are unknown, FDOT sets grant funding allocation targets for the Aviation Development Program (ADP) and the SIS in its 5-year Work Program. **Table 9-2** compares the requested state grant funding amounts in JACIP to the planned state allocations in the FDOT Work Program for the 5-year period 2024-2028.

Table 9-2. State Funding Requested and Allocated to Florida System Airports, 2024 to 2028

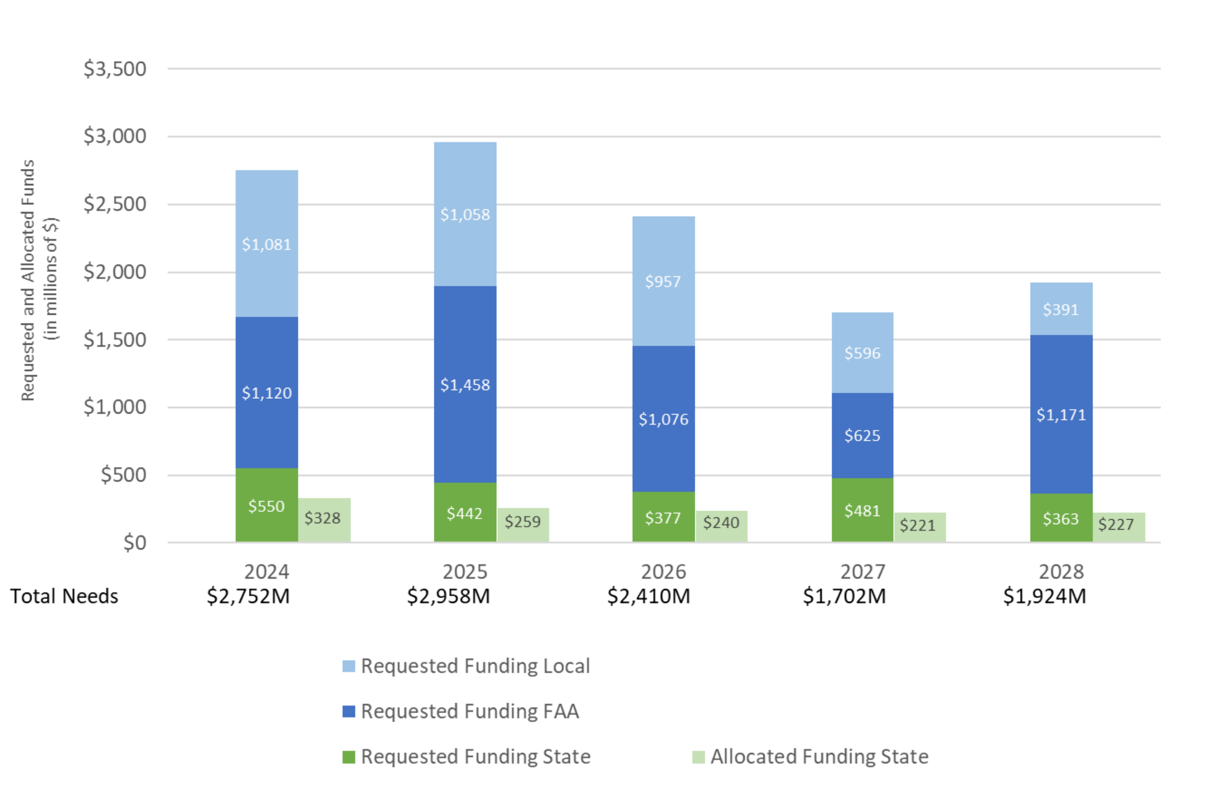
	2024	2025	2026	2027	2028
State Grant Funding Requested Amount	$550M	$442M	$377M	$481M	$363M
State Grant Funding Allocated Amount	$328M	$259M	$240M	$221M	$227M
Difference (Requested – Allocated)	**$222M**	**$183M**	**$137M**	**$260M**	**$136M**

Source: JACIP and FDOT Work Program

As indicated in **Table 9-2**, requested amounts exceed planned allocations every year from 2024 to 2028. The difference is greatest in 2027, reaching $260 million, but falls to the lowest difference in the following year to $136 million.

Figure 9-3 shows the funding requests from Florida system airports from 2024 to 2028, along with how much funding FDOT plans to allocate to airports for each of those years, shown alongside the stacked bar graph.

Figure 9-3. Florida Airport Funding Requests Compared to Funding Allocations, 2024 to 2028



Source: JACIP and FDOT Work Program

While the amount of FDOT grant funding allocated for aviation development projects is quite substantial, the funding requested from the state always surpasses what FDOT plans to allocate each year.

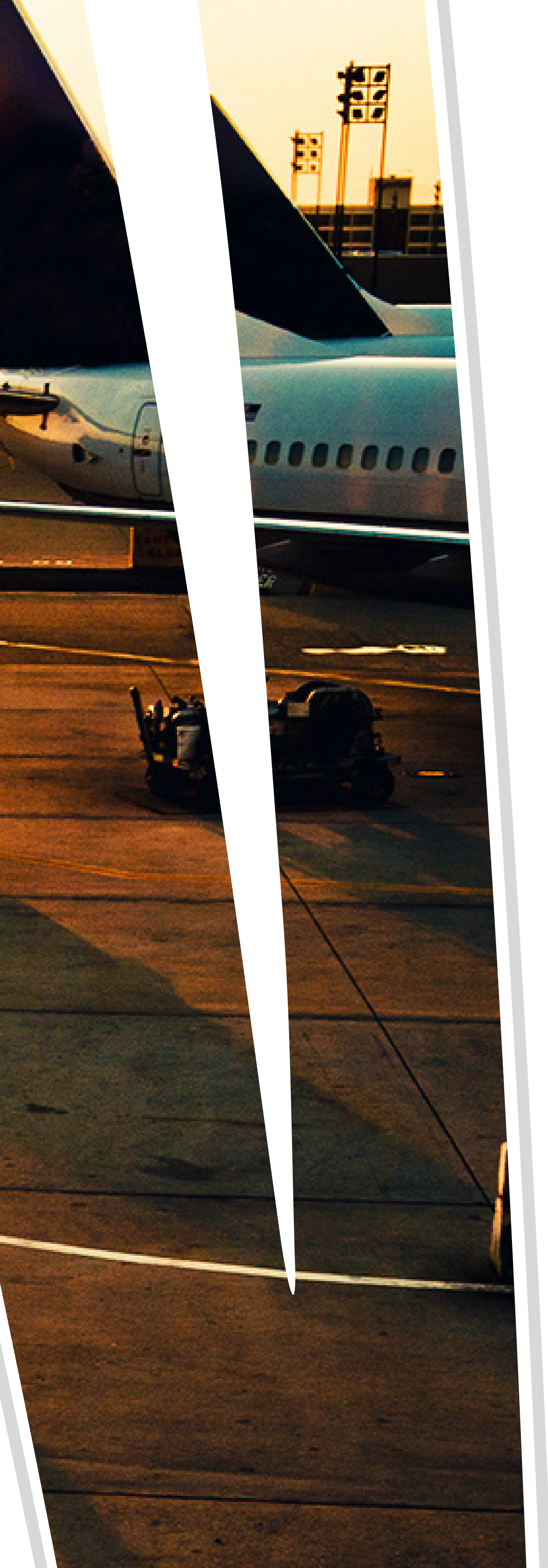
9.5 Summary

Florida airports have a variety of capital project funding sources available to them at the federal, state and local levels. At the federal level, the FAA's AIP grants along with supplemental AIP appropriations provide a substantial resource for Florida's airports. BIL funding is expected to also benefit Florida airports until FY2026.

A significant amount of airport capital funding comes from the FDOT AO Aviation Development Program and SIS. Both of these programs have a history of providing needed funding to airports in the Florida system. In addition to these funding sources, Florida also makes other financial resources available to airports, including the EDTF funds, SAFE funds, and the SIB.

Finally, funding from local sources, either generated by the airports themselves or provided by the airport sponsor, plays a critical role in maintaining and improving the infrastructure of Florida's airports. Nevertheless, data from the JACIP shows that annual airport development needs over the next five years exceed $1 billion, with requested funding approaching $3 billion in 2025. The portion of these needs requested from Florida consistently exceeds what FDOT plans to allocate to airports through 2028.

The gap between the requested funding shown in the JACIP and what FDOT allocates means either more state funding will be necessary, federal or local sources must be used to make up the difference, or airport development projects will be deferred or canceled.



10 Recommendations

2043 FASP FLORIDA AVIATION SYSTEM PLAN

Chapter 10
Recommendations

The Florida Aviation System Plan 2043 (FASP 2043) included an extensive inventory and survey of the Florida airport system that provided a baseline for analysis of the performance of the system airports and the system as a whole. The Florida Department of Transportation Aviation Office (FDOT AO) also specified four topics for in-depth investigation and assessment. The FDOT AO will continue its oversight and monitoring of the Florida airport system using the results of this material.

FDOT District Aviation Coordinators collaborate closely with the system airports in their Districts when it comes to prioritizing airport capital projects and the associated funding. With this in mind, this chapter recommends areas where airport system improvements could be made and raises issues for discussion among the Districts and airports to facilitate the collaborative decision-making described.

These recommendations stem from the analysis and initiatives presented in earlier chapters. The analyses looked at the classifications within the National Plan of Integrated Airport Systems (NPIAS), performance of the overall airport system, subcomponents of the system, and individual system airports. The improvements for each category are explained in more detail in this chapter. With these recommended improvements based on a system-level analysis, they will need independent analysis at the individual airport level. This is particularly true since any planned airport improvement needs to be on an approved airport layout plan with sufficient justification documented to be eligible for state or federal funding assistance. Inclusion in this system plan can aid in the justification but may not be sufficient on its own.

The recommendations are based on evaluation of the NPIAS, the analysis of performance measures, geographic coverage, and the four initiatives identified by the FDOT AO.

10.1 Recommendations from NPIAS Evaluation

Chapter 3 – Airport System NPIAS Classifications evaluated the eligibility of the Florida system airports to maintain their NPIAS classification and for the eligibility of the seven non-NPIAS system airports to be added to the NPIAS.

The primary takeaway from this analysis was the importance of maintaining current based aircraft counts at both NPIAS and non-NPIAS system airports. NPIAS classifications, which the Federal Aviation Administration (FAA) uses for some types of funding allocations, relies on verified based aircraft counts. The FAA updates its NPIAS report every two years using data that it gathers in December. It is in every airport's best interest to ensure that the data the FAA gathers in December is as accurate and up-to-date as possible, especially at those airports where the based aircraft count is near the threshold of a classification. These are the key based aircraft thresholds, as taken from the FAA Order 5090.5 Formulation of the NPIAS and the Airport Capital Improvement Program, last updated September 3, 2019:

- 11 based jets (National Airport threshold)
- 1 based jet or 100 based aircraft (Regional Airport threshold)
- Reliever airports with 90 based aircraft (Regional Airport threshold)
- 15 based aircraft (Local Airport threshold)
- 10 based aircraft (Basic Airport threshold)
- 4 based helicopters (Basic Heliport threshold)

NPIAS classifications are critical for eligibility for some FAA funding allocations. It is in every airport's best interest to routinely report based aircraft data promptly and accurately.

Since based aircraft are not the only criteria used for NPIAS classifications, airports should also endeavor to monitor the operational statistics that could govern their NPIAS classification and correct any errors expeditiously. The operational statistics that FAA uses for NPIAS classifications include:

- Instrument operations.
- International flights.
- Interstate departures.
- Enplanements.
- Landed cargo weight.
- Domestic flights over 500 miles.

Competition for funding from the FAA is only expected to increase, so it is in an airport's best interest to remain cognizant of its NPIAS status and maintain the data that is critical for its NPIAS evaluation.

10.2 Recommendations from Performance Measures

Chapter 7 – System Analysis assessed a large number of performance measures, providing a number of metrics to assess how Florida system airports are performing. This section outlines recommendations stemming from the analysis of performance measures.

The FDOT AO intends to discuss these findings with FDOT District personnel to assist with identifying priorities for initiatives and funding decisions. To aid in that discussion, this section highlights areas of the system analysis that FDOT can influence.

10.2.1 FAA Airfield Design Standards

From a safety perspective, the system analysis identified a number of airports with primary runways and primary taxiways that currently do not meet FAA standards. **Table 10-1** lists the number of airports by FDOT District that have primary runways and taxiways that currently do not meet FAA standards. For the identified primary runways, most airports indicated runway protection zones (RPZs), or Part 77 surfaces, did not meet FAA standards. A small number of airports indicated that their runway safety areas (RSA) were inadequate.

Table 10-1. Florida System Airports with FAA Design Standard Issues

FDOT District	Number of System Airports in District	Airports with Primary Runways not Meeting FAA Standards	Airports with Primary Taxiways not Meeting FAA Standards	Airports with FAA Designated Hotspots
1	21	12	1	4
2	16	5	0	3
3	15	9	2	2
4	15	7	1	8
5	21	6	2	4
6	7	6	0	2
7	11	6	1	1
Total	**106**	**51**	**7**	**24**

Source: FASP 2043 Airport Survey

It is recommended that FDOT, the FAA, and individual airports continue to address these primary runway related issues with the goal of reducing, eliminating, and/or effectively mitigating them. Doing so enhances safety and, in the cases of tree obstructions penetrating Part 77 surfaces, prevents tree growth from negatively impacting operations or further degrading operations at impacted airports.

As noted in **Table 10-1**, only seven airports reported their primary taxiways not meeting FAA design standards. These taxiways fell short of taxiway safety area or taxiway object free area standards.

Finally, **Table 10-1** also shows the number of airports by FDOT District with FAA-designated hot spots.

Additional recommendations for consideration include:

- Consolidate airfield projects--A recommended strategy is to identify those hot spots that can be corrected while also addressing shortcomings in the primary runway or taxiway, thereby leveraging project dollars to the maximum extent possible.
- Continue to emphasize obstruction removal—Encourage airports to maintain clear approaches, which may be addressed with more proactive approach evaluations and on-going mitigation projects.

10.2.2 Pavement Maintenance

The system analysis demonstrated that the Florida airport system is a fairly mature, well-developed system, but the downside to a well-developed system is the effort required to maintain the system. A significant maintenance item is the upkeep of pavement at system airports. FDOT should plan to address the rehabilitation needs of the less than 20 percent of primary runways reported as having a pavement condition index (PCI) value under 70 (**Table 10-2**).

Primary taxiways and primary aprons also need maintenance consideration. More airports have primary taxiways and aprons in need of rehabilitation than primary runways, so FDOT will need to carefully consider which pavement maintenance projects to prioritize.

Table 10-2. Florida System Airports Needing Pavement Rehabilitation

FDOT District	Number of System Airports in District	Airports with Primary Runway PCI < 70	Airports with Primary Taxiway PCI < 70	Airports with Primary Apron PCI < 70
1	21	1	6	4
2	16	4	5	6
3	15	3	6	6
4	15	4	1	2
5	21	4	5	7
6	7	4	3	4
7	11	0	2	5
Total	**106**	**20**	**28**	**34**

Source: FASP 2043 Airport Survey and AVCON

10.2.3 Backup Power

The analysis of backup power systems for the airport terminal, runway lighting, and fueling found that a number of airports lacked these facilities. **Table 10-3** identifies the number of airports without backup power systems by FDOT District. It is recommended that FDOT prioritize assisting these airports with acquiring backup power systems to enhance their operational reliability during times of emergency, with hurricanes being a notable concern.

Additional recommendations for consideration include:

- Prioritize hurricane prone areas—With the prolonged power loss that frequently accompanies hurricane activity, FDOT may want to consider prioritizing those airports in coastal areas where the risk from hurricanes is greatest.
- Assess the critical component at each airport—Different airports may have different critical infrastructure. For example, an airport suited for serving as a hurricane shelter likely will prioritize backup power for the terminal over other systems. An airport that needs to operate around the clock will want airfield lighting equipped with backup power.

Table 10-3. Florida System Airports Needing Back-Up Power Systems

FDOT District	Number of System Airports in District	Airports without Backup Power for the Terminal	Airports without Backup Power for Runway Lighting	Airports without Backup Power for Fueling
1	21	11	10	12
2	16	6	3	7
3	15	6	9	7
4	15	5	3	5
5	21	12	5	15
6	7	0	0	3
7	11	7	5	9
Total	**106**	**47**	**35**	**58**

Source: FASP 2043 Airport Survey

10.2.4 Airport Planning Studies

The FDOT AO stressed the importance of proper planning for system airports during the FASP 2043. The FDOT AO established a goal of having 80 percent of system airports with a master plan, ALP, and property maps that were less than 10 years old, acknowledging that some of the smallest airports or those with limited development may not benefit from routine updates or be financially able to support more frequent updates. **Table 10-4** shows that more than 80 percent of Florida system airports have current ALPs and property maps. More than 70 percent of airports have a current master plan. When accounting for airports that have plans in progress or plans to update, the 80 percent threshold is met for all plans. Consequently, the FDOT AO should continue to encourage airports to keep their planning documents up to date.

Table 10-4. Florida System Airports Needing Current Plans

FDOT District	Number of Airports	Airports with Master Plans More than 10 Years Old	Airports with Airport Layout Plans More than 10 Years Old	Airports with Property Maps More than 10 Years Old
1	21	9 (2)	4 (2)	1 (0)
2	16	6 (0)	2 (0)	5 (0)
3	15	0 (0)	0 (0)	2 (0)
4	15	4 (4)	4 (4)	0 (0)
5	21	10 (9)	8 (8)	9 (7)
6	7	0 (0)	0 (0)	0 (0)
7	11	2 (2)	2 (2)	1 (1)
Total	**106**	**31 (17)**	**20 (16)**	**18 (8)**

Note: Updated plans in progress, or planned, are shown in parenthesis.
Source: FASP 2043 Airport Survey

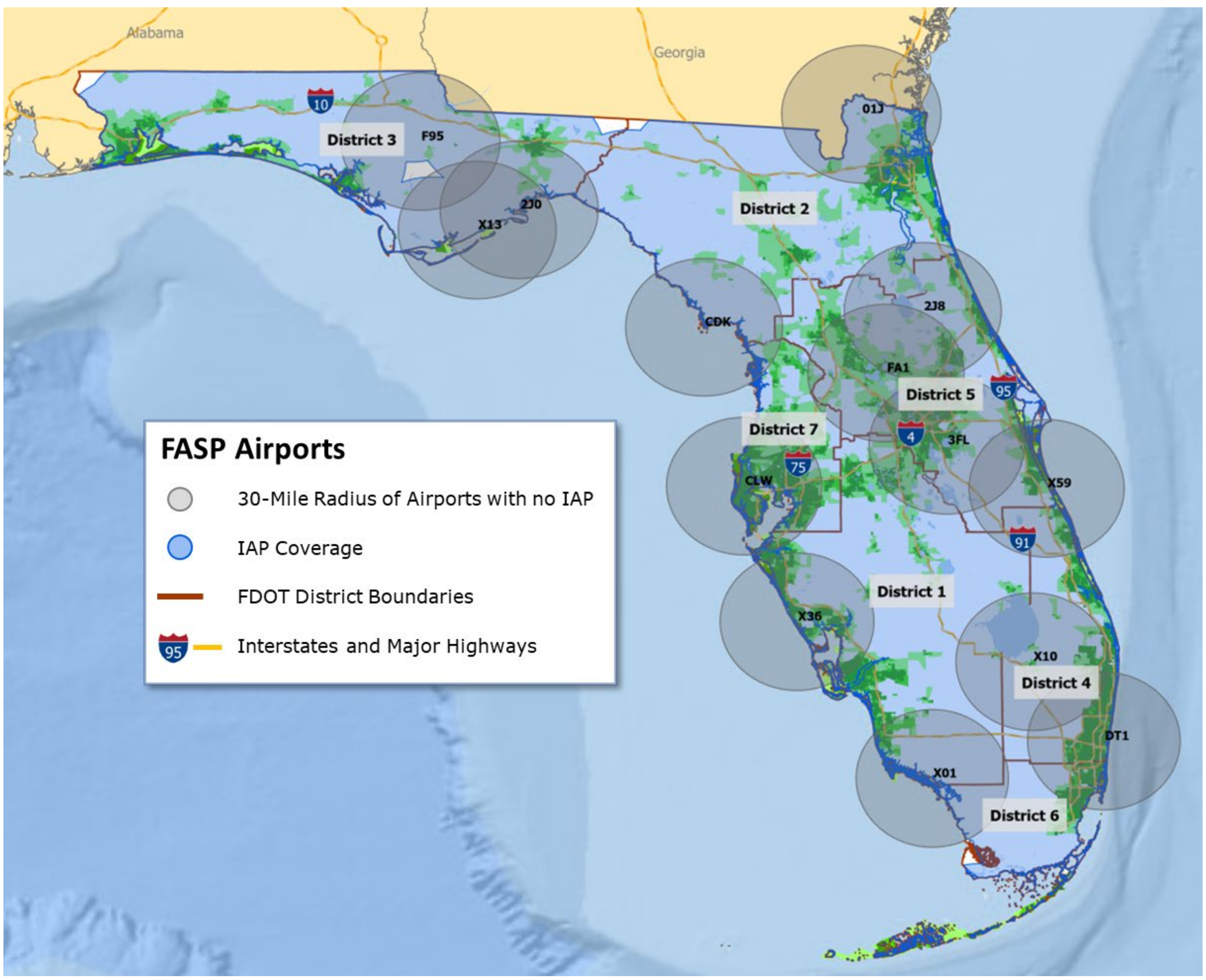
10.3 Geographic Analysis Recommendations

The evaluation of geographic coverage by the Florida airport system found that this well-developed system provides excellent coverage to the people and businesses of Florida. Even the analysis of subsets of the airport system showed significant coverage. Review of flight coverage by airports with instrument approach procedures and fuel service demonstrated only a handful of opportunities to improve coverage.

10.3.1 Flight Coverage by Airports with Instrument Approach Procedures

Figure 10-1 shows that there is an opportunity to improve the geographic instrument approach coverage in the panhandle (white shaded area in the center of District 3).

Figure 10-1. Coverage by Instrument Approach Procedures and Airports without Instrument Approaches



Note: Areas shown in green denote significant population densities.
Source: Cignus and FAA Chart Supplement Southeast U.S. 10 AUG 2023 to 5 OCT 2023

Calhoun County Airport (F95), located in Florida's panhandle, can provide complete flight coverage for a small area south of F95 that is currently outside of 30 nautical miles from an airport with an instrument approach. Carrabelle-Thompson Airport (X13) could also slightly expand flight coverage with the addition of an instrument approach by covering a small corner of the same area. **Figure 10-1** also illustrates the handful of Florida system airports that lack instrument approaches. While adding instrument approaches to these airports would not increase flight coverage from a system perspective, such improvements would improve the utility of the individual airport.

Additional recommendations for consideration include:

- Effectiveness of the instrument approach—If there are obstructions or other issues with the approach that will result in minimums that are close to visual flight rule weather minimums, then the approach will not be of much use, especially if other airports nearby have decent instrument approaches.
- Amount of traffic expected to use the approach—This factor should consider both the traffic that would use the approach to arrive and the traffic that would use the approach for training purposes.
- Capability of the airport to maintain the new approach—If the airport's new instrument approach is subject to encroachment by vegetation growth, it is important for the airport to have the resources and tools necessary to maintain the approaches to the instrument procedure. Otherwise, the instrument approach can become degraded, or even eliminated.

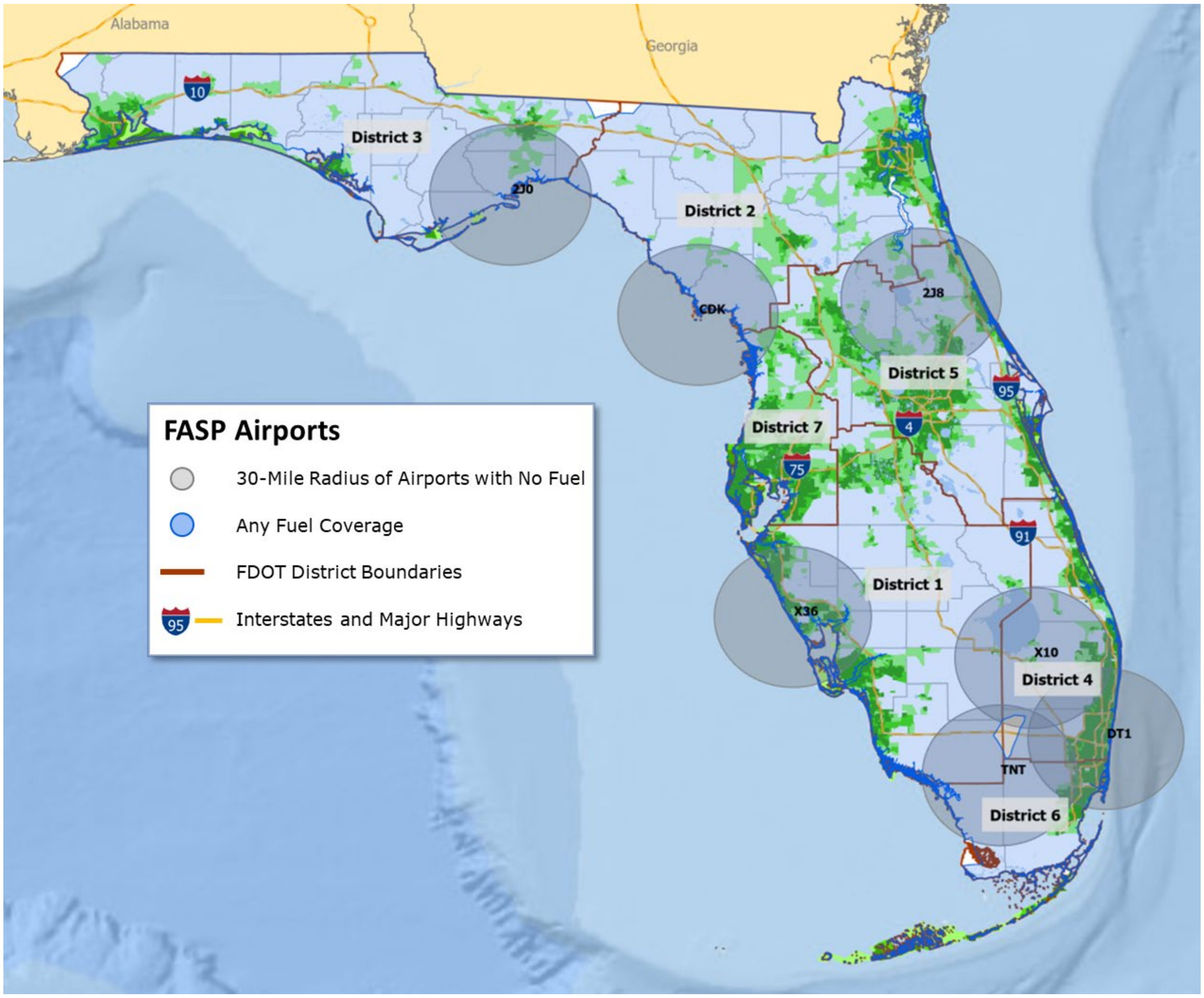
10.3.2 Flight Coverage by Airports with Fuel Service

Demand for fuel service at Florida's airports has resulted in widespread availability of aviation fuel. **Figure 10-2** demonstrates the extensive fuel service coverage provided by Florida's airport system. There is an opportunity to expand the fuel service coverage to an isolated area in south Florida. Fuel service at Dade-Collier Training and Transition Airport (TNT) would completely cover the small area in the Everglades that lacks coverage. Belle Glade State Municipal Airport (X10) would partially cover this same area.

Additional recommendations for consideration include:

- Sufficient demand for infrastructure—Fuel service should only be considered where sufficient demand justifies the expense of necessary infrastructure. For example, there are 11 system airports that offer only avgas fuel. The recommendation is that these airports assess the demand and cost-benefit of providing jet fuel in addition to avgas.
- Location relative to demand—TNT is isolated, lacks many facilities found at typical general aviation airports, and is unmanned. It is unlikely to have much demand for fuel, making X10 a better candidate for fuel service that expands flight coverage.

Figure 10-2. Coverage by Airports with Aviation Fuel



Note: Areas shown in green denote significant population densities.
Source: Cignus and FASP 2043 Airport Survey

As pointed out in the geographic analysis, Florida has airports that cater to the emerging market of unleaded and sustainable fuels. One obstacle to the broad adoption of these new fuels is the infrastructure needed to deliver them. Even in cases where the fuel is a drop-in replacement that can be safely mixed with an existing fuel, such as unleaded avgas replacing leaded avgas, fuel providers may defer to customer concerns over the new fuel and refuse to offer the new fuel unless it can be kept apart from the existing fuel. This approach requires an independent fuel distribution system for the new fuel, which is an expense that can be difficult to fund, and adds to the cost of the new fuel, making it less economically competitive. FDOT may want to consider ways to make new fueling infrastructure more affordable for airports looking to promote unleaded or sustainable fuels.

Additional recommendations for consideration include:

- Future use of the fueling system—As the fuel market evolves, FDOT may consider future uses for additional fueling infrastructure since service for multiple fuel types is likely a transitory condition. The general aviation market is not large enough to support excessive types of fuel, so it is likely that the market will force a consolidation of fuels, leaving airports with additional fueling infrastructure that should be put to use, ideally as additional capacity for the prevailing fuel.
- Fuel distribution method—Having the fuel available is only part of the fuel distribution equation. FDOT may want to discuss with stakeholders the options for getting the fuel into aircraft, which may involve fueling trucks or self-service fuel pumps that may, or may not, be available 24 hours per day.

10.4 Recommendations for FDOT AO Initiatives

The FDOT AO identified four topics that warranted additional research and investigation:

- Alternative Weather Reporting.
- Airport Electrification.
- Hangar Vacancy.
- Stormwater Management Plans.

The recommendations for each of these initiatives are detailed below, along with FDOT AO considerations going forward.

10.4.1 Alternative Weather Reporting

The FASP 2043 found that a significant number of system airports are equipped with some type of automated weather reporting system, generally an automated surface observing system (ASOS), or automated weather observing system (AWOS).

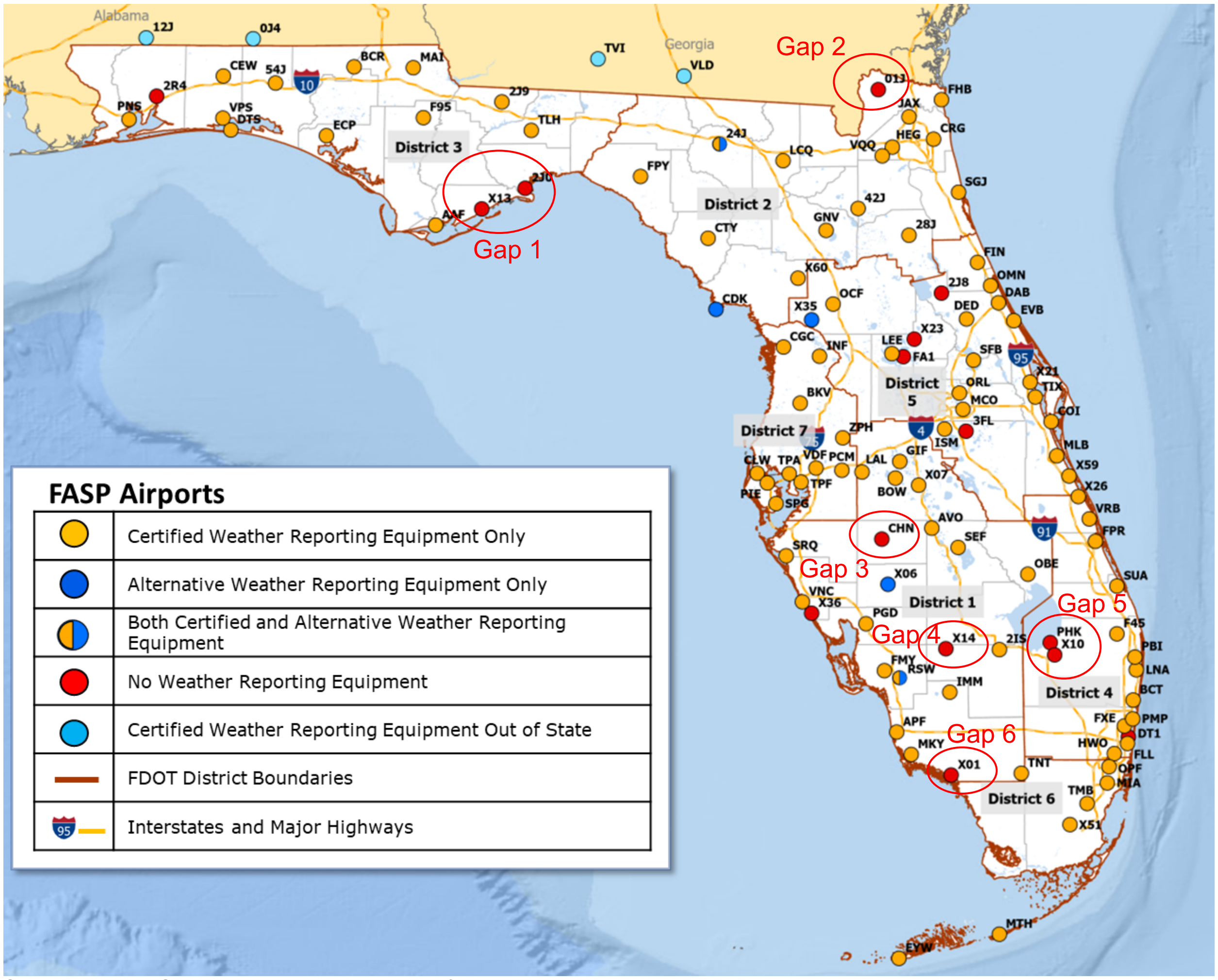
However, a detailed evaluation determined that certain airports, lacking any type of weather reporting capability, were found in areas up to 15 miles from the nearest airport with a weather reporting system. **Figure 10-3** shows the gaps where these airports are located. To enhance system weather coverage, it is recommended that these airports consider obtaining weather reporting equipment.

Additional recommendations for consideration include:

- Costs versus benefits—Equipping these airports with certified weather reporting equipment (i.e., ASOS or AWOS) is more costly than using a non-certified system, but provides needed weather reporting to support commercial operations, such as charter flights.
- Accessibility compared with certified weather reporting systems—Using non-certified weather reporting equipment is less costly, and supports visual flight rule (VFR) operations, which may be sufficient for some of these airports. However, these systems are typically

not tied into the FAA and National Weather Service reporting system, which somewhat limits the accessibility of this weather information.

Figure 10-3. Weather Reporting Gaps in System Coverage



Source: 2043 FASP airport survey, 2023; Mead & Hunt, Inc., 2023

10.4.2 Airport Electrification

The FASP 2043 found that many of Florida's airports are currently accommodating electric automobiles and electric ground service equipment (GSE). Additionally, many airports are planning to accommodate these vehicles, along with electric aircraft in the future. The resulting electrification of airports may have far-reaching consequences. Proper planning for such a transition should follow a process similar to other types of facility planning. FDOT may choose to identify the existing electric infrastructure, anticipate the demands for future electricity, consider where investment in electric upgrades will have the greatest impact, and prepare a capital plan that considers the expenditures and potential revenues.

Additional recommendations for consideration include:

- Electric grid capacities—The condition of the existing electric grid may make it challenging to upgrade an airport's electric service to the desired level. Airports will need to engage electric service providers in discussions about what the best course of action is for meeting future electrical capacity needs.
- Rates and charges—The growth of electric aircraft is expected to undercut a major revenue source for airports – aviation fuel sales. FDOT may need to assist the airports in planning for how the current structure of their rates and charges will need to be revised to accommodate changes resulting from an increase in electric vehicles. For example, automobile parking lots that provide for vehicle charging may need to consider how to best recoup that cost. Also, hangars that historically have included electric charges in the fixed rent may need to account for the cost of charging an electric aircraft while it is stored.
- Availability of electric aircraft—Part of the electrification of airports is contingent upon the anticipated growth of electric conventional takeoff and landing aircraft (eCTOL) and electric vertical takeoff and landing (eVTOL) aircraft. Given the challenges these aircraft face in getting FAA certification, FDOT should consider monitoring the progress these aircraft manufacturers are making toward final certification, and plan accordingly to schedule projections of when they plan to achieve final certification to support installation of necessary electrical service infrastructure in a timely manner.

10.4.3 Hangar Vacancy

Stakeholders throughout Florida have known anecdotally that hangar space is in short supply. The FASP 2043 undertook an effort to document the extent of this situation. Based on the existing inventory and forecasted demand for hangar space, the FASP 2043 concluded that more than 1,500 new T-hangars and 276 box hangars are needed currently, or will be in the long term, to meet the need expressed at Florida's airports by 2043.

Recommendations for consideration include:

- Hangar development—FDOT should discuss the pros and cons of having airports build and manage the hangars themselves, versus using a ground lease to allow a private developer to build and manage the hangars. The best solution will likely vary by airport based on their particular circumstances.
- Adequate space for hangar development—Not all airports reported having space for development. Those that did indicated that, more often than not, challenges existed to developing the space available. Consequently, FDOT may need to discuss additional funding for more robust site development that goes beyond the typical prep for just the hangar slab or foundation.
- Charging for utilities—With the development of electric aircraft, airports will face the issue of how to replace lost aviation fuel revenue. One approach is to recoup this lost revenue by billing hangar occupants for charging their electric aircraft in their hangars. To do this,

airports will need to have each hangar unit on its own electric meter so that proper billing can occur, which may result in initial up-front costs to install appropriate meters or independent electrical service. Changes to leases, and billing procedures, may also need to occur.

10.4.4 Stormwater Management Plans

The analysis of stormwater management plans (SWMP) at Florida's system airports found that nearly half lacked a current SWMP. Florida is vulnerable to stormwater damage due to its extensive coastline, rainy summers, history of hurricane events, rapid growth, and low elevations. Given the safety implications from poorly managed stormwater and efforts to improve stormwater management across Florida, FDOT may want to consider steps to increase compliance with current SWMPs at system airports.

Additional recommendations for consideration include:

- Funding options at non-NPIAS airports to generate a SWMP—None of the non-NPIAS airports have a SWMP, so federal funding is not available for a SWMP at these sites.
- Prioritizing the most vulnerable airports—Airports that are more prone to stormwater related impacts that do not have a current SWMP may need more immediate attention than airports less susceptible to mismanaged stormwater.

10.5 Summary

This chapter provided a series of recommended airport improvements, along with possible issues that the FDOT AO could discuss with the FDOT Districts and stakeholders who may support the implementation of these recommendations. These recommendations were based on evaluation of the NPIAS, the analysis of performance measures, geographic coverage of the airport system, and the four initiatives identified by the FDOT AO.


FDOT
2043 FASP
FLORIDA AVIATION SYSTEM PLAN
APPENDICES

A

Stakeholder Engagement

FDOT 2043 FASP FLORIDA AVIATION SYSTEM PLAN

Appendix A

Florida Aviation System Plan 2043 Stakeholder Engagement

The Florida Aviation System Plan (FASP 2043) is Florida's long-term aviation planning process designed to assess the ability of the existing system to achieve current and anticipated future aviation demands. The Florida Department of Transportation Aviation Office (FDOT AO), through the FASP 2043, intends to investigate, assess, review, and plan for the existing and future aviation needs of the state to promote the further development and improvement of air routes, airport facilities and landing fields, protect airport approaches, and to stimulate the development of aviation commerce and air facilities. The Stakeholder Engagement Plan describes the steps the FDOT AO undertook to communicate the intent, findings, and results of the FASP 2043, as well as obtaining feedback from stakeholders throughout the study.

Stakeholder Engagement Plan (SEP)

The FDOT Public Involvement Handbook provides techniques and methods to encourage meaningful public participation throughout the transportation decision-making process. The handbook is intended for use by the FDOT/Department staff, FDOT consultants, and any others interested in designing effective Public Involvement Plans. It provides guidance for developing and implementing effective public involvement activities that meet federal and state requirements. The FDOT Public Involvement Handbook was used to develop this SEP for the FASP 2043 to comply with FDOT public involvement policies.

This SEP summarizes the key components that the FDOT AO planned for outreach and engagement efforts. Later sections provide details on the execution of the SEP.

Primary Contacts

Table 1 lists the four organizations involved with the development of the SEP and their contacts.

Table 1. Primary Contacts for FASP 2043

Organization	Name	Role	Email
FDOT Aviation Office	Mike McClure	FDOT PM	Mike.McClure@dot.state.fl.us
AVCON	Virgil "Lee" Lewis	AVCON PM	vclewis@avconinc.com
Mead & Hunt	Stephanie Ward	Mead & Hunt PM	Stephanie.Ward@meadhunt.com
CFASPP	Daniel Afghani	CFASPP Administrator	dan@da-consultinginc.com

This SEP includes the following sections:

- Public Involvement Goals
- Stakeholder Identification
- Documentation Procedures
- Website/Social Media Activities
- Primary Contacts
- Execution of the Stakeholder Engagement Plan

Public Involvement Goals

The FASP 2043 is comprised of 106 public-use airports including 19 commercial service airports and 87 general aviation airports. In 2021, Florida's commercial service airports collectively experienced more passenger enplanements than any other state in the country. It is a thriving aviation system that had an estimated statewide aviation annual economic impact of $336 billion in 2022. Therefore, it is vital to have a comprehensive public outreach program as part of the FASP 2043. This will help to solicit feedback, comments, and emerging trends from a wide range of stakeholders involved in: the maintenance and growth of the aviation system; the various modal offices of the FDOT; the Federal Aviation Administration (FAA); the day-to-day management and operation of airports; policy making; economic and municipal planning organizations; and the public. Some key public involvement goals for the FASP 2043 are listed below. This was not intended to be an exhaustive listing of all public involvement goals that should be considered; rather, it was intended to represent common goals to consider as the public involvement program evolved throughout the undertaking of the FASP 2043 efforts.

- Solicit feedback from a wide range of stakeholders on the goals and objectives of the FASP 2043.
- Provide comments on study deliverables and methodologies to ensure the accuracy of study documentation.
- Ensure that pertinent information is disseminated throughout the aviation system.
- Obtain pertinent data from FASP airports.
- Discuss emerging trends and determine how Florida (and Florida airports) can be best positioned to leverage new opportunities.
- Integrate system plan goals and objectives with other statewide transportation plans.
- Facilitate team collaboration and the continued working relationships between Florida airports and the FDOT.
- Build trust and understanding with stakeholders.
- Meet regulatory requirements.
- Gain approval of recommendations and "buy in" from stakeholders.
- Promote the importance of the Florida aviation system and tremendous opportunities for continued growth over the next 20 years.

With the goals of the SEP established, the FDOT AO identified the appropriate stakeholders that would have an interest in the FASP 2043.

Stakeholder Identification

Table 2 identifies the key stakeholders for the FASP 2043. It is not an exhaustive listing of all stakeholders that were included in the outreach efforts for the study. For example, it does not identify specific Florida and FDOT agencies that were coordinated with regarding integrating the FASP 2043 recommendations with the Florida Transportation Plan (FTP) and Florida's Strategic Intermodal System (SIS).

Table 2. Primary Stakeholders for FASP 2043

Organization	Description	Phases/Activities
Florida Department of Transportation Aviation Office (FDOT AO)	The FDOT AO is the sponsor for the FASP 2043. The FDOT AO develops the Florida Aviation System Plan, promotes the development and improvement of Florida's airports, regulates airports, and protects airport approaches. Major activities include aviation system development, aviation grant program, airport regulation, intergovernmental coordination, aviation outreach and aviation emergency operations management. Other FDOT offices and FDOT Administration will also be coordinated with regarding integrating the FASP 2043 recommendations with the FTP and SIS.	**Phase 1** • FDOT Project Briefings • Visioning Session • Strategic Direction • Update FDOT Website Postings • FDOT Internal Team Meetings **Phase 2** • FDOT AO Internal Team Meetings
Consultant Team	The primary Consultant Team members include AVCON and Mead & Hunt, which are referred to as the Consultant Team. They will assist the FDOT with the FASP 2043 and coordinating and facilitating all project activities and outreach activities.	**Phase 1** • Internal Team Coordination **Phase 2** • FDOT AO Internal Team Meetings
Florida Transportation Plan (FTP) Implementation Committee	The FTP Implementation Committee provides assistance with developing near-term actions for the FTP Implementation Element based on the Committee member's expertise; input from other statewide, regional, and local partners; and supporting technical analyses. This committee will also provide input on the update of the SIS Policy Plan.	**Phase 1** • FDOT Internal Team Meetings **Phase 2** • FDOT AO Internal Team Meetings

Organization	Description	Phases/Activities
Florida Airports Council (FAC)	FAC is the official association of the publicly owned and publicly operated airports in Florida. Originally formed as the Florida Airport Managers Association (FAMA) in October of 1969, the organization was created to provide the strength of numbers needed to successfully face the major challenges of the industry at that time and in the future. FAC is committed to continued improvement of the many aviation facilities in Florida, as well as professional development of its members. Educational programs, conferences, webinars, and seminars are held each year to provide the membership with the tools necessary to perform their job responsibilities, as well as prepare them for more challenging positions in the future.	**Phase 1** • 2022 Florida Airports Council (FAC) Conference • FAC-Hosted Webinar **Phase 2** • 2023 FAC Conference • FDOT-Hosted Webinar
FASP Input Team (FIT)	The FIT consists of 18 airport representatives that will help guide the ongoing FASP 2043, which addresses the future 20-year needs of the statewide airport system and is required by statute. The FIT will help guide some of the subject matter to be explored.	**Phase 1** • Comprehensive Review Team (CRT) Meetings **Phase 2** • FASP Input Team Meetings
Continuing Florida Aviation System Planning Process (CFASPP)	The CFASPP was established by the FAA and FDOT because of the need for a method to help maintain a viable Statewide aviation environment. The objective of FAA, FDOT, and CFASPP is to maintain and enhance the Florida aviation system. A primary function of CFASPP is to help keep the FASP in step with the constant changes by updating the FASP periodically. The CFASPP is a method used within Florida to continually monitor the aviation environment and determine the development requirements to best meet projected aviation demands.	**Phase 1** • Comprehensive Review Team (CRT) Meetings **Phase 2** • CFASPP Meetings
Florida Metropolitan Planning Organization Advisory Council (MPOAC)	The Florida MPOAC is a statewide transportation planning and policy organization created by the Florida Legislature pursuant to Section 339.175(11), Florida Statutes, to augment the role of individual MPOs in the cooperative transportation planning process. The MPOAC assists MPOs in carrying out the urbanized area transportation planning process by serving as the principal forum for collective policy discussion.	**Phase 1** • Regional Workshop with Interested Parties **Phase 2** • Regional Workshop with Interested Parties

Documentation Procedures

The SEP called for the Consultant Team to take a consistent approach to documenting outreach and engagement efforts. To that end, the SEP detailed that the Consultant Team would develop the following templates for use with all project materials and at all meetings:

- Meeting Agendas
- Meeting Minutes
- Sign-In Sheets
- PowerPoint Presentations
- Meeting Boards (24” x 36” format)

Setting up these templates included addressing the necessary Americans with Disabilities Act (ADA) and FDOT compliance issues, where applicable. The Consultant Team would provide the FDOT AO with all graphics, illustrations, logos, and other media in an electronic format compatible to be modified for the FDOT AO’s own use and purposes.

Outreach and Engagement Efforts

The SEP envisioned multiple paths for communicating with the stakeholders of the FASP 2043. One of the key elements was the formation of a FASP Input Team (FIT). This group was intended to represent both commercial service and general aviation airport interests from around Florida. The FIT would act as a sounding board during the study, providing feedback to the FDOT AO and Consultant Team on the methods, findings, and results of the FASP 2043. The FIT was also expected to help guide the direction of the FASP 2043 by providing input on which topics were most important and relevant.

The SEP also planned for coordination between the Consultant Team and the FDOT AO. This would consist of regular status briefings between the project managers of the Consultant Team and the FDOT AO. Additional FDOT Internal Team Meetings would involve both the FDOT AO and Consultant Team personnel, as appropriate, to address specific topics related to the FASP 2043 study. The SEP anticipated that these meetings would occur both in person and virtually.

Additional meetings between members of the Consultant Team would take place on a regular basis to focus on project progress, discuss the schedule, and plan for forthcoming meetings and deliverables.

For public engagement, the SEP planned for presentations to the Florida Airports Council – once at the annual conference, and once via webinar.

Finally, the SEP called for a final Regional Workshop with Interested Parties, which would present the study process, findings, results, and recommendations via a webinar. Participants would be invited to submit questions for the Consultant Team to answer.

Website/Social Media Activities

To facilitate a timely exchange of information (data, draft documents, graphics, etc.) between the FDOT AO and the Consultant Team, an internal project site would be developed specifically for the FASP 2043. The site would contain information such as a project calendar, contact information, and folders for uploading and downloading data. Documents stored on the site would allow the Consultant Team to keep single, working versions of documents as they are developed rather than multiple local copies that can become confusing. The site would also allow uploads without restriction to size, which would be critical when transferring design files, high resolution graphics, and final documents. The Consultant Team would develop and host the site.

As part of future efforts, the Consultant Team would employ the use of the FDOT website to help communicate with stakeholders and the public. Through the website, users could obtain information about the FASP 2043. All materials developed would conform to the applicable web standards. If requested by the FDOT AO, the Consultant Team would provide social media content for social media posts to FDOT's Facebook, Instagram, LinkedIn, and Twitter pages.

Execution of the Stakeholder Engagement Plan

As outlined in the SEP, several stakeholder engagement efforts were conducted throughout the development of the FASP 2043. This section of the SEP defines the purpose of each stakeholder engagement effort, meeting frequencies and meeting types (in-person or virtual), known dates or milestone timeframes for meetings, anticipated participants, meeting materials, required FDOT AO review periods for meeting materials (agendas, presentations, and other handouts) prior to established meeting dates, responsible member of the Consultant Team, and responsible agency contact.

FIT Team Meetings

One of the first of such efforts was the establishment of the FIT. The FDOT AO extended invitations to representatives from commercial service and general aviation airports in the Florida system to participate as members of the FIT over the course of the study. The FDOT AO sought to obtain representation from across all parts of Florida. **Table 3** lists the individuals that volunteered to serve on the FIT.

Table 3. List of FASP Input Team (FIT) Members

FIT Member	Airport	CFASPP Region
Terry Beacham	Bartow Executive Airport (BOW)	Central
Alex Vacha[1]	Winter Haven Regional Airport (GIF)	Central
Roy Sieger	Flagler Executive Airport (FIN)	East Central
George Speake	Orlando Sanford International Airport (SFB)	East Central
Matt Grow	Ocala International Airport (OCF)	North Central
Allan Penska	Gainesville Regional Airport (GNV)	North Central
Tony Cugno	Jacksonville Aviation Authority (JAA)	Northeast
Nathan Coyle[1] / Sam Carver	Fernandina Beach Municipal Airport (FHB)	Northeast
Eric Houge	Tallahassee International Airport (TLH)	Northwest
Chad Rogers	Okaloosa County Airports (VPS, DTS, CEW)	Northwest
Craig Delegato	Palm Beach County Airports (PBI, LNA, PHK, F45)	Southeast
Scott Kohut	Boca Raton Airport (BCT)	Southeast
James Parish	Punta Gorda Airport (PGD)	Southwest
Kerry Keith	Naples Municipal Airport (APF)	Southwest
Brandon Dambeck	Vero Beach Regional Airport (VRB)	Treasure Coast
Sam Carver[1]	Witham Field Airport (SUA)	Treasure Coast
Richard Lesniak	Albert Whitted Airport (SPG)	West Central
Mark Sprague	St. Pete-Clearwater International Airport (PIE)	West Central

[1] Identifies original FIT members who resigned from their respective airports during the FASP 2043 system planning process.

Table 4 lists the information surrounding the seven virtual meetings that were held with the FIT. The input provided by the FIT was extremely valuable in terms of guiding the FASP 2043 and helping the Consultant Team better understand the critical issues facing airports in Florida.

Table 4. FASP FIT Meetings

Category	Description
Purpose	The FIT will serve in an advisory capacity to the FDOT AO and Consultant Team throughout the study. The FIT consists of 18 representatives from CFASPP member airports. It is anticipated that the FIT, in conjunction with the FDOT PM and CFASPP Administrator, will provide updates to all CFASPP member airports during the quarterly meetings in each region.
Frequency/Meeting Type/Time Allotted	7 Times / Teams Virtual Meeting / 1.5 Hours
Date(s)/Milestone Timeframe(s)	September 19, 2022 (Monday) @ 2:00 pm ET – Discuss the FASP 2043 process, role of the FIT, and preliminary discussion on goals, objectives, and performance measures (GOPMs) and emerging trends October 17, 2022 (Monday) @ 2:00 pm ET – Review GOPMs, results of activity/emerging trends survey, review of digital options/tools for consideration November 15, 2022 (Tuesday) @ 2:00 pm ET – Identify FASP tasks/objectives based upon earlier work May 11, 2023 (Thursday) @ 1:30 pm ET – Discuss inventory and preliminary tasks August 22, 2023 (Tuesday) @ 1:30 pm ET – Provide an initial summary of the survey effort and baseline performance measures November 16, 2023 (Thursday) @ 1:30 pm ET – Highlight additional baseline performance measures, goals, objectives, and remaining efforts February 29, 2024 (Thursday) @ 2:30 pm ET – Discuss final project efforts
Participants	• FDOT PM • AVCON PM • Mead & Hunt PM • CFASPP Administrator • FIT (refer to list of FIT members in **Table 3**)
Meeting Materials	• Agenda • PowerPoint Presentation • Minimal Handouts/Support Materials • Meeting Minutes
Consultant Contact/Scheduler	Lee Lewis, AVCON PM
Agency Contact	Mike McClure, FDOT AO PM
Notes	None

FDOT Project Briefings

Coordination with FDOT AO Staff was key and covered the entire course of the project. **Table 5** details the FDOT AO project briefings that occurred during the FASP 2043.

Table 5. FDOT AO Project Briefings

Category	Description
Purpose	Routine coordination between Consultant PMs and the FDOT AO PM to discuss the status of current work progress and efforts, upcoming meetings, upcoming work efforts, and potential challenges.
Frequency/Meeting Type	Two Times Per Month / Teams Virtual Meeting
Date(s)/Milestone Timeframe(s)	May 2022 through November 2022 April 2023 through March 2024
Participants	• FDOT PM • AVCON PM • Mead & Hunt PM • CFASPP Administrator
Meeting Materials	Varied
Consultant Contact/Scheduler	Lee Lewis, AVCON PM
Agency Contact	Mike McClure, FDOT PM
Notes	None

FDOT Internal Team Meetings

The details of the FDOT internal team meetings are shown in **Table 6**. These meetings took advantage of scheduled FDOT District meetings to brief district personnel to get their feedback, as well as discuss project progress with team members.

Table 6. FDOT Internal Team Meetings

Category	Description
Purpose	Meeting with FDOT PM and other FDOT personnel to discuss how the FASP can be used to assist in their decision-making, as well as support the airport sponsors.
Frequency/Meeting Type	Two Times / In-Person
Date(s)/Milestone Timeframe(s)	Collect information that will be helpful in reviewing the goals, objectives, performance measures, and airport roles. After preliminary recommendations are developed. Discuss data collection efforts. After preliminary recommendations are developed.
Participants	• FDOT PM • Other FDOT Personnel • AVCON PM • AVCON Senior Planner • Mead & Hunt PM • Mead & Hunt Senior Planner
Meeting Materials	• Agenda • PowerPoint Presentation • Minimal Handouts/Support Materials • Meeting Minutes
Consultant Contact/Scheduler	Lee Lewis, AVCON PM
Agency Contact	Mike McClure, FDOT AO PM
Meeting(s) Held	5/16/2023 & Various Times (e.g., monthly Aviation Task Team Meetings) to Update FDOT District Coordinators Regarding FASP Activities & Recommendations
Notes	Meeting 1 was conducted on June 28, 2022, at the FDOT Central Office and included a Visioning Meeting for the FDOT Executive Management Team followed by a separate Visioning Meeting for the FDOT Aviation Staff.

Internal Consultant Team Coordination

Coordination within the Consultant Team was key to keeping the project organized. **Table 7** lists the details of the internal team coordination meetings. These were held virtually and were held more frequently as deadlines approached to better coordinate the study efforts.

Table 7. Internal Team Coordination

Category	Description
Purpose	Routine coordination with the Consultant Team to discuss the study progress, invoicing, upcoming meetings and deliverables, and status updates for the FDOT PM.
Frequency/Meeting Type/Time Allotted	1 Time Per Month (6 Total) / Teams Virtual Meeting / 1.5 Hours
Date(s)/Milestone Timeframe(s)	May 2022 through November 2022 April 2023 through March 2024
Participants	• AVCON PM • AVCON Senior Planner • Mead & Hunt PM • Mead & Hunt Senior Planner
Meeting Materials	• Agenda • Meeting Minutes
Consultant Contact/Scheduler	Lee Lewis, AVCON PM
Notes/Action Items	None

Florida Airports Council (FAC) Webinar/Conference

The specifics of the presentations given to the Florida Airports Council are shown in **Table 8**. These presentations allowed for a question and answer period that provided valuable feedback to the study team.

Table 8. Florida Airports Council Webinar/Conference

Category	Description
Purpose	This was an online seminar hosted by FAC to advise members on the project goals and objectives.
Frequency/Meeting Type	One Time / Online Virtual Seminar At Annual FAC Conference (virtually)
Date(s)/Milestone Timeframe(s)	July 30, 2022 (FDOT presentation at FAC conference) November 17, 2022 (FAC-hosted online webinar) July 26, 2023 (team presentation at FAC conference) March 6, 2024 (FDOT-hosted online webinar)
Participants	• FDOT PM • AVCON PM • Mead & Hunt PM • FAC President/CEO • FAC Members
Meeting Materials	• Agenda • PowerPoint • Meeting Minutes
Consultant Contact/Scheduler	Lee Lewis, AVCON PM
Agency Contact	Lisa Waters, FAC President/CEO
Notes	None

Regional Workshop

The original regional workshop as planned for in the SEP was modified to be a more general statewide stakeholder briefing on the overall project. As shown in **Table 9**, it served to inform stakeholders throughout Florida about the results of the FASP 2043.

Table 9. Regional Workshop with Interested Parties

Category	Description
Purpose	This webinar informed stakeholders of the goals, objectives, and performance measures of the FASP 2043, study findings, and results.
Frequency/Meeting Type	1 Time / Online Virtual Seminar
Date(s)/Milestone Timeframe(s)	FASP Webinar – 3/6/2024
Participants	• FDOT PM • AVCON PM • Mead & Hunt PM • Florida system airports
Meeting Materials	• Agenda • PowerPoint • Meeting Minutes
Consultant Contact/Scheduler	Lee Lewis, AVCON PM
Agency Contact	Mike McClure, FDOT AO PM
Notes	None

B

Goals and Performance Measures

Appendix B

Goals and Performance Measures

The process used to evaluate the goals, objectives, and performance measures for the Florida Aviation System Plan (FASP) 2043 allowed for improved alignment of performance measures (PMs) and in some instances performance indicators (PIs) with actionable targets for the Florida Department of Transportation Aviation Office (FDOT AO) and airports. It allows for the development of PMs that support aviation activities that are prevalent across the system, provide for emerging trends, and guide development of the FASP 2043 that supports decision-making.

Assessment Process

PMs identified as a result of document reviews, comparable state reviews, and airport and staff surveys were further refined for recommendation into the FASP 2043. Key factors in selecting PMs centered around two concepts:

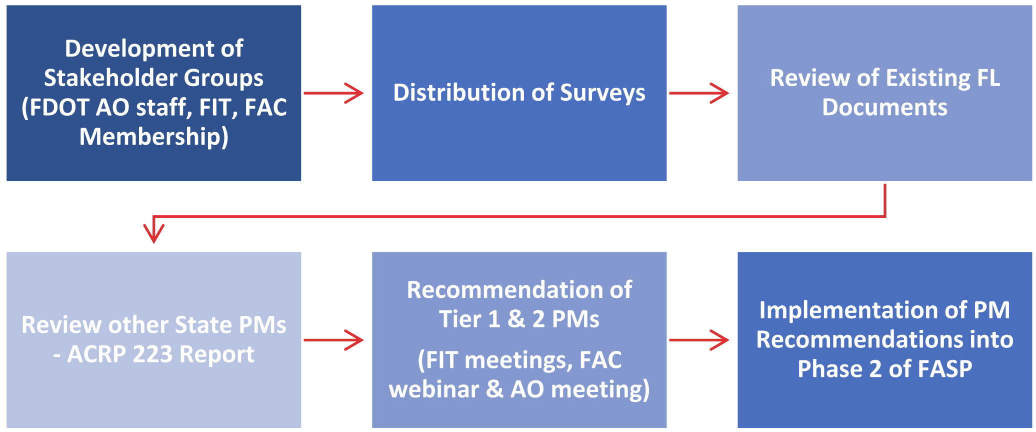
- Provide for more efficiency in decision-making within the FDOT AO to support funding and development decisions
- Provide recommendations for development to airports within the system that support their individual missions while contributing to the overall strength and health of the Florida aviation system

This process resulted in two tiers of potential performance measures for consideration:

- Tier 1 – those most likely to be included
- Tier 2 – those that are more challenging to evaluate

Discussion with FASP Input Team (FIT) members and the FDOT AO staff was sought to determine if there is merit to include the Tier 2 elements. Discussion was also held to determine if these Tier 2 items may be better defined as PIs instead of PMs.

The process for PM development for the FASP 2043, as part of Phase 1, is illustrated below. **Attachment 1** to this appendix outlines the PMs generated from this process for consideration. The first set of tables summarizes the existing FASP 2035 goals, objectives, PMs, and PIs. The second set of tables provides a summary of the other Florida-related documents with the existing goals, objectives, and PMs that should be considered.



Refinement of Performance Measures in Phase 1

Using this data and the responses from the various survey efforts and FIT meetings, a summary of these measures was presented for consideration to the FIT, the FDOT AO staff, and Florida Airports Council (FAC) members for review and comment during November and December 2022. This included measures grouped into airfield-related and planning-related PMs and various PIs as summarized below.

Airfield-Related Performance Measures

Issues that are safety-related

- Number of Airports with:
  - Federal Aviation Administration (FAA)-designated “hot spots”
  - Non-compliant airfield geometry (runway and taxiway)
  - Pavement Condition Index (PCI) rating of less than 70 (currently or forecast within next 5-10 years)

Issues related to capacity

- Number of Airports with:
  - Capacity related projects (runways, taxiways, aprons, hangars) planned in their Joint Automated Capital Improvement Program (JACIP)
    - Within the next 2 years, 3-5 years, more than 5 years out
  - Weather reporting
    - Automated weather observing system, automated surface observing system, other, none
  - Non-precision approach to at least one runway
  - Precision approach to at least one runway

Issues supporting aircraft operations that result in positive economic impact

- Number of airports without:
  - Broadband access

- Fuel service
  - Types of fuel (100 low lead [LL], JetA, unleaded avgas [avgas], sustainable aviation fuel [SAF], other)
  - Methods of delivery
    - Self-fuel, full-service, credit card readers
    - Truck vs. fuel farm
- Backup generators for:
  - Fueling, airfield lighting, terminal building

Planning-Related Performance Measures

Design and layout of each airport and supporting decision making process

- Number of airports with:
  - Master Plans
    - Updated in the past 5 years, 10 years, more than 20, or none
  - Airport Layout Plans (ALPs)
    - Updated in the past 5 years, 10 years, more than 20, or none
  - Exhibit 'A' Property Plans
    - Updated in the past 5 years, 10 years, more than 20, or none
- Number of municipalities enacting Zoning Ordinances under F.S. Chapter 333
- Number of airports with:
  - Airport Security Plans
    - Updated in the past 5 years, 10 years, more than 20, no security plan
  - Wildlife Hazard Management Plans (WHMPs)
    - Updated in the past 5 years, 10 years, more than 20, no WHMP
  - Disadvantaged Business Enterprise (DBE) Plan
    - Updated in the past 5 years, 10 years, more than 20, no DBE plan
  - Airport Minimum Standards
    - Updated in the past 5 years, 10 years, more than 20, no minimum standards
  - Airport Rules and Regulations
    - Updated in the past 5 years, 10 years, more than 20, no rules and regulations

Performance Indicators

In some instances, there are items that are often requested by other agencies or provide interesting talking points about Florida Aviation System. These need to be considered in the FASP 2043, however, are identified as PIs since they are seen as informational items versus actionable items for both the FDOT AO and airport managers. These items include:

- Number of based aircraft,

- Number of annual operations,
- Hangar occupancy rate,
- Tonnage of air cargo shipped,
- Number of enplanements.

Additionally, there were items identified through the Phase 1 process that, while interesting, may be difficult or cost-prohibitive to collect and were therefore also placed in the category of PIs for consideration by the FDOT AO staff and FIT membership. These items included:

- Change in economic impact of FASP 2043 airports between past two economic impact studies,
- Number of Floridians employed directly/indirectly by the aviation industry,
- Amount of fuel flowage by various types,
- Number of airports with increases in number of commercial service destinations served,
- Ratio of allocated state and federal funds to the amount put under grant.

All of these PMs and PIs were adjusted in Phase 2 as additional information about the system and goals, objectives, and PMs were assessed.

Recommended Goals, Objectives, and Performance Measures

The following summarizes the recommended goals, objectives, and PMs for the FASP 2043, using the FASP 2035 data as a base. With the current focus on PMs that provide actionable items that support decision-making, several of the past FASP goals were removed from consideration.

FASP 2043 Goal 1:
Provide efficient, safe, secure, and convenient service to Florida's citizens, businesses, and visitors

Objective – Support FASP airports in meeting FAA airfield geometric design criteria to promote operational safety.

- PMs
  - The number/percentage of FAA-obligated FASP airports that meet current FAA runway design standards.
  - The number /percentage of FAA-obligated FASP airports that meet current FAA taxiway design standards.
  - The number/percentage of FAA-obligated FASP airports that have FAA designated airfield "hot spots."

Objective – Support FASP airports in achieving greater capacity

- PMs
  - The number/percentage of airports with Pavement Condition Index (PCI) ratings of 70 or greater (currently or forecast within next 5-10 years) on their primary runway
  - The number/percentage of airports with PCI ratings of 70 or greater (currently or forecast within next 5-10 years) on their primary taxiway
  - The number/percentage of FASP airports with a non-precision approach to at least one runway end.
  - The number/percentage of airports with a precision approach to at least one runway end.
  - The number/percentage of airports with capacity related projects (runways, taxiways, aprons, and hangars) planned in their JACIP within the next 2 years, 3 years, 5 years, or more than 5 years out.

FASP 2043 Goal 2:
Contribute to operational efficiency, economic growth, and competitiveness while remaining sensitive to Florida's natural environment and exhibiting social responsibility

Objective – Encourage operational efficiency and economic growth

- PMs
  - The number/percentage of airports providing pilot support:
    - Broadband access
    - Fuel service
      - Types of fuel (100 low-lead [LL], JetA, unleaded aviation gas [avgas], sustainable aviation fuel [SAF], other)
      - Methods of delivery
      - Self-fuel, full-service, credit card readers
      - Truck vs. fuel farm
    - Backup generators for:
      - Fueling, airfield lighting, terminal building
- PIs
  - The number of based aircraft across system airports
  - The number of annual operations across system airports
  - The number of annual enplanements across system airports
  - The hangar occupancy rate across the system airports
  - The tonnage of air cargo shipped within the system

Objective – Encourage environmental and community sustainability planning for FASP airports.

- PMs
  - Number/percentage of airports with Master Plans updated in the past 5 years, 10 years, more than 20 years, or none
  - Number/percentage of airports with ALPs updated in the past 5 years, 10 years, more than 20 years, or none
  - Number/percentage of airports with an Exhibit 'A' Property Plan updated in the past 5 years, 10 years, more than 20 years, or none
  - Number/percentage of airports with a Stormwater Management Plan
- PIs
  - The number/percentage of airports with a DBE Plan updated in the past 5 years, 10 years, more than 20 years, no DBE plan
  - The number/percentage of airports with Airport Minimum Standards updated in the past 5- years, 10 years, more than 20 years, or no minimum standards
  - The number/percentage of airports with Airport Rules and Regulations updated in the past 5 years, 10 years, more than 20 years, or no rules and regulations

FASP 2043 Goal 3:
Protect airspace and promote compatible land uses around public airports

Objective - Encourage FASP airports to work with communities to enact airport zoning ordinances compatible with F.S. Chapter 333 and FDOT's Florida Airport Compatible Land Use Guidebook.

- PM
  - The number/percentage of municipalities enacting Zoning Ordinances under F.S. Chapter 333

- PI
  - The number/percentage of airports with a Wildlife Hazard Management Plan (WHMPs) updated in the past 5 years, 10 years, more than 20 years, or no WHMP

FASP 2043 Goal 4:
Foster technological innovation and support implementation of new technologies

Objective - Encourage FASP airports to provide infrastructure and technologies that support innovation and the implementation of new technologies.

- PMs
  - The number/percentage of airports providing changing opportunities for electric passenger vehicles
  - The number/percentage of airports that are providing or planning for changing of electric aircraft
  - The number/percentage of airports utilizing solar infrastructure on their airfield
  - The number/percentage of airports utilizing geothermal infrastructure on their airfield
  - The number/percentage of airports that provide alternative weather reporting
  - The number/percentage of airports providing alternative fuel options (SAF or unleaded avgas)

Attachment 1 Mission, Vision, Goals Matrix

Source	Mission *The clear and concise declaration of why an organization exists*	Goals *Broad targets to achieve*	Objectives *Describe specific areas where progress is desired to achieve the goal*	Performance Measures *Quantitatively assess a particular objective*	Performance Indicators
Florida Aviation System Plan (FASP)	The FASP 2035 Update is a tool to help FDOT maintain a safe, efficient, and reliable system, evaluate future funding decisions by identifying the facilities and services that are needed to meet future demand, and effectively expand capacity in those areas where it is most needed and beneficial.	**Goal 1:** Provide efficient, safe, secure, and convenient service to Florida's citizens, businesses, and visitors	• Ensure that FASP airports operate at an efficient demand/capacity (D/C) ratio.	• The number of FASP airports with an annual airfield D/C ratio of 60% or more (FDOT PM). • The number of FASP airports with an annual airfield D/C ratio of 80% or more (FDOT PM). • The number of FASP airports identified in FAA Future Airport Capacity Task (FACT) reports for capacity concerns.	• The number of FASP airports with terminal-related development projects (building, rental car, parking) and the amount of Joint Automated Capital Improvement Program (JACIP) funding identified for these projects. • The percentage of "on time" flights relative to departure reliability (FDOT PM). • The percentage of "on time" flights relative to departure reliability (FDOT PM).
			• Achieve and maintain 100% of primary runways at FASP airports in compliance with FAA and Florida Administrative Code (FAC) 14-60 Runway Safety Area (RSA) standards.	• The number of FASP airports identified by FDOT inspection that do not meet relevant RSA standards on their primary runway.	
			• Achieve and maintain 100% of nonprimary runways at FASP airports in compliance with FAA and FAC 14-60 RSA standards.	The number of FASP airports identified by FDOT inspection that do not meet relevant RSA standards on their nonprimary runways.	
			• Support protection of people and appropriate land uses and controls of runway protection zones (RPZs) at FASP airports.	• The number of FASP airports, as determined by a statewide database of land use, that control (through fee simple) the land for the RPZs of the primary runway. • The number of FASP airports, as determined by a statewide database of land use, that control (through fee simple) the land for the RPZs of nonprimary runways.	• The number of FASP airports that have incompatible land uses within the RPZs of the primary runway. • The number of FASP airports that have incompatible land uses within the RPZs of the nonprimary runways.
			• Achieve compliance with Florida Statute (F.S.) regarding security plans.		• The number of FASP airports with a runway greater or equal to 5,000 feet in length that report having a security plan.
			• Ensure FASP airports can maintain operational capabilities during disasters.		• The number of FASP airports with standby emergency power for airfield lighting. • The number of FASP airports with standby emergency power for fueling operations. • The number of FASP airports with standby emergency power for its terminal.
			• Ensure FASP airports address wildlife incompatible uses through appropriate means.	• The number of FASP airports with completed wildlife hazard site visits, assessments, and/or management plans.	
			• Support FASP airports in meeting FAA airfield geometric design criteria to promote operational safety.	• The number of FAA-obligated FASP airports that meet current FAA taxiway design standards. • The number of FAA-obligated FASP airports that have FAA designated airfield "hot spots."	

Source	Mission	Goals	Objectives	Performance Measures	Performance Indicators
	The clear and concise declaration of why an organization exists	*Broad targets to achieve*	*Describe specific areas where progress is desired to achieve the goal*	*Quantitatively assess a particular objective*	
Florida Aviation System Plan (FASP)		**Goal 2:** Contribute to operational efficiency, economic growth, and competitiveness while remaining sensitive to Florida's natural environment and exhibiting social responsibility	• Encourage revenue generation at FASP airports to enhance airport self-sufficiency by assisting airports to develop business plans in accordance with FDOT's Florida General Aviation Airport Business Plan Guidebook.		• The number of FASP airports that report having a business/marketing plan.
			• Enhance the competitiveness of Florida Strategic Intermodal System (SIS) airports for intermodal enhancement funding. Provide seamless transportation for Florida's travelers from point of departure to destination.		• The number of commercial service SIS airports reporting direct bus service. • The number of commercial service SIS airports reporting direct passenger rail connections. • The percentage of levels of service (LOS) on SIS Highway Airport Connectors that are LOS A through C (FDOT PM).
			• Encourage economic, environmental, and community sustainability planning for FASP airports.		• The number of airports that have plans on file with FDOT (master plans and sustainability plans).
		Goal 3: Support and enhance the position of leadership and prominence held by Florida's aviation industry	• Maintain Florida's status as a national leader in supporting aviation.		• The amount of Florida's aviation funding in relation to other states. • The amount of Florida's aviation economic impact in relation to other states. • The number of pilot certificates held in Florida (by category). • The number of United States (U.S.) Parachute Association licenses issued in Florida. • The number of revenue passengers boarding aircraft (FDOT PM). • The tonnage of all air cargo landed at FASP airports (FDOT PM). • The value of air cargo transported at FASP airports (FDOT PM).1 • The number of based aircraft in Florida.
		Goal 4: Protect airspace and promote compatible land uses around public airports	• Encourage FASP airports to work with communities to enact airport zoning ordinances compatible with F.S. Chapter 333 and FDOT's Florida Airport Compatible Land Use Guidebook.		• The number of FASP airports reporting that surrounding municipalities have enacted airport zoning ordinances compatible with F.S. Chapter 333.
			• Encourage mapping at FASP airports that is compatible with FAA's electronic airport layout plan (eALP) standards.		• The number of FASP airports reporting that they have mapping compatible with FAA eALP standards.
		Goal 5: Foster technological innovation and support implementation of new technologies	• Encourage the development of global positioning system (GPS)-based instrument approaches.	• The number of FASP airports with a GPS approach.	
			• Encourage readiness of FASP airports to meet NextGen requirements.		• The number of FASP airports that meet the FAA standards for an instrument approach procedure with visibility minima between 3/4 mile and less than one mile. • The number of FASP airports that meet the FAA standards for an instrument approach procedure with visibility minima less than 3/4 mile.
			• Ensure unmanned aerial system (UAS) operations are considered in the state infrastructure and airway system in accordance with FAA directives.		• The number of coordination events with various UAS stakeholders (e.g., institutions of higher learning, UAS manufacturers, etc.) in the development of UAS technologies.

		Goal 6: Promote support for aviation from business, government, and the public	• Quantify and communicate the economic impact of FASP airports.		• The change in the economic impact of FASP airports.
			• Coordinate with Enterprise Florida to advertise the availability of resources and developable land at FASP airports to aviation-minded businesses around the country.		• The number of coordination meetings with Enterprise Florida representatives to communicate economic impact and business development opportunities of FASP airports.
			• Encourage airports to maintain pavement in an above-average level of condition.		• The number of airport pavement condition index (PCI) inspections per year.
		Goal 7: Foster Florida's reputation as a military- and aerospace-friendly state	• Coordinate with military aviation representatives as it relates to the Florida aviation system.		• The number of military officials participating in the Continuing Florida Aviation Systems Planning Process (CFASPP). • The number of task force meetings held with military officials.
			• Coordinate with military on emergency response coordination efforts.		• The number of coordination meetings held with emergency response officials, including the military.
			• Measure the economic impact of military aviation in Florida.		• The amount of Florida's aviation economic impact with military aviation units and airports included.

Source	Mission *The clear and concise declaration of why an organization exists*	Goals *Broad targets to achieve*	Objectives *Describe specific areas where progress is desired to achieve the goal*	Performance Measures *Quantitatively assess a particular objective*	Performance Indicators
Florida Transportation Plan		**Goal 1:** Safety and Security	• Eliminate transportation-related fatalities and serious injuries		• Highway fatalities (total and rate) • Highway serious injuries (total and rate) • Non-motorized fatalities and serious injuries • Reportable transit fatalities, serious injuries (total and rate) • Reportable transit safety events (total and rate) • Micromobility safety events • Crashes (total and rate) • Derailments • Rail trespassing events • **Human trafficking incidents using the transportation system** • Incident response time • **Emergency evacuation clearance times**
			• Reduce the number of crashes and other safety incidents on the transportation system		
			• Reduce the frequency and severity of transportation-related public health, safety, and security risks		
			• Improve emergency response and recovery times		
		Goal 2: Infrastructure and Mobility	• Maintain Florida's transportation assets in a State of good repair for all modes		• Pavement condition • Bridge condition • Transit vehicle and facility condition • **Airport pavement condition** • Seaport infrastructure condition • **Spaceport infrastructure condition** • Sidewalk and trail condition • Vulnerability to flooding or storm surge • **Hours or days of transportation facility closure due to smoke,** • **fire, flooding, wind, or extreme temperature** • **Frequency of repairs due to damage from extreme weather** • **or other events** • **Customer satisfaction** • **Connections between modes/systems and extent of system gaps**
			• Increase the resilience of infrastructure		
			• Meet customer expectations for infrastructure		
			• Improve transportation system connectivity		
		Goal 3: Accessibility	• Increase access to jobs, education, health, and other services for all residents		• Access to jobs • Access to education and healthcare • **Broadband access** • Transportation options for traditionally underserved • Communities • Percent of people working remotely • **Travel time reliability** • Truck travel time reliability index • **Person-hours of delay** • **On time departure or arrival for aviation and passenger rail** • **Freight hours/cost of delay** • Supply chain efficiency/resilience • Person trips by mode, including bicycle/pedestrian and micromobility
			• Increase the reliability and efficiency of people and freight trips		
			• Increase alternatives to single occupancy vehicles		

					• Number of automated and connected vehicles sold
		Goal 4: Economy, Community, and Environmental	• Support job creation and economic development		• Jobs in transportation-dependent industries • Support for statewide and regional economic development goals • Industry-recognized credentials in transportation-related industries • Return on investment from FDOT Work Program • Flooding events related to stormwater runoff • Air pollutant and greenhouse gas emissions • Energy per ton/passenger mile • Share of vehicle fleet using alternative fuels • Consistency with local government comprehensive plans • Support for statewide conservation and environmental stewardship goals
			• Reduce transportation's impact on water, critical lands, and habitats		
			• Decrease transportation-related air quality pollutants and greenhouse gas emissions		
			• Increase the energy efficiency of transportation		

Source	Mission *The clear and concise declaration of why an organization exists*	Goals *Broad targets to achieve*	Objectives *Describe specific areas where progress is desired to achieve the goal*	Performance Measures *Quantitatively assess a particular objective*	Performance Indicators
FDOT Freight Mobility and Trade Plan		**Goal 1:** Capitalize on the Freight Transportation Advantages of Florida through Collaboration on Economic Development, Trade, and Logistics Programs	• Maximize the strategic advantage of Florida's transportation hubs for trade logistics	• Characterize and highlight the unique strengths of each seaport • Develop criteria for strategic port investments in tandem with private investments to respond to market needs nimbly and transparently • Determine the operating characteristics of transportation hubs and improve the connecting distribution/transportation system to match their particular logistic needs and opportunities • Develop a comprehensive plan to support/facilitate international exports and interstate commerce	•
			• Foster the development and deployment of ILCs through cooperative efforts with industry	• Include ILCs in the SIS and roadways and railways serving ILCs • Expedite the resolution of local issues for ILC development • Include onsite capacity to facilitate international exports • Implement the ILC infrastructure support program	
			• Support the branding of Florida as the Gateway to the Western Hemisphere for trade	• Include all freight transportation modes	
			• Focus general collaboration with other agencies	• Host a joint website as a comprehensive portal for freight mobility and trade matters with Enterprise Florida, Workforce Florida, and the Florida Chamber of Commerce to facilitate manufacturers locating and expanding in Florida; e.g., "the freight base" • Include Enterprise Florida, Workforce Florida, and the Department of Economic Opportunity as ex officio members of the predominantly industry sector CEO Freight Leadership Group	
			• Support the Statewide Economic Development Strategic Plan led by the DEO	• Factor logistics efficiency and sustainability into comprehensive economic development strategies • Proactive participation by the FDOT economic development liaison to the DEO • Coordinate and inform transportation programs with the initiatives and policies of the DEO • Expand interagency collaboration and coordination • Foster relationships with local government economic development staff	•
			• Collaborate with Enterprise Florida to address transportation and logistics needs for the targeted industries	• Identify and address transportation issues and challenges for each of the targeted industries • Match trade and transportation needs of the targeted industries with the characteristics of the ports, airports, and ILCs as branding enhancements • Inventory and brand beneficial transportation characteristics of the different regions to support economic development branding	

			• Collaborate with Workforce Florida to develop a trade and logistics workforce	• Identify needed skills, abilities, and best strategies for attracting and developing the necessary workforce • Develop jointly sponsored vocational and technical training academies for maritime operations, trade and logistics staff, and other skills needed for increased manufacturing, trade, and logistics operations in Florida	
			• Explore mutual interests and highlight value that Florida can bring to neighboring states	• Participate in the update of the Latin American Transportation and Trade Study • Coordinate freight planning activities with states in our region as encouraged by federal legislation	•

FDOT Freight Mobility and Trade Plan		**Goal 2:** Increase Operational Efficiency of Goods Movement	• Identify the critical freight transportation network for the state, which includes the national freight network designated by the USDOT	• No tactics listed	•
			• Identify and implement freight movement gap-closing improvements	• Improve hub connections (last mile and beyond) • Work with local governments to support and back-up efforts to maintain and improve freight movement access and reduce negative local impacts	
			• Identify and implement freight movement efficiency enhancements	• Prioritize investments on connections (distribution hubs, ILCs, etc.)	
			• Promote and support use of Intelligent Transportation Systems (ITS) technology to increase efficiency and reliability of freight movements	• Establish appropriate role to promote and support the use of best practice information technology among all Florida trucking companies (in coordination with transportation systems management and operations [TSM&O]) • Foster uniform information technology among all Florida seaport for trucking and rail operators • Expedite the implementation of recommendations and lessons from the Freight Advanced Traveler Information System (FRATIS) pilot	
			• Champion and support needed freight capacity expansions	• Identify and implement projects to eliminate freight bottlenecks • Examine dedicated freight facilities or freight shuttles when existing capacity has been maximized • Explore the appropriate role of marine highways or short-sea shipping • Anticipate future freight facility needs • Examine dedicated facilities for “non-freight” activity that serves to restore capacity for freight movement	•
			• Identify and implement safety and security enhancements	• Information technology cargo and truck, truck parking, dedicated truck lanes • Employ alternative delivery mechanisms for rest-stops/lay-over areas and other safety-enhancing facilities • Facilitate the safe implementation of autonomous vehicles (driverless vehicles and unmanned space vehicles)	
			• Assess possible freight network disruptions and develop contingency plans or principles that support the logistics industry and disaster response	• Conduct periodic strengths, weaknesses, opportunities, and threats (SWOT) • analyses of the complete freight and logistics network	
		Goal 3: Minimize Costs in the Supply Chain	• Advance the use of more environmentally friendly alternative fuels	• Support and provide fuel site information and locations to LNG and CNG users	•
			• Support and facilitate the deployment of CNG/LNG use for hub logistics and long-haul trucking in collaboration with the Florida Department of Agriculture	• Explore alternative fuel corridors with suppliers and first-adopters (facilitation to address local issues) • Coordinate initiatives for user conversions as market evolves (via incentives to level playing field)	
			• Evaluate alternative fuel taxing options as a successor to gasoline taxes	• Assess impact of alternative tax or user fee proposals	

			• Advocate for regulatory reform and federal inspection agencies staffing to reduce impediments to goods movement (e.g., weight limits)	• Support integration and implementation of technology to reduce inspection time	
			• Support manufacturing and assembly that reduces empty backhauling	• Expand FTZ benefits to ILCs with potential for manufacturing capacity • Facilitate transportation and CNG/LNG supply to support such ILCs • Strategize with freight forwarders on how to maximize freight forwarding opportunities for goods manufactured in other states for export through Florida ports and airports	
FDOT Freight Mobility and Trade Plan		**Goal 4:** Align Public and Private Efforts for Trade and Logistics	• Formalize CEO Freight Leadership Group from the FMTP Florida Freight Leadership Forum to function in the role of the freight advisory committee encouraged by federal law	• Establish freight policy and program input and feedback mechanisms • Convene regularly to discuss and strategize on trade and logistics issues	
			• Devise public-private partnership framework options for joint investments for freight mobility	• Focus public investment in long-term infrastructure • Leverage private investment in technology and operational improvements • Solicit public-private partnership for infrastructure investment	
			• Bring business community into transportation planning process	• Maintain continuous contact with freight system users via listening sessions, webinars, surveys, etc.	
		Goal 5: Raise Awareness and Support for Freight Movement Investments	• Tell the Freight Story – undertake a joint public-private communications campaign	• To educate the public about the importance of freight transportation • To educate young people about the job opportunities in the freight and logistics field • To educate and inform elected officials about freight	
			• Develop a common lexicon of freight terms for transportation and business partners to use to minimize confusion over terms	• Identify existing freight terminology dictionary sources • Encourage private freight sector partners to review and revise periodically	
		Goal 6: Develop a Balanced Transportation Planning and Investment Model that Considers and Integrates All Forms of Transportation	• Provide transportation and land use planning guidance and direction to local and regional agencies for enhanced economic development and freight efficiencies that support community goals	• In coordination with FDOT Districts, facilitate on-going discussions with private sector stakeholders, MPOs and local agencies on transportation needs and solutions	
			• Coordinate across state agencies to ensure consistency of regulations that impact freight operations and mobility	• Continue to support and collaborate with ITTS/Freight in the Southeast conference	
			• Coordinate and integrate freight-related plans and programs of freight facility owners, local jurisdictions, Metropolitan Planning Organizations (MPOs) and the FDOT (Central Office & Districts) for expedited and informed decision-making	• In coordination with FDOT Districts, facilitate on-going discussions with private sector stakeholders, MPOs and local agencies on transportation needs and solutions	
			• Facilitate and maintain regional partnerships for multi-jurisdictional consensus and collaboration	• In coordination with FDOT Districts, facilitate on-going discussions with private sector stakeholders, MPOs and local agencies on transportation needs and solutions	

			• Assign specific responsibility to FDOT leadership to ensure alignment of state and local freight transportation policies, plans, and programs	• Upon completion of the FMTP, develop and present information to FDOT leadership on topics and matters where policies, programs, and projects may be in conflict or not congruent	
		Goal 7: Transform the FDOT's Organizational Culture to Include Consideration of Supply Chain and Freight Movement Issues	• Integrate modal perspectives with multimodal supply chain perspective	• Add freight factors to Strategic Investment Tool (SIT) prioritization process • Add freight movement metrics to the FDOT performance measures • Add criteria for inclusion of ILCs in the SIS • Position and support emerging freight facilities: spaceports, marine highways, etc.	
			• Instill goods movement perspective in the transportation planning process and decisions	• Revise FDOT policies to incorporate freight movements in planning, design, and operations • Revise FDOT organization and processes to be more truly multimodal • Provide freight policy guidance to Districts and local agencies • Streamline FDOT procedures to respond nimbly to market changes	
			• Prioritize freight projects across the modes	• Establish procedures to identify critical freight infrastructure investments that reflect private sector and local goals and needs • Leverage freight infrastructure investments to amplify private sector investments • Establish ROI or value criteria to focus investments • Develop multimodal investment and decision tools • Support freight infrastructure investments from the SIS, State Infrastructure Bank (SIB), Transportation Infrastructure Finance and Innovation Act (TIFIA), etc.	

Source	Mission *The clear and concise declaration of why an organization exists*	Goals *Broad targets to achieve*	Objectives *Describe specific areas where progress is desired to achieve the goal*	Performance Measures *Quantitatively assess a particular objective*	Performance Indicators
FDOT Source Book	The objective of this document is to detail the methodologies used to develop the measures and factors presented in the Source Book.		• People-Related Mobility Measures ○ Auto/Truck ○ Transit ○ Aviation ○ Bicycle/Pedestrian ○ Rail ○ Seaport		Auto/Truck • Vehicle Miles Traveled • Person Miles Traveled • Travel Time Reliability • Average Travel Speed – Auto • Average Speed vs. Posted Speed • Vehicles per Lane Mile • % Travel by Congestion Level • % Miles by Congestion Level • Duration of Congestion • Hours of Delay • Job Accessibility by Auto Transit • Transit Passenger Trips • Transit Revenue Miles • Passenger Trips per Revenue Mile • Transit Revenue Miles Between Failures • Transit Weekday Span of Service • Resident Access to Transit • Job Accessibility by Transit Aviation • Aviation Passenger Boardings • Aviation Departure Reliability • Aviation Tonnage Bicycle/Pedestrian • % Bicycle Facility Coverage • % Pedestrian Facility Coverage • Non-Motorized Traffic Counts Rail • Rail Passengers • Passenger Rail On-Time Arrival Seaport • Seaport Passenger Movements
			• Safety Measures ○ Auto/Truck		Auto/Truck • Number of Fatalities • Number of Serious Injuries • Rate of Fatalities • Rate of Serious Injuries • Motorcycle Fatalities and Serious Injuries • Pedestrian Fatalities and Serious Injuries • Bicycle Fatalities and Serious Injuries • Safety Belt Use

FDOT Source Book			• Freight-Related Mobility Measures ◦ Truck ◦ Aviation ◦ Space Measures ◦ Seaport		Truck • Average Travel Speed – Combination Truck • Combination Truck Cost of Delay
					Aviation • Aviation Tonnage
					Space Measures • Space Launches and Sites • Space Payloads
					Seaport • Seaport Tonnage • Seaport Twenty-Foot Equivalent Units

Source	Mission	Goals	Objectives	Performance Measures	Performance Indicators
	The clear and concise declaration of why an organization exists	*Broad targets to achieve*	*Describe specific areas where progress is desired to achieve the goal*	*Quantitatively assess a particular objective*	
FL Planning Division [FDOT Office of Chief Planner](#)	To provide the foundation for programming and project delivery through innovative planning and effective outreach that will strategically advance the best transportation solutions at the right time.	• **Consistent** in processes and approaches to provide clear direction and reliable service • **Collaborative** in working with all customers and partners • **Purposeful** in everything we do to ensure we maximize the value of planning to FDOT's programming and project development • **Adaptable** so that we adjust with agility and flexibility as our organization and the transportation industry changes	•	Infrastructure Measures	• Percent of lane miles on the State Highway System (SHS) having a pavement condition rating of either excellent or good • Percent of bridge structures on the SHS having a condition rating of either excellent or good • Achieve the acceptable maintenance standard on the SHS
				Mobility Measures	• Peak hour vehicle hours of delay on the SHS • Daily combination truck hours of delay on the SHS • Annual transit revenue miles
				Safety Measures	• Number of fatalities on all public roads • Number of serious injuries on all public roads
				Accountability	• **Percent of construction projects completed on time** • **Percent of construction projects completed within budget**

C

Airport Activity/Emerging Trends Survey Results

FDOT 2043 FASP FLORIDA AVIATION SYSTEM PLAN

Appendix C

Airport Activity/Emerging Trends Survey Results

The functional roles of airports within the Florida Aviation System are pivotal in the overall success of securing funding for projects, prioritizing projects per airport, implementing sustainable measures, and supporting new technologies to the degree that the Florida Department of Transportation Aviation Office (FDOT AO) desires to continue meeting user needs and interests as the system continues to thrive and grow. Following the analysis of current conditions related to electrification, sustainable fuels, and aviation gas (avgas), the FDOT AO sought stakeholder input regarding the types of activity and emerging trends each airport is experiencing. Identifying the most prevalent types of activity within each functional role along with emerging trends being observed at the airports gives the FDOT AO the data needed to inform strategic direction for planning the future improvements for the overall system. This document contains the highlights from stakeholder responses regarding the types of activity and emerging trends observed at Florida airports.

Background

The FDOT AO issued a survey to all public-use airports in late Summer 2022. Responses from more than 85 percent of the airports were received.

The survey questions prompted airport management to assess whether specified airport services and aircraft activities at their airports occurred at no level (none), minor levels, moderate, or significant levels. **Attachment A** contains a copy of the survey template. Additionally, survey respondents were asked to assess whether the timing of anticipated impacts of emerging trends and technologies to their airports would be immediate, near-term, mid-term, long-term, or would not have an impact at all. Survey highlights are outlined below.

Airport Activities

The survey inquired about the presence of activity levels in these categories:

- Airport service facilities.
- Alternate aircraft activities.
- Community outreach.
- Flight activities.

Airport Service Facilities

- Managers were asked if they had some level of maintenance, manufacturing, maintenance/repair/overhaul (MRO), sales, and avionics activity at their airport. These activities offer the mutual benefit of providing revenue opportunities for the airport and on-site services for users. While many airports indicated they had more than one of these activities present on their airfield, the activities that were reported the most at each airport type included:

- Fifty-eight percent of Commercial Service airports reported having aircraft maintenance activities.
- Forty-four percent of General Aviation (GA) airports reported having MRO services.

Flight Activities

Managers were asked to comment on their level of air cargo flights, military operations, charter operations, and flight instruction. Noteworthy highlights for these activities consist of the following:

Air Cargo

- Commercial service airports had significant air cargo activity with 68 percent reporting this activity, while the majority of GA airports had limited or no air cargo activity.

Charter Activity

- Commercial service airports saw significant levels of charter aircraft activity (68 percent), while approximately 12 percent of GA airports reported significant air charter activity.

Military Operations

- Commercial service airports saw equal amounts of minor to moderate military operations, while the majority of GA airports (48 percent) experience minor levels of military activity.

Flight Instruction

Flight instruction results were segmented into three categories: Private, Part 61, and Part 141.

- Commercial service airports reported their highest levels of flight training with Part 141 activities with 32 percent of the airports having this type of instruction.
- At GA airports, nearly a quarter of the respondent's report Part 141 training, and over 60 percent report at least minor or moderate levels of private flight instruction, and just under 25 percent report significant levels of Part 61 instruction.

Alternate Aircraft Types

There are a range of types of aircraft that can be found operating at airports across the state of Florida. As such, the survey also addressed the levels of activity for powered parachutes, skydiving, ultralight, gyrocopter, and other alternate types of aircraft. Notable results include the following:

- Commercial service airports report having little activity in these categories.
- GA airports also experience only minor activity in all of these categories.

Community Outreach

Community outreach is a tool that facilitates community involvement and support, and it is often a means to help the community understand the significant role airports play in terms of local and regional economy and access. Respondents were asked to comment on the levels of training and education occurring at or through airports, civil air patrol activities, community events and fly-ins, and Experimental Aircraft Association (EAA) club activity. Highlights from the survey results include:

Career Training/Education

Career training/education and youth education opportunities were the focus of survey questions.

- All commercial service airports reported some level of training and education activities.
- More than 70 percent of GA airports experience some level of career training and youth education activity, with the remaining 20 percent experiencing significant levels.

Civil Air Patrol Activities

Civil Air Patrol (CAP) activities are fairly limited at both commercial service and GA airports, with no CAP activity occurring at most of these airports.

Hosting Community Events and Fly-Ins

Community events and fly-ins provide opportunities to introduce or promote the amenities and other benefits an airport provides a local community, boost the local or regional economy, and generally foster stronger partnerships and relationships across the airport's community stakeholders, whether decision-makers or the general public. Survey highlights for these categories are as follows.

- The majority of commercial service airports reported having minor or moderate levels of the hosting of community events.
- Approximately 75 percent of GA airports reported host community events at some level.
- Nearly two-thirds of the commercial service airports report that they do not host airshows or fly-ins, which is not

Daytona Beach International Airport is known for pilot training with Embry-Riddle Aeronautical University based there. In the previous FDOT Economic Impact Study, ERAU had a $1 billion economic impact on the Daytona Beach region alone.

The Sarasota Bradenton International Airport is actively working with outside partners to provide facilities for K-12 Aviation Magnet school.

Palm Beach County Park Airport (Lantana) is the original location of the Civil Air Patrol - set up to help look for German submarines.

Orlando International Airport hosts a variety of community and charity events throughout the year, including job fairs, performances by the Orlando Philharmonic, and events associated with the Special Olympics.

Lakeland Linder International Airport (LAL) is the home of the annual Sun 'n Fun Aerospace Expo, which draws 150,000 people from 85 different countries and over 2,000 aircraft to LAL each spring.

Arcadia Municipal Airport hosts Taco Tuesday, a weekly fly-in with two or three food trucks coupled with avgas reduced by $0.10 per gallon. In the 3 years of its existence, the members of the community have begun driving out for the event, changing what was once a fly-in, to a fly-in/drive-in event.

surprising given the activity levels and security issues at commercial service airports.

- Nearly half of GA airports also report that they do not host airshows or fly-in activities.

EAA Clubs

The majority of commercial service airports and just over half of the GA airports report no EAA Club activity.

Emerging Trends and Technology

The survey also investigated the amount of activity related to the following emerging trends:

- Electrification of vehicles.
- Equipment innovations.
- Resiliency and sustainability.

Electrification of Vehicles

The interest in electrification of airports has already generated funding opportunities, project development, planning for future projects, and investment in upgrading electrification capacity. The survey addressed when airport management staff anticipated aircraft charging, ground support equipment (GSE) charging, and the charging of personal or rental vehicles would impact their airports. Respondents indicated if they thought the impacts would be immediate, near-term, mid-term, long-term, or if there would be no impact.

Aircraft Charging

- Twenty-five percent of commercial service airports anticipated near-term impacts, with another quarter anticipating mid-term impacts.
- Just under half of GA airports expect no impacts, with just over a quarter expecting the impacts to be long-term.

GSE Charging

- Close to half of commercial service airports expect impacts to be near-term, with nearly one-third anticipating mid-term impacts for GSE charging.
- GA airports see this as a much longer-term issue with less than 10 percent indicating an immediate impact.

Passenger Vehicle Charging

- The overwhelming majority of commercial service airports anticipate either immediate or near-term impacts, accounting for nearly 90 percent of the airports.
- Approximately 60 percent of the GA airports anticipate impacts in the immediate to near-term periods.

Equipment Innovations

Emerging technologies are offering airports the opportunity for improved data collection or monitoring of conditions around the airport. To that end, the survey addressed equipment innovations for counting aircraft, alternate weather reporting, and remote airport traffic control tower (ATCT) operations.

Solutions for Counting Aircraft Operations (ADS-B, etc.)

- More than half of the commercial service airports anticipate impacts immediately or in the near term for counting aircraft operations with emerging technologies.
- Over one-third of the GA airports anticipate immediate impacts.

Alternative Weather Reporting (SayWeather, Micro Tower, etc.)

- Since many commercial service airports already have FAA-certified weather reporting, only a third report having any sort of near-term impacts with alternative weather reporting options.
- Among GA airports, nearly 60 percent anticipate some type of impact, with the impacts occurring over the near- and long-term periods.

Remote Airport Traffic Control Towers (ATCTs)

- One-third of commercial service airports expect long-term impacts from the use of remote ATCTs.
- Approximately 20 percent of GA airports anticipate long-term impacts at their facility.

Resiliency and Sustainability

Resiliency and sustainability are becoming more critical to consider in planning and development. For that reason, the survey asked managers to comment on the topics of alternative power sources, impacts from weather events, impacts to the Florida system from implementation of sustainable aviation fuels, and the use of unleaded avgas. Highlights for each of these topic areas include:

Solar, Wind, and Geothermal Power

- About 60 percent of commercial service airports anticipate mid- to long-term impacts with these alternative power sources.
- GA airports are almost evenly split, reporting their anticipated impacts to be spread over the immediate, near-, mid-, and long-term timeframes.

Waste Reduction

- Commercial service airports are equally split on the topic of waste reduction with nearly one quarter reporting this being an immediate, near-term, mid-term, or long-term impact.
- Approximately 75 percent of GA airports anticipate waste reduction impacts in the near-term to mid-term period.

Weather-Related Impacts (Hurricanes, sea-level rise, etc.)

- Much like waste reduction, commercial service airports are equally split on the topic of weather-related impacts, with nearly one quarter each reporting this being an immediate, near-term, mid-term, or long-term impact.
- GA airports also rated weather-related impacts to be evenly spread across the immediate, near-, mid-, and long-term periods.

Sustainable Aviation Fuels (SAF)

- Approximately 75 percent of commercial service airports see SAF as an issue in the mid-term to long-term period.
- GA airports are much more aggressive with this topic with 60 percent reporting SAF being an impact in the immediate to near-term period.

Unleaded Avgas

- Commercial service airports are split in their anticipated impacts of unleaded avgas with about half seeing it as an issue in the immediate to near term and half seeing it as an impact in the mid- to long-term timeframe.
- GA airports are equally split on the impact of unleaded avgas being an issue in the immediate, near-, mid-, and long-term period.

Advanced Air Mobility, Urban Air Mobility, and electric Vertical Takeoff and Landing

Advanced Air Mobility (AAM), Urban Air Mobility (UAM), and electric Vertical Takeoff and Landing (eVTOL) aircraft have been in development for some time. As these innovative aircraft and their market continue to develop and expand, there is tremendous potential for a wide range of uses, but airports must be planning for their implementation or impacts to their airports. The survey addressed the timing of these impacts to Florida airports as well. The following statements present some of the survey highlights.

- Eighty-five percent of the commercial service airports expect near- or mid-term impacts related to AAM/UAM/eVTOL at their facilities.
- GA airports report equal impacts across the near-, mid- and long-term periods.

Conclusion

Understanding the prevalence of a variety of airport activities and facilities allows the FDOT AO to proactively assess the needs necessary to accommodate existing and future flight activities within the airport system. Having the ability to evaluate demand by an assortment of flight activities, coupled with the ability to identify where aviation-related facilities are and are not available will allow the FDOT AO to be better positioned to accommodate them in future airport programming efforts.

In addition, the FDOT AO plays an important role with developments in emerging trends and technologies by being involved to represent the interests and challenges of airports across the state. By doing so and implementing recommendations from this emerging trend paper, Florida will be well positioned to accommodate the dynamic changes in the areas of electrification of vehicles, equipment innovations, and resiliency and sustainability.

Likewise, airports of the Florida system can learn and develop from each other in the fields of community outreach and education. Understanding how other airports have been successful in gaining community appreciation and fostering the need to improve aviation education to provide for future aviators and other aviation professionals alike is critical to accommodate the demand for a skilled aviation industry workforce in the future.

Attachment A – State of Florida 2022 Airport Activity Inventory

STATE of FLORIDA 2022 AIRPORT ACTIVITY INVENTORY

Airport Name: ____________________ ID: __________

Name of Person Completing Survey: ____________________

Email: ____________________ Phone: ____________________

Part 1 - Identifying Current Activity Level

As an airport manager, we know that you understand what happens at your airport better than anyone. As part of the update to the Florida Aviation System Plan (FASP), we want to capture all of the activities that take place across the entire system and that starts with your airport.

Please place a ✓ to note the amount of activity your airport experiences for each type of activity.

Provide any comments on activity type and include any additional activities at the bottom of the page.

Please return this survey by September 9, 2022 via email to Mike.McClure@dot.state.fl.us or complete online using the following link: https://www.surveymonkey.com/r/7PDJKCF

Type of Activities	Level of Activity (choose only one per activity)				Comments
	Significant Amount	Moderate Amount	Minor Amount	None	
Types of Flights					
Commercial Airline Flights	☐	☐	☐	☐	
Charter Aircraft Flights	☐	☐	☐	☐	
Corporate Aircraft Flights	☐	☐	☐	☐	
Air Cargo Flights	☐	☐	☐	☐	
Agricultural Spraying Flights	☐	☐	☐	☐	
Personal/Recreational Flights	☐	☐	☐	☐	
Flight Club	☐	☐	☐	☐	
Sightseeing Flights	☐	☐	☐	☐	
Emergency Medical Flights/Air Ambulance	☐	☐	☐	☐	
Law Enforcement Flights	☐	☐	☐	☐	
Traffic or News Reporting Flights	☐	☐	☐	☐	

STATE of FLORIDA 2022 AIRPORT ACTIVITY INVENTORY
Part 1-Identifying Current Activity Level

Type of Activities	Level of Activity (choose only one per activity)				Comments
	Significant Amount	Moderate Amount	Minor Amount	None	
Military Exercises/Training Flights	☐	☐	☐	☐	
Advertising/Banner Towing	☐	☐	☐	☐	
Environmental/Natural Resource Flights	☐	☐	☐	☐	
Prisoner Transport	☐	☐	☐	☐	
Real Estate Tours	☐	☐	☐	☐	
Aerial Inspections	☐	☐	☐	☐	
Aerial Photography	☐	☐	☐	☐	
Flight Training					
Private (CFI offering private lessons)	☐	☐	☐	☐	
Part 61 (small, flexible program)	☐	☐	☐	☐	
Part 141 (larger, FAA structured, university)	☐	☐	☐	☐	
Instrument Approach Traning	☐	☐	☐	☐	
Visiting Training from Other Airports	☐	☐	☐	☐	
Alternate Aircraft Types					
Powered Parachutes	☐	☐	☐	☐	
Skydiving	☐	☐	☐	☐	
Ultralights	☐	☐	☐	☐	
Powered Paraglider	☐	☐	☐	☐	
Gyrocopter	☐	☐	☐	☐	

STATE of FLORIDA 2022 AIRPORT ACTIVITY INVENTORY
Part 1-Identifying Current Activity Level

Type of Activities	Level of Activity (choose only one per activity)				Comments
	Significant Amount	Moderate Amount	Minor Amount	None	
Airport Service Facilities					
Aircraft Maintenance	☐	☐	☐	☐	
Aircraft Avionics	☐	☐	☐	☐	
Aircraft Sales	☐	☐	☐	☐	
Aircraft Manufacturing	☐	☐	☐	☐	
Maintenance, Repair, and Overhaul (MRO)	☐	☐	☐	☐	
Community Outreach					
Career Training/Education	☐	☐	☐	☐	
Youth Education	☐	☐	☐	☐	
Civil Air Patrol	☐	☐	☐	☐	
Hosting Community Events	☐	☐	☐	☐	
Air Shows/Fly-ins	☐	☐	☐	☐	
EAA Club	☐	☐	☐	☐	
Other Activities not previously listed:					
	☐	☐	☐	☐	
	☐	☐	☐	☐	
	☐	☐	☐	☐	

STATE of FLORIDA 2022 AIRPORT ACTIVITY INVENTORY
Part 1-Identifying Current Activity Level

What is your airport known for? Does it have a niche? Please provide a brief description.

Please return survey by September 9, 2022 via email to Mike.McClure@dot.state.fl.us or complete online using link noted above.

STATE of FLORIDA 2022 AIRPORT ACTIVITY INVENTORY

Part 2 - Identifying Emerging Trends and Technology

As part of the update to the Florida Aviation System Plan (FASP), we want to identify emerging trends and technologies that may impact your airport or the statewide system so we can investigate possible ways to address these issues in future decision-making efforts.

Please place a ✓ to note the time-frame that you anticipate the following trends and technologies may impact your airport or the system as a whole and include any comments. Please provide any additional trends, technologies, or comments you wish to share at the bottom of the page.

Please return survey by September 9, 2022 via email to Mike.McClure@dot.state.fl.us or complete online using the following link: https://www.surveymonkey.com/r/7PDJKCF

Emerging Trends & Technologies	Anticipated Timeframe for Possible Impact					Comments
	Immediate Impact	Near-term Impact	Mid-term Impact	Long-term Impact	No Impact	
Electrification of Vehicles						
Aircraft Charging						
Ground Support Equipment Charging						
Passenger Vehicle Charging						
Equipment Innovations						
Solutions for counting aircraft operations (ADS-B, etc.)						
Alternative weather reporting options (SayWeather, Micro Tower, etc.)						
Remote Air Traffic Control Towers						
Resiliency and Sustainability Issues						
Solar, wind and geothermal power options						
Waste reduction						
Weather related impacts (hurricanes, sea-level rise, etc.)						
Sustainable Aviation Fuels (SAF)						
Unleaded Avgas						
Advanced Air Mobility (AAM) Concepts *						
AAM/UAM/eVTOL						
Other trends not previously listed:						
General Comments:						

*"AAM is a new concept of air transportation using electric vertical takeoff and landing (eVTOL) aircraft to move people and cargo between places not currently or easily served by surface transportation or existing aviation modes. EVTOL aircraft may be powered by hybrid electric systems, batteries or potentially hydrogen fuel cells. Sometimes AAM is also called urban air mobility (UAM), although potential applications for this form of transportation could extend beyond high-density urban centers. These aircraft, which will range in size from single-passenger aircraft to large shuttles, will bring accessibility to cities, underserved communities and geographically distant regions. Development of infrastructure in support of AAM is underway in cities today, with AAM expected to become an increasingly important part of our transportation system in the next several years." *Source:* "Advanced Air Mobility (AAM)." National Business Aviation Association, Retrieved from https://nbaa.org/aircraft-operations/emerging-technologies/advanced-air-mobility-aam/, 18 July 2022.

Please return survey by September 9, 2022 via email to Mike.McClure@dot.state.fl.us or complete online as noted at top of survey.

D
Aviation Activity Forecasts

FDOT 2043 FASP FLORIDA AVIATION SYSTEM PLAN

Appendix D

Aviation Activity Forecasts

Forecasting aviation activity across the state of Florida is crucial for understanding the potential strains and demands that the Florida aviation system may face in the future. The forecasts referred to in this chapter will be used to address future functionality of the airport system in the state and to ensure that every airport can serve appropriately in their role. The Florida Department of Transportation's (FDOT) seven regional districts will use these projections to assess the need for development of aviation facilities that service general and commercial aviation activity. These forecasts include 106 airports that are both publicly owned and available for public use. This group of airports is generally recognized as the Florida Aviation System of Airports.

The forecasts evaluate historical growth and trends using several methodologies. The methodologies being used are trend analysis, regression analysis, and market share analysis. The multiple, Florida systemwide forecasts developed address aircraft operations, enplanements, and based aircraft for both commercial service and general aviation airports.

In addition, the fleet mix analysis and critical aircraft review conducted in association with the forecasting effort assist with identifying potential shortfalls in aviation facilities across the Florida aviation system.

The following sections document projections of aviation demand developed for the Florida Aviation System Plan (FASP) 2043:

- Data Collection.
- FDOT Transportation Districts.
- Aviation Trends.
- Socioeconomic Trends.
- Historic Aviation Activity.
- Projections of Aviation Demand.
- Summary of Forecast Scenarios and Comparison to Terminal Area Forecast (TAF).
- Aircraft Fleet Mix.
- Critical Aircraft Analysis.
- Recommended Forecast.

Data Collection

The following resources were collected to assist with documenting existing and projecting forecasted levels of aviation activity within the state of Florida.

Airport Master Plans

Fifteen airport master plans that have been completed since 2018 were reviewed as part of the data collection effort. The comparison of aviation activity levels as projected in the master plans against existing data collected by the FDOT Aviation Office (FDOT AO) yields a fuller picture of activity levels.

FDOT Forecasts

The FDOT AO provided historical numbers regarding the total commercial enplanements of all commercial airports in the state from 2002 to 2021. In addition, the FDOT AO also provided their projected number of enplanements from 2022 to 2041.

Federal Aviation Administration (FAA) Terminal Area Forecast

The Terminal Area Forecast (TAF) is the official FAA forecast of aviation activity for United States (U.S.) airports. It contains active airports in the National Plan of Integrated Airport Systems (NPIAS) including FAA-towered airports, federal contract-towered airports, non-federal towered airports, and non-towered airports. Forecasts are prepared for major users of the National Airspace System including air carrier, air taxi/commuter, general aviation, and military. The TAFs used for this forecasting effort were issued by the FAA in February 2023. TAFs for each airport, the Southern Region of the FAA, and the Florida airport system were extracted to provide historical operations data from 2012 to 2021 and forecasted operations data through 2043.

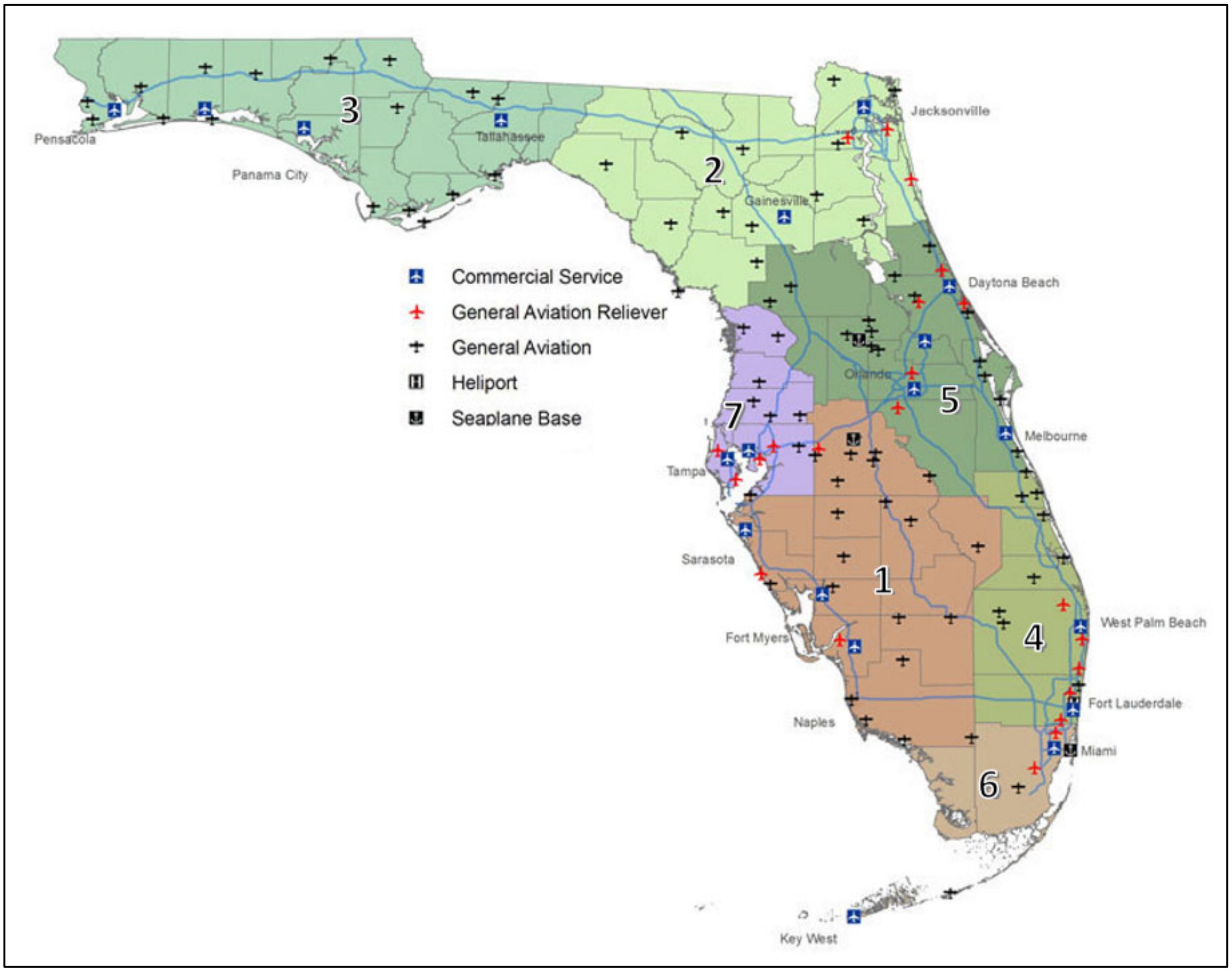
FAA Aerospace Forecasts 2023-2043

The FAA Aerospace Forecasts presents trends in all aspects of aviation in the United States. The latest document published by the FAA forecasts national aviation activity from 2023-2043. The FAA develops forecasts by using historical data to identify potential trends that include predicted growth and/or decay rates of several segments of aviation, including operations, enplanements, based aircraft, and general aviation activity.

FDOT Transportation Districts

FDOT governs its transportation system by separating the state into seven districts (**Figure 1**). Every district has a District Secretary and divisions for Operations, Production, Administration, and Planning. District Aviation Coordinators oversee the FDOT AO's grant management and other responsibilities for the Florida Aviation System airports within their respective districts. Additional information regarding each of FDOT's seven transportation districts is provided in the following sections.

Figure 1. Florida District Map



Source: FDOT 2023

District 1 (Southwest Florida)

This district is roughly 12,000 square miles and contains 12 counties. District 1 provides grant funds to 21 of the 27 public-use airports located in the district, including three commercial service airports. In addition, it is home to approximately 106 private-use aviation facilities, one military aviation facility, and one deep-water seaport. Sarasota, Fort Myers, and Naples are major cities located in this district.

- **Population:** 3.0 million
- **Airports:** 134 *(privately owned and military airports are not included in forecast)*
- **Busiest Airports:** Punta Gorda Airport, Sarasota-Bradenton International, and Southwest Florida International

District 2 (Northeast Florida)

Eighteen counties and their associated cities including Jacksonville and St. Augustine make up this district. District 2 provides grant funds to 16 of the 18 public-use airports located in the district, including two commercial service airports. In addition, it is home to approximately 95 private-use aviation facilities, and four military aviation facilities. Estimates here indicate roughly 43.2 million miles are driven every day. This region contains two deep-water ports, three major rail lines, and two major transit authorities.

- **Population:** 2.2 million
- **Airports:** 117 *(privately owned and military airports are not included in forecast)*
- **Busiest Airports:** Jacksonville International, and Gainesville Regional

District 3 (Northwest Florida)

District 3 is located entirely in the Florida Panhandle spanning over 11,500 square miles and 16 counties. District 3 provides grant funds to 15 of the 19 public-use airports located in the district, including four commercial service airports. In addition, it is home to approximately 69 private-use aviation facilities, and 15 military aviation facilities. Major urban centers located in this district include Pensacola and Tallahassee. The district has three deep-water ports, four rail lines, and more than 26.1 million miles are driven daily.

- **Population:** 1.4 million
- **Airports:** 103 *(privately owned and military airports are not included in forecast)*
- **Busiest Airports:** Northwest Florida Beaches International, Pensacola International, Tallahassee International, and Destin-Ft. Walton Beach

District 4 (Southeast Florida)

District 4 is a bit smaller compared to its counterparts, with it occupying 5,000 square miles and comprising four counties. District 4 provides grant funds to 15 of the 17 public-use airports located in the district, including two commercial service airports. In addition, it is home to approximately 60 private-use aviation facilities, and no military aviation facilities. This region sees travel totaling 52.4 million miles driven daily. It is home to three deep-water seaports, two railroads, a commuter rail line, and two transit authorities. The largest cities in this district are Fort Lauderdale, Hollywood, and West Palm Beach.

- **Population:** 4.0 million
- **Airports:** 70 *(privately owned and military airports are not included in forecast)*
- **Busiest Airports:** Fort Lauderdale/Hollywood International, and Palm Beach International

District 5 (Central Florida)

Nine counties and 9,000 square miles make up the fastest growing region in Florida. District 5 provides grant funds to 21 of the 26 public-use airports located in the district, including four commercial service airports. In addition, it is home to approximately 121 private-use aviation facilities, and two military aviation facilities. A total of 125.9 million miles are driven daily, and seven transit authorities, four railroads, one passenger rail line, and one deep-water seaport serve the district. Unlike anywhere else in the state, the Central Florida region also hosts Space Florida, a spaceport used by NASA, SpaceX, and the United States Space Force. Major cities in the region include Orlando, Daytona Beach, and Palm Bay.

- **Population:** 4.4 million
- **Airports:** 149 *(privately owned and military airports are not included in forecast)*
- **Busiest Airports:** Daytona Beach International, Orlando International, Melbourne Orlando International, and Orlando Stanford International

District 6 (South Florida)

This district is home to two counties, Miami-Dade and Monroe. District 6 provides grant funds to 7 of the 8 public-use airports located in the district, including two commercial service airports. In addition, it is home to approximately 34 private-use aviation facilities, and two military aviation facilities. Miles driven daily total 56.7 million on roads in the region, and the district is served by two transit authorities, two rail lines, and two deep-water ports. Florida's largest metropolitan area is located here with Miami being the largest city. Other cities in this region are Homestead and Key West.

- **Population:** 2.9 million
- **Airports:** 44 *(privately owned and military airports are not included in forecast)*
- **Busiest Airports:** Key West International, and Miami International

District 7 (West Central Florida)

This district has a land area of 3,322 square miles and represents five counties. District 7 provides grant funds to 11 of the 13 public-use airports located in the district, including two commercial service airports. In addition, it is home to approximately 56 private-use aviation facilities, and one military aviation facility. Miles driven daily total 33.6 million miles, and the region has access to three transit authorities, one rail line, and two deep-water ports. Major cities in this district are Tampa, St. Petersburg, and Clearwater.

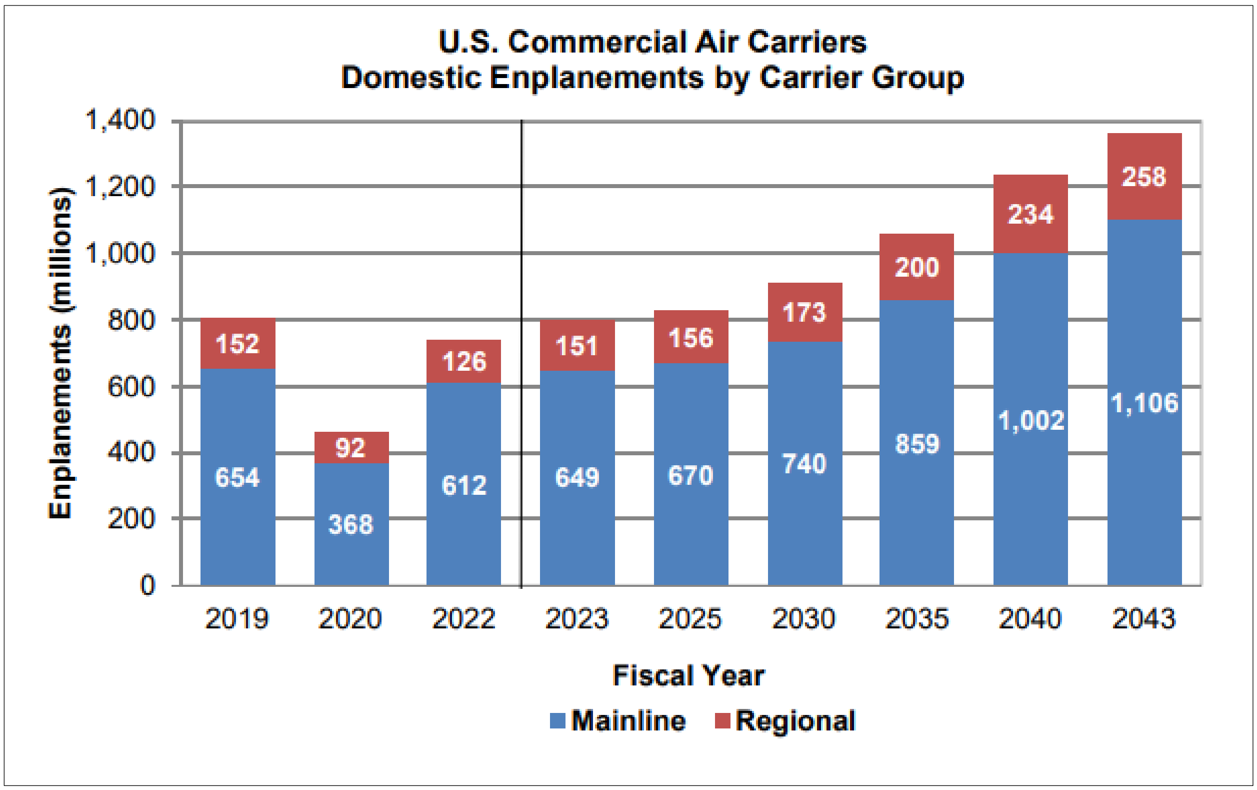
- **Population:** 3.3 million

- **Airports:** 70 *(privately owned and military airports are not included in forecast)*
- **Busiest Airports:** St. Petersburg-Clearwater International, and Tampa International

Aviation Trends

During the COVID-19 Pandemic, enplanements saw a sharp decline, whether travel was domestic or international. Since then, enplanement numbers have recovered to similar rates that were occurring in 2019. The *FAA Aerospace Forecast 2023-2043* predicts that enplanement numbers will rise through 2043 (**Figure 2**). As of 2023, domestic airlines are projected to reach 800 million enplanements with 649 million passengers taking main line carriers and 151 million passengers using regional carriers. The FAA forecast indicates that by 2043 passenger enplanements will rise to 1.364 billion passengers, with regional airlines taking on 258 million passengers and main line carriers transporting 1.106 billion passengers. Enplanements in the U.S. are forecasted to increase by more than 68 percent between 2023 and 2043.

Figure 2. Domestic Enplanements



Source: FAA Aerospace Forecast 2023-2043

Likewise, the FAA Aerospace Forecast also projects international enplanements to increase annually by 3.9 percent through 2043. In 2023, 241 million enplanements are projected to be conducted on U.S. and international air carriers travelling to and from the U.S. In 2043, it is predicted that 482 million enplanements will occur among all air carriers for international travel to and from the U.S.

Commercial Operations Growth Through 2043

Like enplanements, air carrier operations are returning to pre-pandemic levels. Demand for leisure travel has never been higher, and demand for air service for business purposes continues to rise as well. As demand is expected to grow through 2043, it is believed that carriers may struggle with capacity. A pilot shortage has hindered airline operations since before the pandemic. Many airlines had to furlough or lay off pilots, making it difficult for airlines today to meet the demands of American passengers. The forecasts published by the FAA indicate operational growth that is optimistic; however, the concern is that if the pilot shortage continues to be an issue, airlines will not be able to keep up.

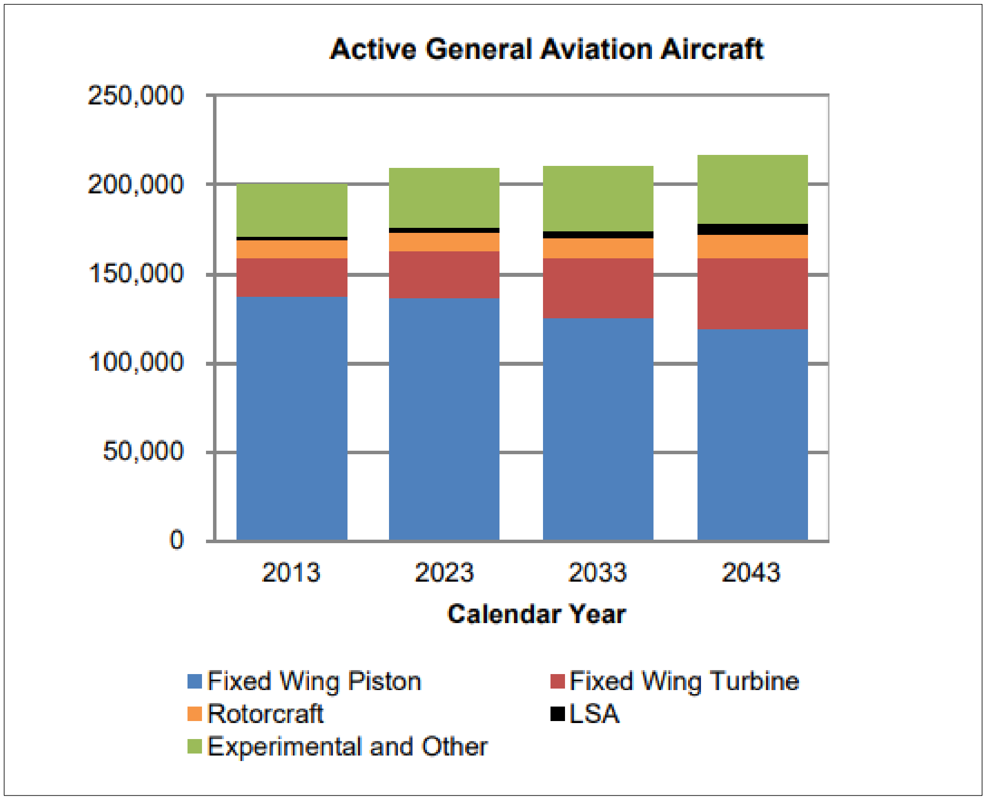
General Aviation Operations Through 2043

Like other trends in aviation, general aviation (GA) operations are expected to increase through 2043. The increase in GA operations results from the impact that the growth in the projected GA aircraft fleet has on GA operations. Active aircraft totals in the U.S. are projected to increase from 209,195 aircraft in 2023 to 216,395 in 2043. With this increase, the total number of fixed-winged piston aircraft is expected to decrease; however, turbine and light sport/experimental aircraft are expected to offset that decrease and drive the overall increase in aircraft in 2043 (**Figure 3**).

Another forecast published by the FAA indicates that hours flown by GA aircraft is expected to increase by 0.7 percent per year through 2043. Like active GA aircraft, fixed-winged piston aircraft operations are expected to see a decrease in hours flown. This decrease is again offset by turbine and light sport/experimental aircraft as these types of operation are expected to grow (**Figure 4**).

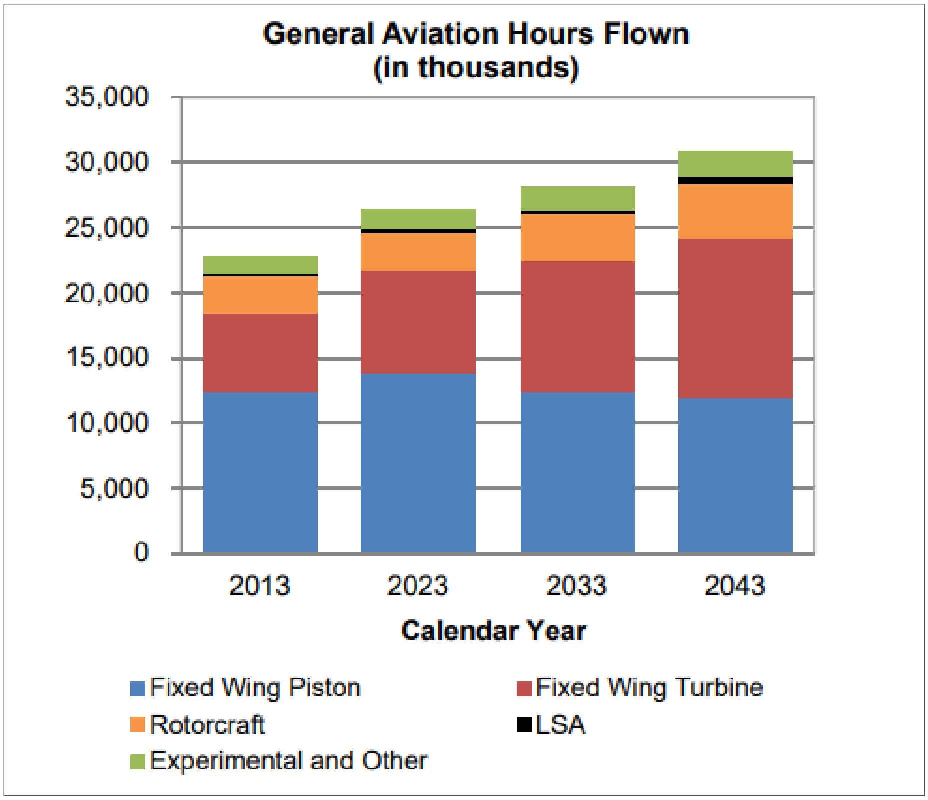
In comparison to other aspects in aviation, GA operations are also expected to grow over the next 20 years. Specifically, GA turbine and light sport/experimental aircraft usage is what will be driving the growth in GA operations through 2043.

Figure 3. Aircraft Totals



Source: FAA Aerospace Forecast 2023-2043

Figure 4. Hours Flown



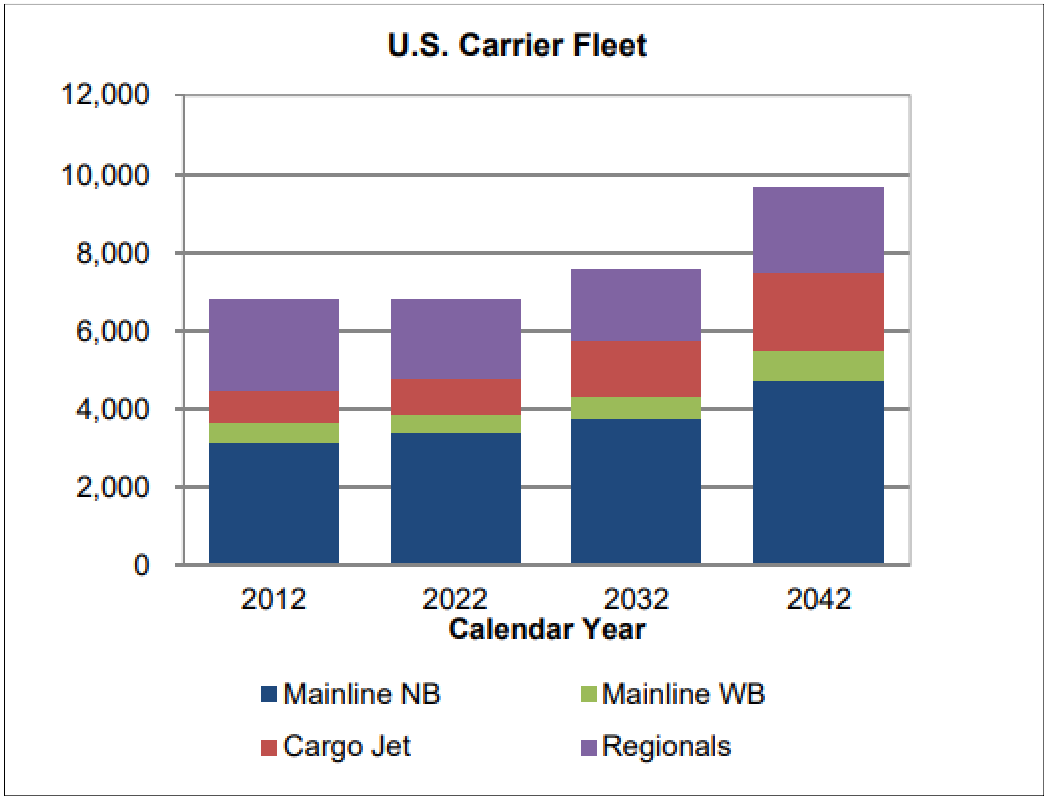
Source: FAA Aersopace Forecast 2023-2043

Based Aircraft Through 2043

As mentioned previously, the inventory of GA aircraft is expected to grow from 209,195 aircraft to 216,395 aircraft between 2023 and 2043. FAA forecasts that the based fleet will see decrease in fixed-winged piston aircraft and an increase in turbine and light sport/experimental aircraft.

Commercial aircraft based in the U.S. are predicted to increase to approximately 10,000 aircraft in 2043 from the 2022 total of 6,852 aircraft. This would result in a 2.0 percent annual growth rate between 2022 and 2043. Mainline commercial aircraft are expected to make up most of the commercial fleet based in America; however, cargo fleets are expected to see the largest increase (**Figure 5**).

Figure 5. Commercial Based Fleet



Source: FAA Aerospace Forecast 2023-2043

In light of the previously mentioned forecasts, it is expected that the total number of based aircraft in the U.S. is going to increase through 2043.

Socioeconomic Trends

Socioeconomic characteristics are often collected during the airport planning process and examined to derive an understanding of the dynamics of historic and projected growth within an airport system's market area. The socioeconomic factors play a vital role and have a direct impact on the long-term passenger and operational demand on Florida's aviation system. In general, there is a correlation among areas of greater populations, employment, personal income per capita, and a strong aviation service demand. Specifically, these key socioeconomic indicators or drivers tend to have an influence on passenger enplanements and their future projections.

The COVID-19 pandemic, which began in the U.S. in March 2020, has led to a prolonged economic recovery. Nearly every industry was impacted by the pandemic, including manufacturing, healthcare, education, finance, hospitality and tourism, and research and development. The following section analyzes the historic growth patterns of the socioeconomic variables for the Florida aviation system. The projections were derived from the most recent edition of Woods & Poole Economics' Complete Economic and Demographic Data Source (CEDDS) and Bureau of Economic and Business Research (University of Florida).

The Bureau of Economic and Business Research anticipates that Florida population will grow by nearly 30 percent between the years 2023 and 2043. **Table 1** identifies populations for each district as well as Florida as a whole from the 2010 and 2020 censuses and the forecasted years of 2023, 2028, 2033, and 2043. The forecasted population was calculated using straight-line interpolation from the forecasted years presented by the Bureau of Economic and Business Research.

Table 1. Florida Population by District

District	Population					
	2010 Census	2020 Census	2023 Forecast	2028 Forecast	2033 Forecast	2043 Forecast
1	2,658,027	3,119,200	*3,257,551*	*3,527,040*	*3,727,780*	*4,052,980*
2	1,960,058	2,229,000	*2,325,900*	*2,470,180*	*2,589,780*	*2,778,700*
3	1,366,092	1,495,300	*1,543,720*	*1,615,180*	*1,673,040*	*1,764,580*
4	3,630,335	4,040,400	*4,177,320*	*4,381,220*	*4,551,040*	*4,824,560*
5	3,692,794	4,408,300	*4,660,720*	*5,038,160*	*5,349,620*	*5,855,840*
6	2,569,525	2,926,200	*3,029,940*	*3,186,460*	*3,320,960*	*3,531,200*
7	2,924,479	3,337,400	*3,479,960*	*3,689,900*	*3,856,980*	*4,124,140*
FL Total	**18,801,310**	**21,555,800**	***22,475,111***	***23,908,140***	***25,069,200***	***26,932,000***

Source: Bureau of Economic and Business Research, 2023

Between the years 2012 and 2020, Florida experienced a compounded annual growth rate (CAGR) of 2.1 percent in employment. Employment rates steadily grew throughout the period, with the exception being between 2019 and 2020. All districts witnessed a minor decline in employment rates most likely resulting from the loss of jobs due to the COVID-19 Pandemic. The historical employment numbers in Florida are identified in **Table 2**.

Forecasted employment numbers, as produced by Woods & Poole, are presented in **Table 3**. Similar to population, employment numbers in Florida are anticipated to grow by more than 36 percent over the forecast period.

Table 2. Historical Employment by District

District	Employment (thousands)								
	2012	2013	2014	2015	2016	2017	2018	2019	2020
1	1,267	1,308	1,368	1,424	1,459	1,511	1,566	1,595	1,542
2	1,051	1,070	1,100	1,134	1,169	1,220	1,255	1,278	1,240
3	732	744	760	774	795	816	836	842	819
4	2,059	2,128	2,222	2,321	2,376	2,451	2,546	2,570	2,432
5	2,010	2,061	2,143	2,229	2,314	2,417	2,528	2,588	2,420
6	1,567	1,622	1,693	1,773	1,811	1,859	1,936	1,962	1,837
7	1,564	1,605	1,652	1,712	1,758	1,823	1,888	1,926	1,860
Florida Total	**10,249**	**10,539**	**10,937**	**11,367**	**11,682**	**12,098**	**12,556**	**12,762**	**12,149**

Source: Woods & Poole, 2023

Table 3. Forecasted Employment by District

District	Employment (thousands)			
	2023	2028	2033	2043
1	1,704	1,845	1,984	2,258
2	1,370	1,493	1,617	1,874
3	891	953	1,016	1,144
4	2,784	3,068	3,361	3,987
5	2,807	3,097	3,394	4,016
6	2,099	2,276	2,453	2,814
7	2,037	2,187	2,330	2,608
Florida Total	**13,693**	**14,918**	**16,155**	**18,701**

Source: Woods & Poole, 2023

During the 2012-2020 period, all districts achieved modest year over year growth in per capita income (**Table 4**).

Similar to population and employment, per capita income (**Table 5**) is also forecasted to grow throughout the forecast period. The average per capita income among all districts is estimated to exceed $64,000 in 2023 and grow to more than $164,000 by 2043.

Table 4. Historical Per Capita Income by District

District	Per Capita Income								
	2012	2013	2014	2015	2016	2017	2018	2019	2020
1	$35,781	$35,908	$38,365	$40,658	$41,030	$43,087	$44,754	$46,537	$49,270
2	$30,894	$31,118	$32,593	$34,012	$34,383	$36,159	$37,429	$38,330	$41,054
3	$32,297	$31,992	$33,375	$34,639	$35,757	$37,276	$38,878	$40,858	$43,819
4	$57,843	$56,384	$61,322	$64,475	$66,521	$70,865	$74,570	$77,520	$79,685
5	$35,665	$35,839	$37,348	$38,938	$40,244	$42,202	$44,052	$46,093	$48,392
6	$54,648	$51,656	$55,633	$57,087	$59,707	$64,878	$71,502	$74,370	$76,322
7	$37,044	$36,974	$38,541	$40,056	$40,877	$42,260	$43,884	$45,596	$48,567
FL Average	$40,596	$39,981	$42,454	$44,266	$45,503	$48,104	$50,724	$52,758	$55,301

Source: Woods & Poole, 2023

Table 5. Forecasted Per Capita Income by District

District	Per Capita Income			
	2023	2028	2033	2043
1	$57,306	$72,768	$92,649	$149,695
2	$46,789	$58,795	$74,134	$117,610
3	$49,903	$62,716	$79,057	$125,243
4	$86,639	$109,438	$138,438	$220,331
5	$56,455	$71,550	$90,918	$146,418
6	$95,411	$121,260	$154,258	$248,197
7	$55,932	$70,608	$89,341	$142,455
FL Average	$64,062	$81,019	$102,685	$164,278

Source: Woods & Poole, 2023

Historical Aviation Activity

Historical data was gathered for each of Florida's airports within the seven transportation districts. Data from 2012 to 2022 regarding based aircraft, GA operations, commercial operations, and enplanements was used to develop forecasts from 2023 to 2043. It is necessary to identify trends in historical data to formulate an accurate forecast for the FASP. This information can help contribute to the appropriate development of Florida's aviation infrastructure in the coming years.

Historical Based Aircraft

Based aircraft are those that are operational and airworthy, which are typically based at a facility for a majority of the year (*Source: BasedAircraft.com, User Guide, page 14, 10/29/2012*). Historical based aircraft counts were retrieved for each airport from the FAA's TAF, published in February 2023. **Figure 6** illustrates the historical aircraft trends by district. **Table 6** specifies the historical based aircraft counts by district for the years 2012-2022.

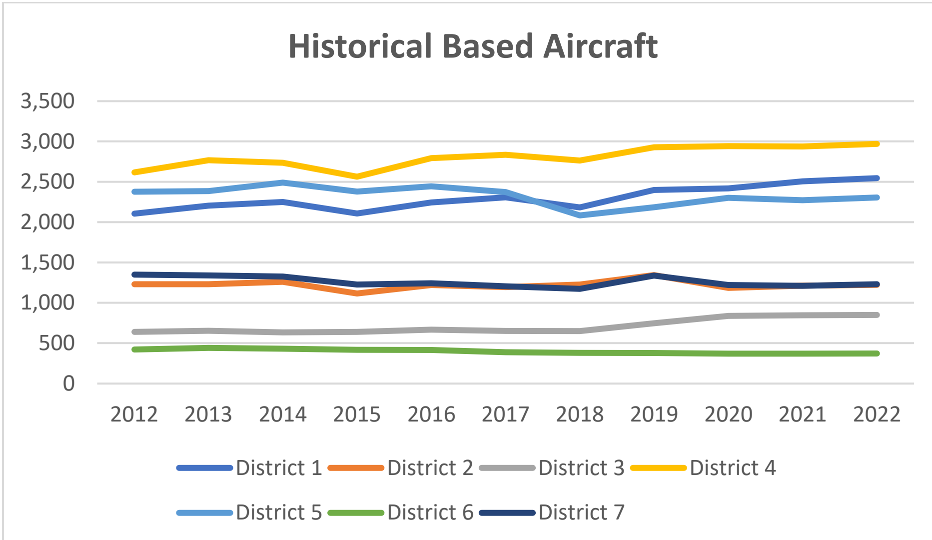
Historical General Aviation Operations

According to the 2023 FAA TAF, GA operations (both local and itinerant) have experienced steady, modest growth in Florida since 2012. However, a downturn in GA operations occurred in 2020 for most districts, except for Districts 2 and 7, due to the impact of the COVID-19 Pandemic. Between 2019 and 2020, GA operations across the state were down by 6 percent. Since 2020, they have rebounded to reach near pre-pandemic levels by the end of 2023. **Figure 7** and **Table 7** demonstrate the historical change in GA operations by district for the years 2012-2022.

Historical Commercial Operations

Likewise, the FAA's TAF demonstrated that, commercial service operations (which include air carrier, air cargo, and air taxi/commuter operations) have experienced year-over-year growth since 2012. However, much like general aviation operations, commercial operations witnessed a significant loss due to the impacts of the COVID-19 Pandemic. Between 2019 and 2020, commercial operations in Florida decreased by 33 percent. By 2021, they had started to regain and by 2022 were recovered to 90 percent of their pre-pandemic levels. **Figure 8** and **Table 8** show the downturn and recovery of the historical commercial/air taxi operations in Florida.

Figure 6. Historical Based Aircraft



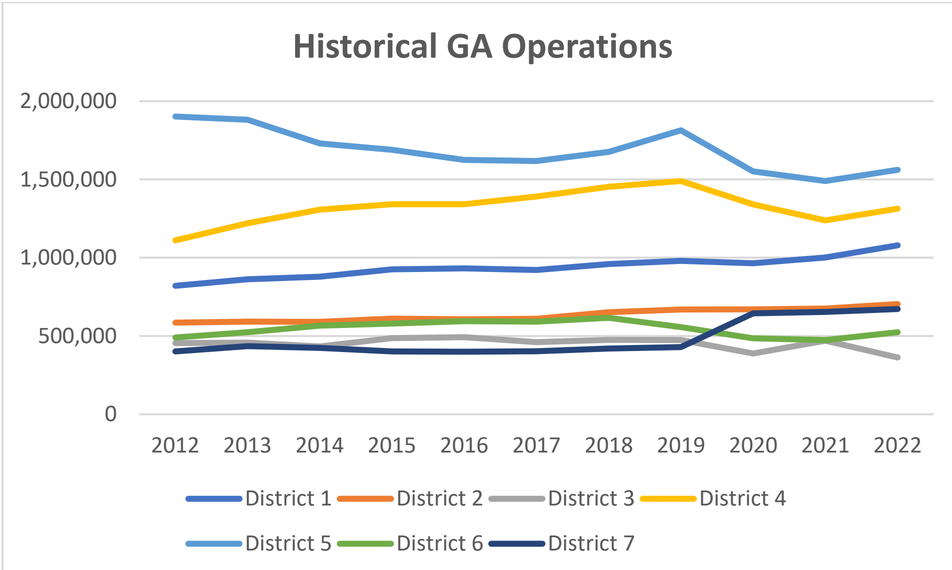
Source: FAA TAF, 2/2023

Table 6. Historical Based Aircraft

District	Historical Based Aircraft										
	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
1	2,106	2,203	2,250	2,107	2,244	2,306	2,181	2,399	2,418	2,506	2,546
2	1,231	1,231	1,260	1,116	1,221	1,194	1,227	1,344	1,184	1,212	1,223
3	639	654	634	639	667	652	649	746	838	846	851
4	2,617	2,766	2,735	2,563	2,793	2,835	2,762	2,927	2,941	2,938	2,970
5	2,377	2,384	2,490	2,378	2,443	2,373	2,083	2,183	2,300	2,271	2,305
6	421	442	432	418	416	388	380	378	370	370	372
7	1,351	1,340	1,325	1,227	1,242	1,205	1,174	1,337	1,220	1,211	1,231
Total	**10,742**	**11,020**	**11,126**	**10,448**	**11,026**	**10,953**	**10,456**	**11,314**	**11,271**	**11,354**	**11,498**

Source: FAA TAF, 2/2023

Figure 7. Historical General Aviation Operations



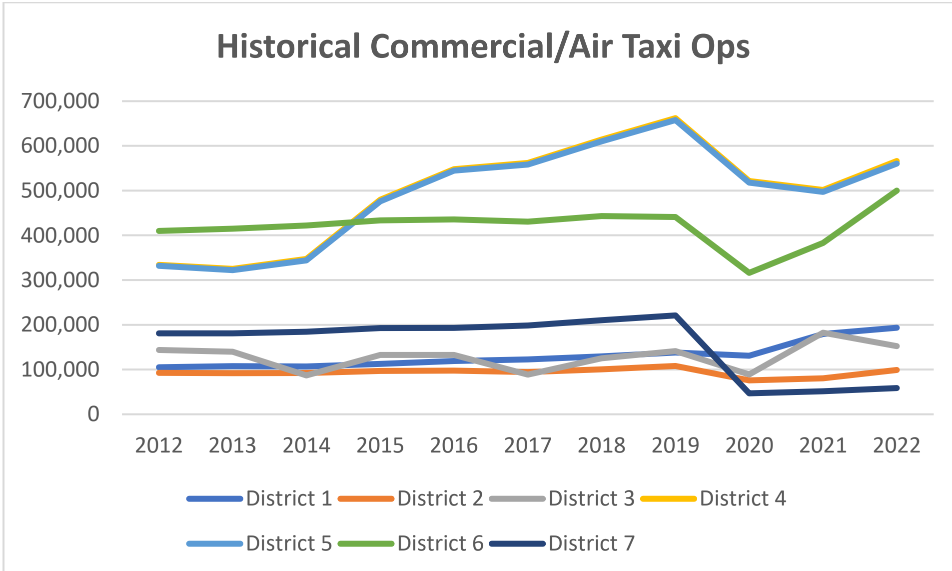
Source: FAA TAF, 2/2023

Table 7. Historical General Aviation Operations

District	Historical General Aviation Operations										
	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
1	820,944	861,831	878,159	925,554	932,161	921,807	958,777	979,430	964,412	1,001,016	1,079,680
2	585,351	591,310	590,096	610,670	607,201	609,401	652,172	668,932	670,558	674,943	704,383
3	454,204	457,295	433,414	486,068	493,129	460,358	474,621	473,946	388,531	470,368	363,233
4	1,111,171	1,219,577	1,306,777	1,341,576	1,341,535	1,389,986	1,452,611	1,490,106	1,339,917	1,238,295	1,312,813
5	1,901,545	1,880,647	1,729,756	1,688,893	1,624,792	1,616,959	1,675,661	1,813,520	1,550,492	1,489,512	1,560,762
6	490,323	524,464	565,931	579,418	594,986	591,869	616,147	557,155	485,143	474,767	523,993
7	401,236	435,334	424,014	401,095	399,418	402,241	419,573	429,347	644,881	654,270	672,824
Total	**5,764,774**	**5,970,458**	**5,928,147**	**6,033,274**	**5,993,222**	**5,992,621**	**6,249,562**	**6,412,436**	**6,043,934**	**6,003,171**	**6,217,688**

Source: FAA TAF, 2/2023

Figure 8. Historical Commercial/Air Taxi Operations



Source: FAA TAF, 2/2023

Table 8. Historical Commercial/Air Taxi Operations

District	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
1	105,111	107,660	106,912	112,678	118,988	122,724	129,477	137,905	130,951	179,619	193,748
2	92,475	91,728	92,333	97,030	97,591	94,417	100,431	108,008	75,781	80,573	98,895
3	143,591	139,828	86,908	132,486	132,733	88,720	125,207	141,081	89,157	182,442	152,322
4	334,057	325,315	347,038	479,402	547,721	561,593	613,757	661,898	521,432	501,295	566,080
5	331,736	322,292	344,049	476,066	544,484	557,967	609,909	657,579	517,726	496,920	560,228
6	409,748	414,600	421,734	433,338	435,506	430,582	442,992	440,999	316,412	382,909	500,121
7	180,782	180,854	184,580	192,704	192,893	198,302	210,312	221,175	46,816	51,480	58,729
Totals	**1,597,500**	**1,582,277**	**1,583,554**	**1,923,704**	**2,069,916**	**2,054,305**	**2,232,085**	**2,368,645**	**1,698,275**	**1,875,238**	**2,130,123**

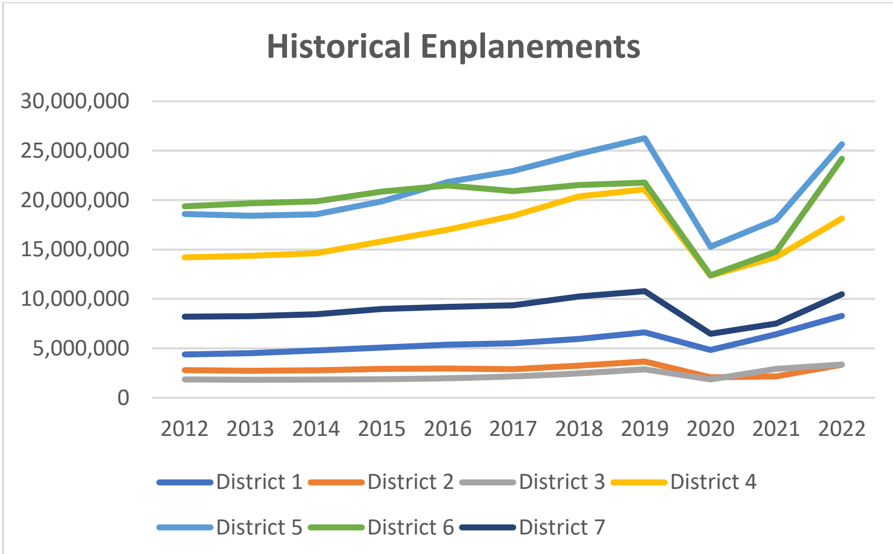
Source: FAA TAF, 2/2023

Historical Enplanements

The FAA's TAF classifies passenger enplanements as the total number of revenue passengers boarding an aircraft, including both origin and transfer passengers. The enplanement counts do not include pilots, flight attendants, and non-revenue airline crew members. The FAA classifies passenger enplanements based on the type of carrier operating the flight. Air carrier enplanements refer to enplanements on mainline air carriers that provide service using aircraft with 60 or more seats. Commuter enplanements typically occur on airlines whose primary function is feeding passengers to mainline carriers. Commuter airlines primarily operate aircraft with 60 or fewer seats. The split by operation type will shift from a commuter/air taxi dominance from historical years to air carrier operations holding a majority share of commercial operations in future years. This is due to the evolution of the aircraft fleet mix, which will see the retirement of 50-seat aircraft and the replacement of smaller aircraft with larger, more fuel-efficient equipment. For the purposes of this forecast, air carrier and commuter enplanements are combined to show total enplanements.

After suffering through an extreme loss (approximately 40 percent) in enplanements between 2019 and 2020, passenger enplanements in Florida not only recovered, but exceeded their pre-pandemic level by the year 2022. **Figure 9** and **Table 9** show the recovery, including overall totals.

Figure 9. Historical Enplanements



Source: FAA TAF, 2/2023

Table 9. Historical Enplanements

District	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
1	4,401,721	4,516,509	4,796,334	5,088,663	5,371,864	5,513,823	5,959,066	6,615,458	4,838,463	6,432,913	8,299,921
2	2,802,278	2,742,000	2,787,845	2,925,377	2,961,194	2,903,334	3,257,439	3,686,753	2,075,211	2,167,793	3,352,633
3	1,860,658	1,837,615	1,844,777	1,898,439	1,973,131	2,169,207	2,481,249	2,879,981	1,864,369	2,922,188	3,367,441
4	14,198,534	14,354,280	14,621,492	15,813,801	16,994,184	18,416,637	20,365,370	21,091,122	12,357,052	14,228,994	18,135,917
5	18,583,995	18,415,814	18,555,169	19,874,170	21,829,270	22,938,694	24,678,021	26,255,263	15,288,446	18,005,152	25,647,469
6	19,365,556	19,667,703	19,873,888	20,854,508	21,477,714	20,908,680	21,522,047	21,763,289	12,402,003	14,789,013	24,182,844
7	8,206,805	8,250,952	8,448,779	8,988,634	9,197,382	9,353,895	10,248,150	10,787,303	6,483,333	7,519,175	10,475,549
Total	**69,419,547**	**69,784,873**	**70,928,284**	**75,443,592**	**79,804,739**	**82,204,270**	**88,511,342**	**93,079,169**	**55,308,877**	**66,065,228**	**93,461,774**

Source: FAA TAF, 2/2023

Projections of Aviation Demand

Projections of aviation demand for the 20-year planning period are typically presented by comparing various methodologies and choosing a preferred projection based on historical trends in operations, passenger enplanements, and based aircraft. The trends are correlated with socioeconomic data such as population, employment, and income. In addition, market share analysis was also performed to forecast Florida aviation activity as it relates to the Southern Region as the FAA defines it. The projections of demand have been developed for the years 2023, 2028, 2033, and 2043.

Forecast Methodologies

The most reliable and acceptable approach to forecasting future aviation demand is to use a variety of analytical techniques. The forecasts prepared for the FASP 2043 were developed using widely accepted methodologies including trendline analysis, regression analysis, and market share analysis.

Trendline Analysis

Trendline analysis examines historical growth trends in activity and applies them to current demand levels to produce projections of future activity. This methodology assumes that aviation activity and the factors which have historically affected it will continue to influence demand levels at similar rates over an extended period of time.

Regression Analysis

The demographic and economic elements of the community and its corresponding economy directly influence forecasting future aviation activity levels. For the purposes of this forecast, socioeconomic factors with the strongest correlation to aviation activity included employment, per capita income, and population.

Market Share Analysis

Market share analysis projects future aviation activity by comparing it to a higher-level forecast. For the purposes of this forecasting effort, market share forecasts were developed for the state of Florida based upon the FAA's forecast of future activity for the entire Southern Region of the FAA. This is considered a "top-down" approach method of forecasting since forecasts of much larger systems are used to generate forecasts for the seven transportation districts within the State of Florida.

Historical Trendline Analysis

The future aviation operations and enplanements displayed in this section were developed using trends found in the previously presented historical data. The purpose of analyzing historical aviation data on a state level and using it to develop a forecast is to prepare the state with an accurate expectation of the growth or decline of aviation operations across Florida. These forecasts were separated into seven transportation districts that assist in analyzing specific regions and their demands for improved aviation infrastructure.

Trendline Forecast for Based Aircraft, and General Aviation and Commercial-Air Taxi Operations

Using historical data from the TAF, based aircraft trendline forecasts were developed for the years 2023, 2028, 2033, and 2043. Results of this analysis indicate that the number of based aircraft are projected to increase by more than 11 percent throughout the state of Florida by 2043. These forecasts also indicate that Districts 5, 6, and 7 may experience a slight decline in the number of based aircraft over the time period. **Figure 10** and corresponding **Table 10** illustrate the trendlines of the forecast and detail the projected number of based aircraft to be housed within the State.

Based upon historical data, GA operations are expected to significantly increase throughout the state of Florida. Every district is anticipated to grow in GA operations throughout the forecast period except for District 5. **Figure 11** and **Table 11** depict details of the GA operations trendline forecast.

Commercial/air taxi operations are expected to significantly increase across the state. Florida is the second most visited state in the U.S., and its tourist industry is expected to continue to grow, which will likely drive increases in commercial/air taxi operations. **Figure 12** and **Table 12** present the trendline forecast for commercial/air taxi operations by district, as well as by state.

Figure 10. Trendline Forecast of Based Aircraft

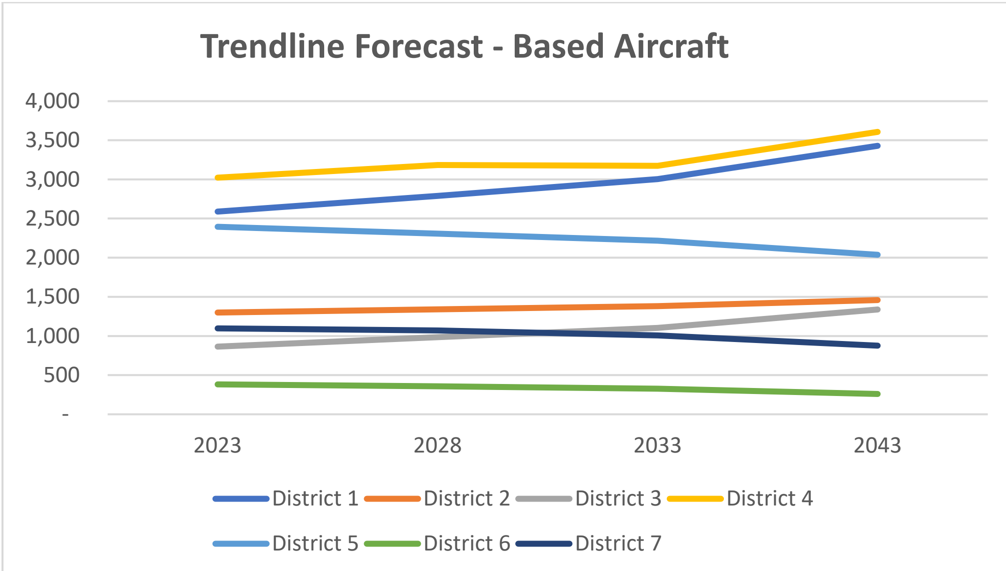


Table 10. Trendline Forecast of Based Aircraft

District	2023	2028	2033	2043
1	2,590	2,790	3,003	3,430
2	1,301	1,341	1,380	1,459
3	866	984	1,102	1,339
4	3,022	3,182	3,172	3,608
5	2,396	2,306	2,216	2,038
6	383	357	326	260
7	1,099	1,071	1,007	877
Totals	**11,657**	**12,031**	**12,208**	**13,012**

Figure 11. Trendline Forecast of GA Operations

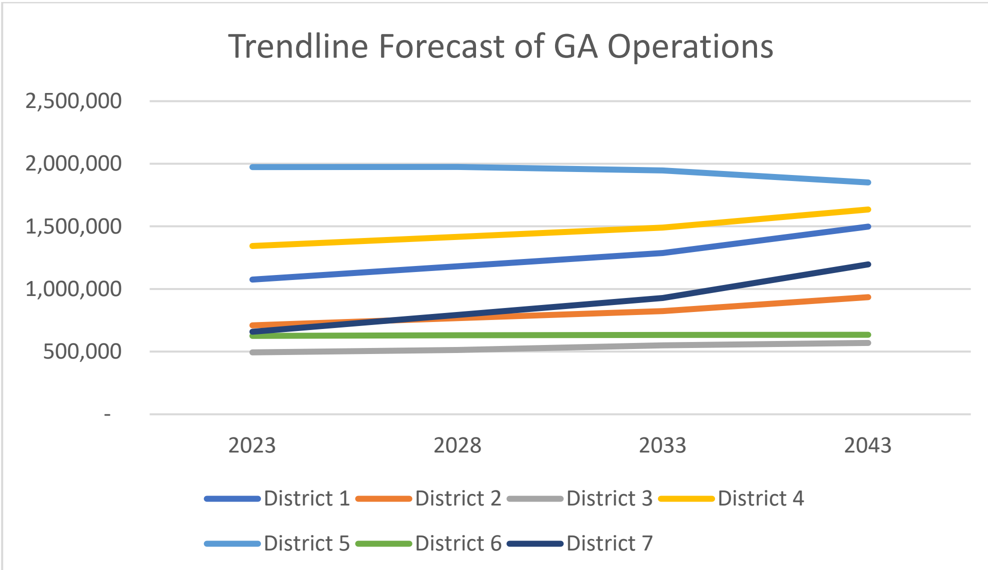


Table 11. Trendline Forecast of GA Operations

District	2023	2028	2033	2043
1	1,075,939	1,181,664	1,287,389	1,498,840
2	710,721	766,914	823,106	935,491
3	495,111	513,701	550,883	569,473
4	1,343,596	1,416,603	1,489,609	1,635,622
5	1,973,109	1,974,988	1,946,543	1,851,038
6	626,724	630,433	632,824	635,070
7	659,115	793,500	927,886	1,196,656
Totals	**6,884,315**	**7,277,803**	**7,658,240**	**8,322,191**

Figure 12. Trendline Forecast of Commercial/Air Taxi Operations

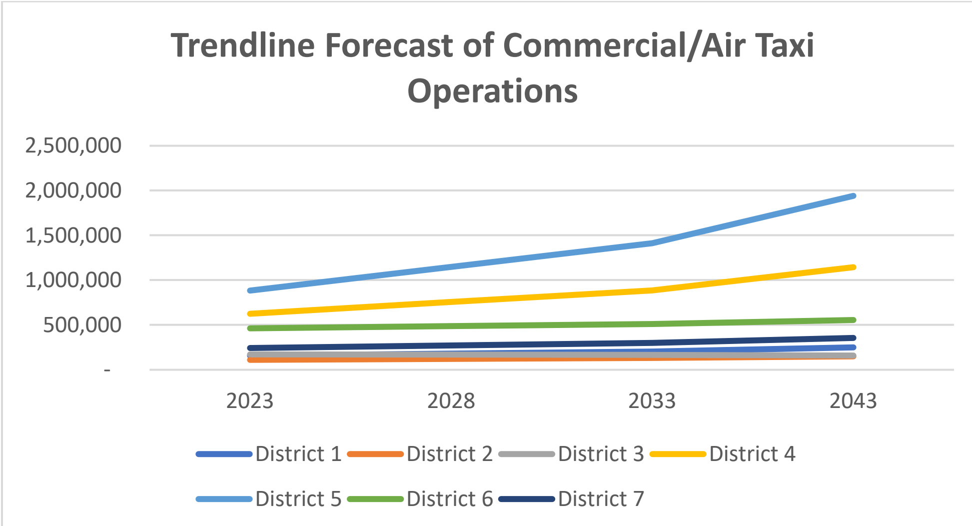


Table 12. Trendline Forecast of Commercial/Air Taxi Operations

District	2023	2028	2033	2043
1	156,193	179,548	202,903	249,613
2	111,426	120,858	130,290	149,153
3	171,962	168,549	165,209	158,734
4	625,412	755,129	884,846	1,144,279
5	883,648	1,147,836	1,412,024	1,940,401
6	462,570	485,818	509,066	555,562
7	243,036	271,098	299,161	355,286
Totals	**2,654,246**	**3,128,836**	**3,603,498**	**4,553,028**

Trendline Forecast of Enplanements

The trendline forecast of enplanements illustrates that the numbers have recovered from the impacts of the pandemic and will continue to increase through 2043 across Florida. Enplanement levels are projected to increase by more than 67 percent (**Figure 13** and **Table 13**).

Figure 13. Trendline Forecast of Enplanements

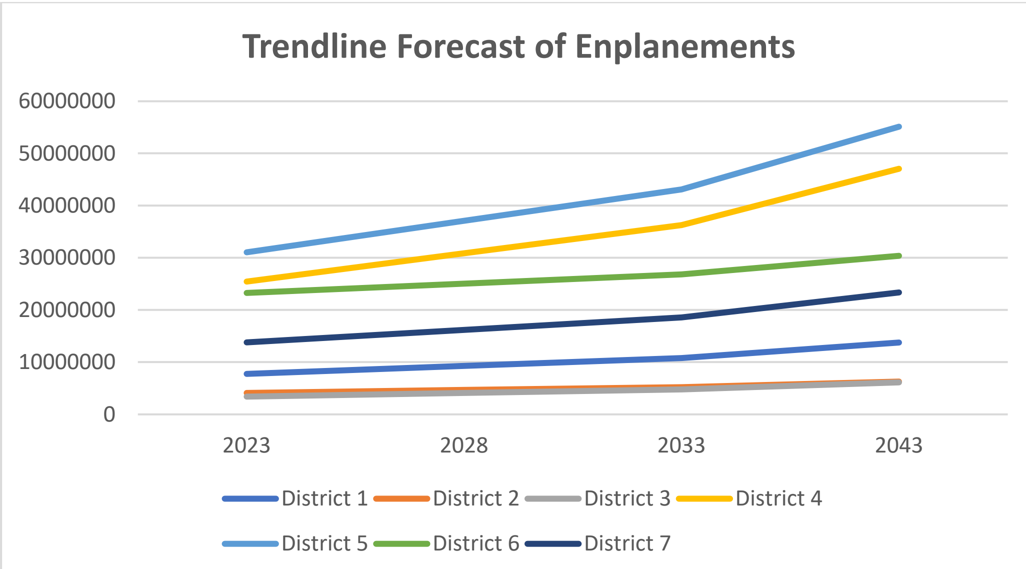


Table 13. Trendline Forecast of Enplanements

District	2023	2028	2033	2043
1	7,776,152	9,273,315	10,770,479	13,764,806
2	4,122,506	4,667,196	5,211,887	6,301,268
3	3,422,905	4,101,561	4,780,217	6,137,528
4	25,441,818	30,847,082	36,252,346	47,062,874
5	31,062,148	37,071,799	43,081,450	55,100,752
6	23,271,238	25,046,928	26,822,619	30,374,000
7	13,788,130	16,183,721	18,579,312	23,370,493
Total	**108,884,896**	**127,191,602**	**145,498,308**	**182,111,721**

Socioeconomic Forecast of Aviation Activity

The level of confidence in a regression analysis is high if there is a high correlation between the two sets of data used for the analysis. In this case, the known data is the projection of employment, per capita income, and population for the state, which was used to extrapolate aviation activity. Correlation is expressed in terms of the correlation coefficient, of which a value of one is perfect correlation, while a value of zero indicates no correlation at all. A value above 0.8 shows a reasonable level of confidence in the correlation and resulting projection. Only scenarios where there was a correlation value of 0.8 or higher between the socioeconomic data set and based aircraft, operations, or enplanements were used for the purposes of the socioeconomic based forecasts.

Aviation Activity vs. Employment

Regression analysis was conducted to determine whether a statistical relationship exists between general aviation operations and employment. The correlation coefficient for this relationship was only 0.63, so it was determined that the correlation between these two data sets is not statistically significant enough to use the relationship in a forecast model. Likewise, there was no significant statistical correlation between employment levels and based aircraft. The correlation coefficient value between these two data sets was only 0.2. No further analysis or forecast models for GA operations or based aircraft were performed based on the low correlation factor.

However, regression analysis was conducted between Florida rates of employment and commercial and air taxi operations. Under this scenario, the correlation coefficient was high, at 0.80, indicating a strong correlation between the two data sets. Historically, commercial and air taxi operations have averaged .17 commercial/air taxi operation per one employment. **Figure 14** and **Table 14** present the resultant commercial/air taxi operations forecast derived from calculating operations against the employment forecast for the years 2023, 2028, 2033, and 2043.

Likewise, regression analysis was run between employment levels and historical enplanements. The correlation factor was extremely high, at 0.95. Historically, Florida has witnessed approximately six annual enplanements per one employment. **Figure 15** and **Table 15** present results of this regression analysis between enplanements and employments.

Figure 14. Commercial/Air Taxi Operations by Employment Forecast

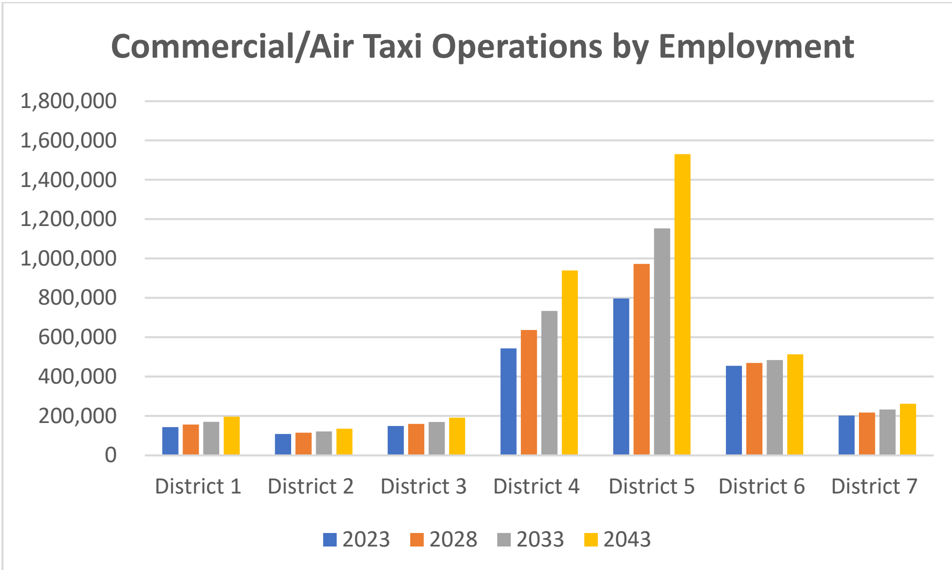


Table 14. Commercial-Air Taxi Operations/Employment Forecast

District	2023	2028	2033	2043
1	143,164	156,559	169,796	195,979
2	107,996	114,551	121,199	134,940
3	148,714	159,144	169,623	191,128
4	543,243	636,731	733,433	939,334
5	796,648	972,558	1,152,863	1,529,936
6	454,971	469,419	483,890	513,388
7	201,888	217,636	232,673	261,839
Total	**2,396,624**	**2,726,598**	**3,063,478**	**3,766,544**

Figure 15. Enplanements by Employment Forecast

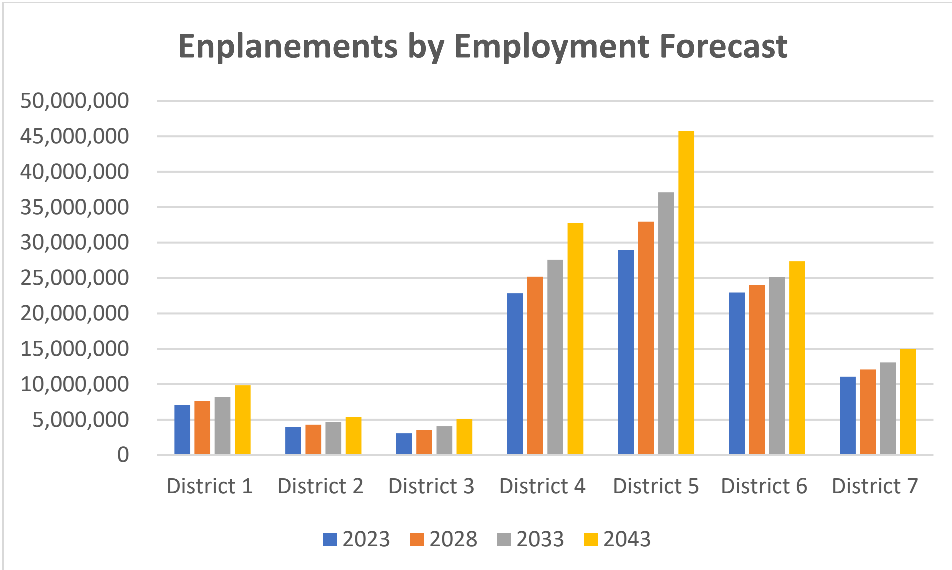


Table 15. Enplanement/Employment Forecast

District	2023	2028	2033	2043
1	7,068,143	7,650,381	8,225,728	9,848,301
2	3,952,969	4,306,714	4,665,512	5,407,055
3	3,075,937	3,572,188	4,070,800	5,094,030
4	22,844,685	25,176,138	27,587,732	32,722,581
5	28,943,564	32,964,986	37,086,890	45,707,032
6	22,953,397	24,043,585	25,135,451	27,361,295
7	11,060,919	12,095,053	13,082,602	14,997,926
Total	**99,899,614**	**109,809,045**	**119,854,715**	**141,138,221**

Aviation Activity vs. Per Capita Income

Regression analysis was conducted between per capita income and commercial and air taxi operations. This analysis demonstrated a high R^2 value at 0.80 between per capita income and commercial/air taxi operations. Since 2012, Florida airports typically experience nearly 35 commercial/air carrier operations per $1 of per capita income. The resultant commercial/air taxi operations forecast derived from per capita income forecasts as projected by Woods & Poole throughout the forecast period. **Figure 16** and **Table 16** present the resultant data.

Figure 16. Commercial/Air Taxi Operations by Per Capita Income Forecast

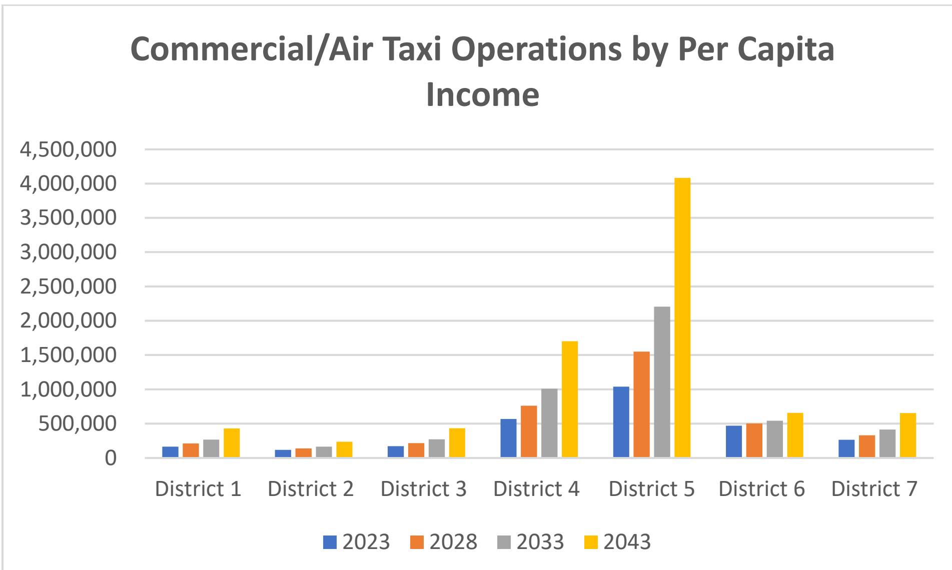


Table 16. Commercial Air/Taxi Operation by Per Capita Income Forecast

District	2023	2028	2033	2043
1	165,309	209,830	267,075	431,333
2	117,532	137,611	163,265	235,980
3	172,166	216,371	272,746	432,088
4	568,717	762,070	1,007,998	1,702,495
5	1,038,910	1,549,597	2,204,821	4,082,449
6	470,594	502,246	542,653	657,681
7	264,046	330,184	414,601	653,955
Total	**2,797,274**	**3,707,910**	**4,873,159**	**8,195,982**

Similar to the commercial/air taxi operations, enplanements when compared to per capita income had an extremely high correlation factor at 0.98. The range of enplanements per capita income varied greatly among the districts. Specifically, District 5 is forecasted to nearly triple enplanements throughout the forecast period because the per capita income forecasted by Woods and Poole for this District is anticipated to grow similarly. **Figure 17** and **Table 17** present the results of this regression analysis.

Figure 17. Enplanements by Per Capita Income Forecast

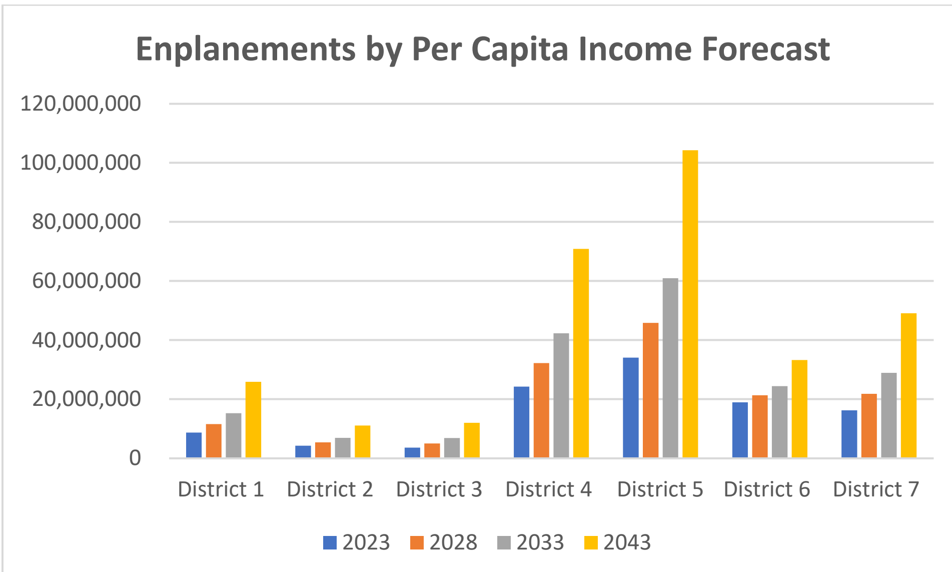


Table 17. Enplanements by Per Capita Income Forecast

District	2023	2028	2033	2043
1	8,657,754	11,533,393	15,230,815	25,840,230
2	4,215,352	5,381,722	6,871,930	11,095,835
3	3,577,166	5,009,168	6,835,403	11,997,151
4	24,230,807	32,186,341	42,305,032	70,880,096
5	34,058,524	45,839,138	60,953,965	104,267,449
6	18,923,172	21,340,673	24,426,825	33,212,376
7	16,221,568	21,790,087	28,897,686	49,050,276
Total	**109,884,343**	**143,080,522**	**185,521,657**	**306,343,412**

Aviation Activity vs. Population

Population numbers have a strong correlation between all activity data sets. As a result, regression analysis was completed for population vs. based aircraft, GA operations, commercial/air taxi operations, and enplanements. The results of these regression forecasts are presented in **Figures 18-21** and **Tables 18-21** on the following pages.

Based aircraft numbers (**Figure 18** and **Table 18**), forecasted as a result of population growth, are likely to increase by nearly 3,500 aircraft during the 20-year forecast period.

Figure 18. Based Aircraft per Population

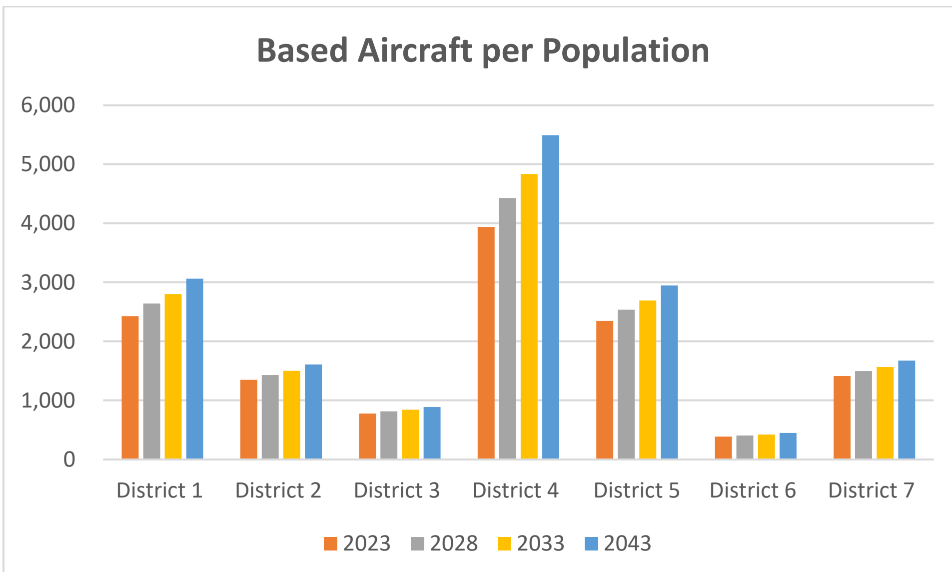


Table 18. Based Aircraft per Population

District	2023	2028	2033	2043
1	2,425	2,641	2,801	3,062
2	1,347	1,430	1,500	1,609
3	777	813	842	888
4	3,937	4,427	4,834	5,491
5	2,346	2,536	2,692	2,947
6	385	405	422	449
7	1,412	1,497	1,565	1,673
Total	**12,629**	**13,748**	**14,656**	**16,118**

Likewise, the anticipated population growth over the next 20 years (**Figure 19** and **Table 19**) may result in a direct increase to general aviation operations by nearly 16 percent.

Figure 19. General Aviation Operations per Population

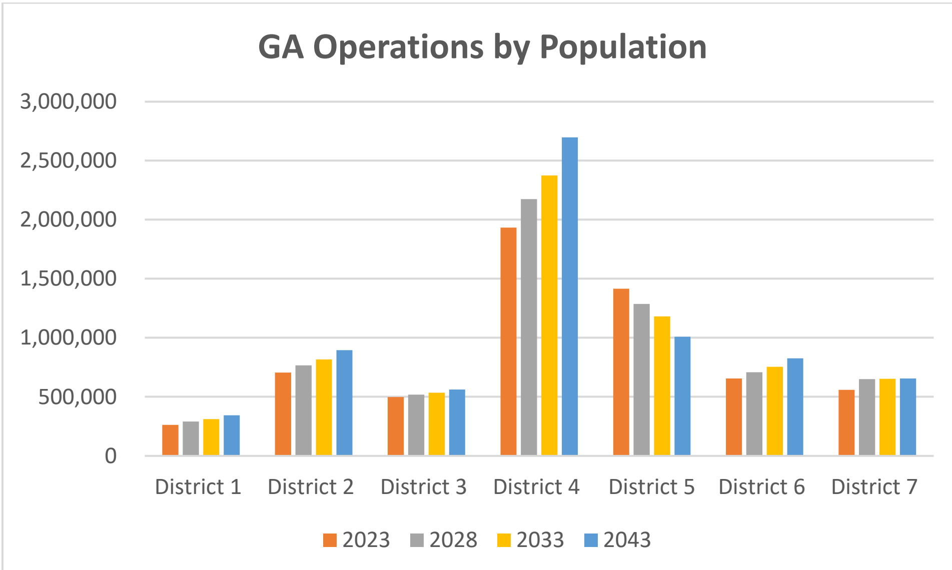


Table 19. General Aviation Operations/Population Forecast

District	2023	2028	2033	2043
1	262,513	289,812	310,147	343,090
2	705,472	765,752	815,721	894,652
3	497,293	517,880	534,550	560,922
4	1,932,579	2,173,345	2,373,868	2,696,840
5	1,415,355	1,287,026	1,181,129	1,009,014
6	654,905	708,168	753,939	825,483
7	558,956	650,013	652,135	655,528
Total	**6,027,072**	**6,391,996**	**6,621,489**	**6,985,530**

When commercial/air taxi operations are correlated against population (**Figure 20** and **Table 20**), it is anticipated that their level of activity will increase for each district and for the state as a whole by more than 35 percent over the forecast period.

Figure 20. Commercial/Air Taxi Operations per Population

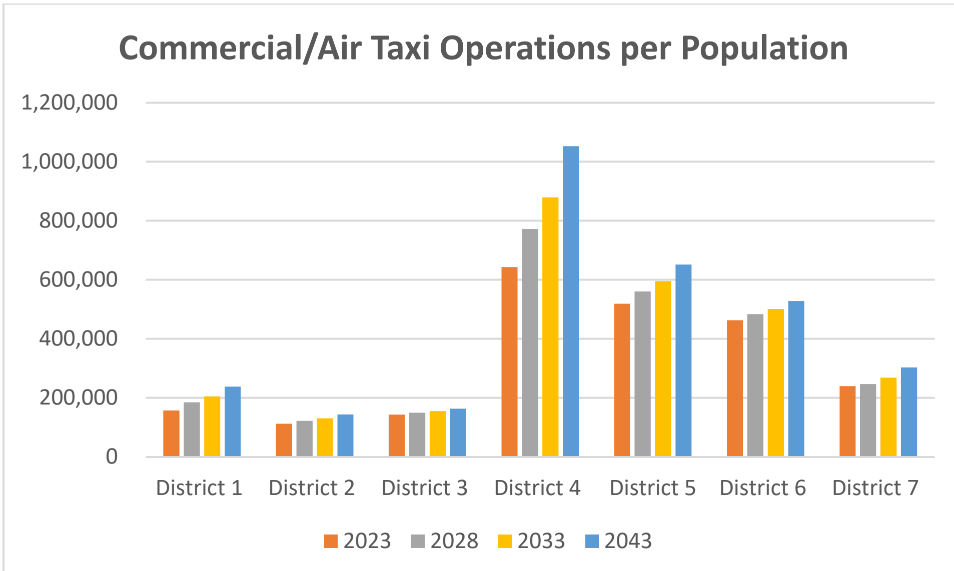


Table 20. Commercial Air Taxi Operation per Population Forecast

District	2023	2028	2033	2043
1	157,415	184,714	205,049	237,992
2	112,077	122,235	130,655	143,954
3	142,964	149,581	154,940	163,417
4	642,990	771,998	879,443	1,052,499
5	518,553	560,547	595,201	651,523
6	463,094	483,442	500,927	528,258
7	239,807	246,567	268,287	303,018
Total	**2,276,900**	**2,519,084**	**2,734,501**	**3,080,662**

Much like commercial/air taxi operations, when enplanement levels are based on population levels, they are also expected to increase over the forecast period (**Figure 21** and **Table 21**). In fact, based on population growth, enplanements are anticipated to grow by more than 50 percent over the forecast period.

Figure 21. Enplanements per Population

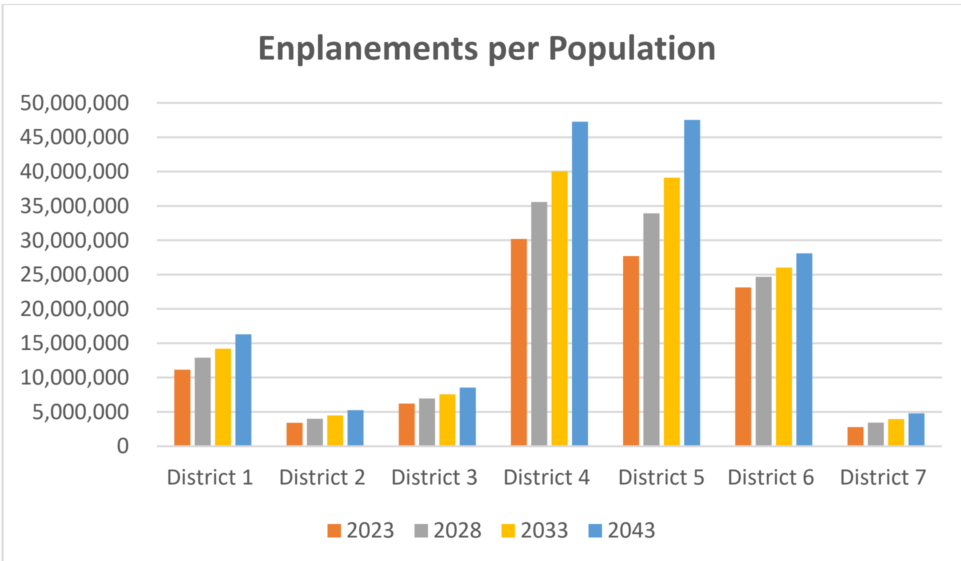


Table 21. Enplanement/Population Forecast

District	2023	2028	2033	2043
1	11,144,438	12,893,664	14,196,647	16,307,488
2	3,421,291	4,005,711	4,490,163	5,255,402
3	6,216,779	6,967,466	7,575,285	8,536,913
4	30,201,879	35,580,965	40,060,986	47,276,717
5	27,694,202	33,920,631	39,108,620	47,540,727
6	23,120,028	24,675,962	26,012,999	28,102,953
7	2,785,092	3,435,738	3,953,552	4,781,535
Total	**104,583,708**	**121,480,137**	**135,398,253**	**157,801,735**

Market Share Analysis

A market share or top-down analysis compares the State of Florida's historical market share relative to the overall Southern Region of the FAA (**Figure 22**) and projects future market share trends. The Southern Region of the FAA includes the states of Alabama, Florida, Georgia, Kentucky, Mississippi, North Carolina, Tennessee, South Carolina, Puerto Rico, and the U.S. Virgin Islands.

Figure 22: FAA Southern Region

Source: www.faa.gov, 09/2023

Market share analysis forecasts present Florida's forecasted aviation activity in comparison to the Southeastern U.S. aviation market. This type of forecast presents the importance of Florida's role in this region of the U.S.

Based Aircraft

Since 2012, Florida, on average, has held 35 percent of the regional market share. Historically, Districts 4, 7, and 1 represent the highest market share in based aircraft at levels of 9.5, 7.5, and 7 percent, respectively. **Figure 23** and **Table 22** illustrate the based aircraft forecast per district and Florida, as a whole, as a derivative of the Southeastern regional forecast developed by the FAA.

Figure 23. Historical Based Aircraft per Regional Market Share

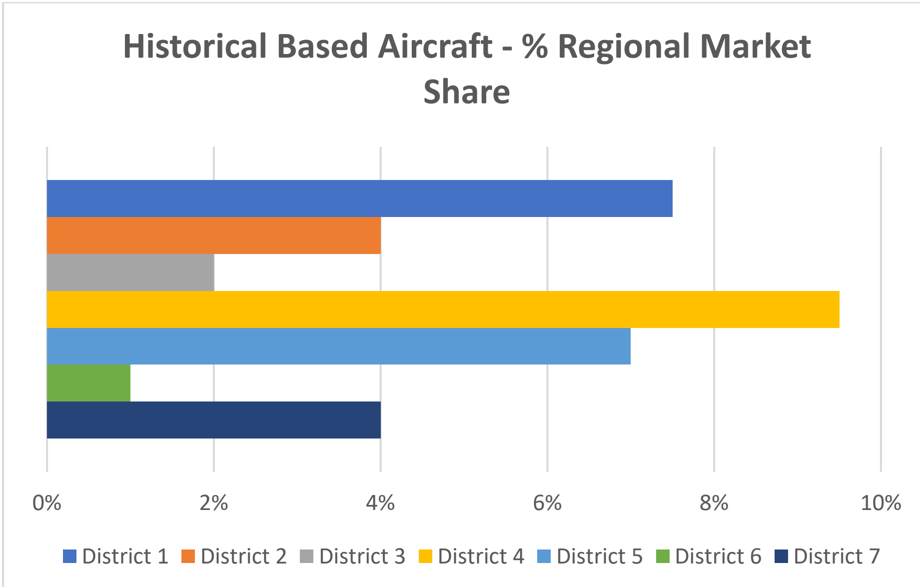


Table 22. Based Aircraft Forecast as Percentage of Regional Market Share

District	2023	2028	2033	2043
1	2,590	2,507	2,611	2,767
2	1,163	1,337	1,393	1,476
3	875	669	931	738
4	2,797	3,176	3,307	3,505
5	2,300	2,340	2,437	2,583
6	376	395	415	459
7	1,284	1,337	1,393	1,476
Total	**11,385**	**11,761**	**12,487**	**13,003**

General Aviation Operations

In contrast to based aircraft per market share, District 5 leads GA operations as determined by market share of the Southeast Region. In 2022, Florida held approximately 38 percent of the regional market share in GA operations. Under this forecast scenario, GA operations are anticipated to grow by more than 10 percent by the year 2043. **Figure 24** and **Table 23** further detail the market share forecast of GA operations by district through the forecast period.

Figure 24. Historical General Aviation Operations per Regional Market Share

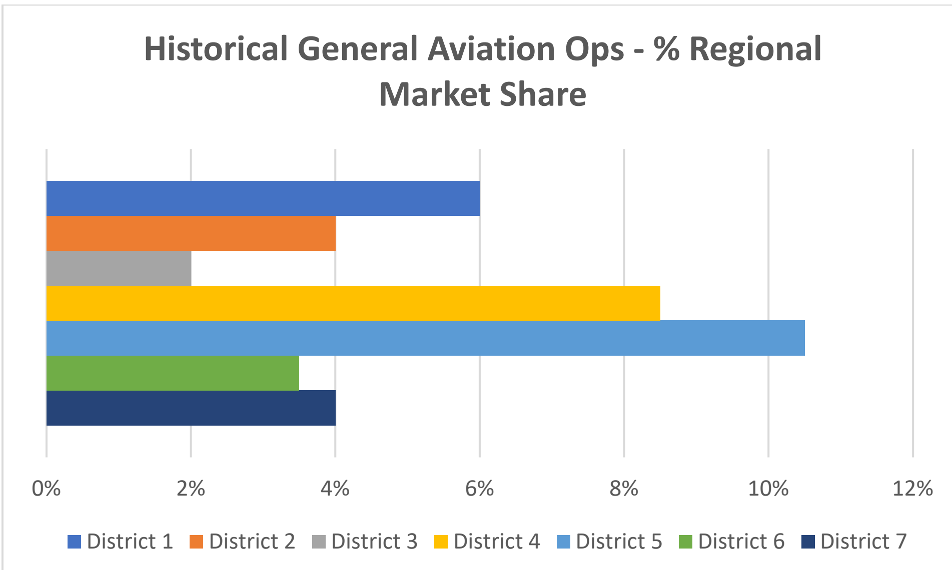


Table 23. GA Operations Forecast as Percentage of Regional Market Share

District	2023	2028	2033	2043
1	989,503	1,031,310	1,050,648	1,093,371
2	659,669	687,540	700,432	728,914
3	329,834	343,770	350,216	364,457
4	1,401,796	1,461,023	1,488,418	1,548,943
5	1,731,630	1,804,793	1,838,634	1,913,400
6	577,210	601,598	612,878	637,800
7	659,669	687,540	700,432	728,914
Total	**6,349,310**	**6,617,576**	**6,741,660**	**7,015,799**

Commercial Operations

Like the other forecasts, commercial/air taxi operations are also expected to grow by more than 1 million operations by 2043. The total market share that Florida's commercial/air taxi operation holds in the region is 33.5 percent.

Figure 25 and **Table 24** illustrate the market share forecast impacts to commercial operations for the years 2023, 2028, 2033, and 2043.

Figure 25. Historical Commercial/Air Taxi Operations per Regional Market Share

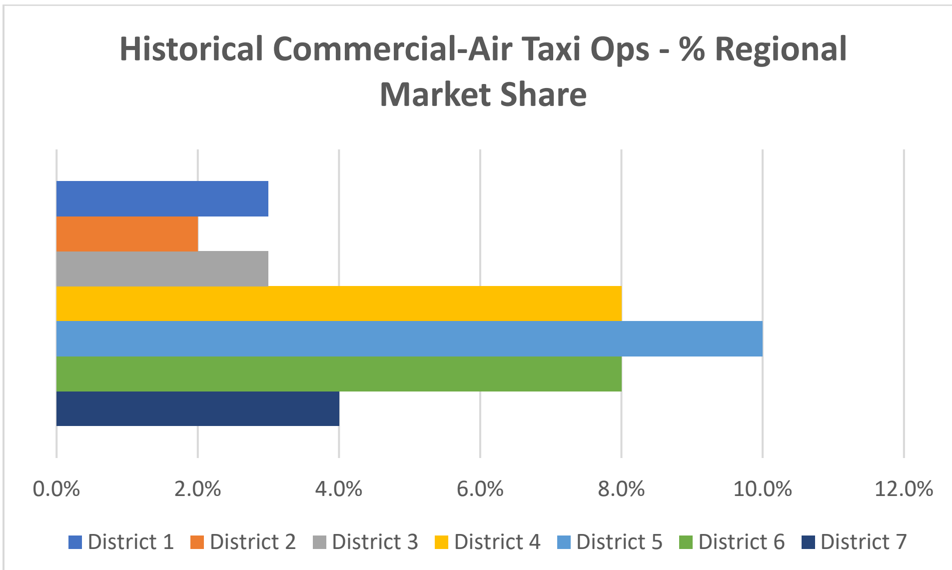


Table 24. Commercial-Air Taxi Operations Forecast as Percentage of Regional Market Share

District	2023	2028	2033	2043
1	166,484	196,115	213,911	294,664
2	110,989	130,743	142,607	168,799
3	166,484	196,115	213,911	253,199
4	443,958	522,974	570,429	675,198
5	554,947	653,717	713,037	843,997
6	443,958	522,974	570,429	675,198
7	221,979	261,487	285,215	337,599
Total	**2,108,798**	**2,484,125**	**2,709,540**	**3,248,654**

Enplanements

Since 2012, enplanements have represented more than 40 percent of the market share in the Southern Region. The market share forecast predicts that enplanements are going to grow to exceed 166 million in the State of Florida by 2043. **Figure 26** illustrates the historical percentage of regional market share by district and **Table 25** provides details of the enplanement forecast numbers throughout the forecast period.

Figure 26. Historical Enplanements per Regional Market Share

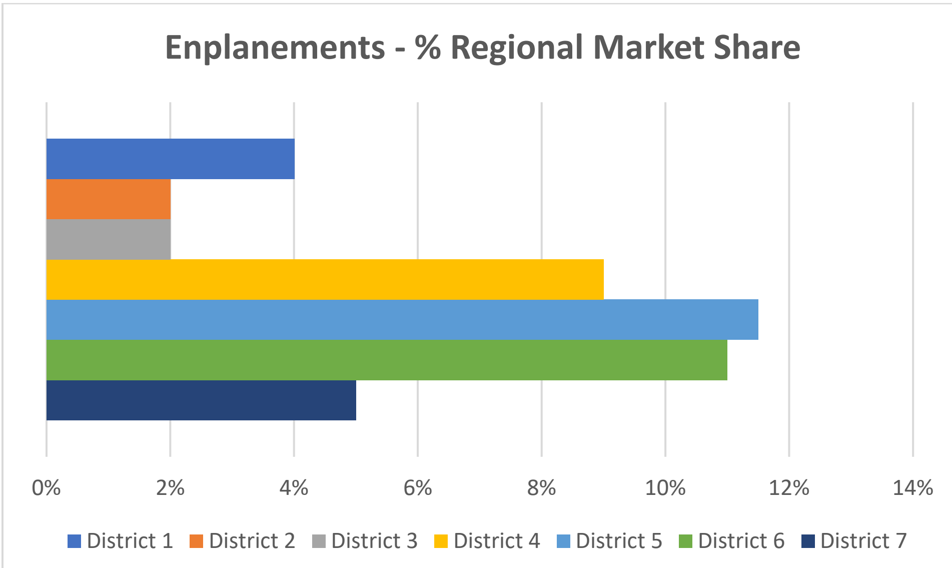


Table 25. Enplanements Forecast as Percentage of Regional Market Share

District	2023	2028	2033	2043
1	9,026,016	10,738,675	12,035,859	14,926,042
2	4,513,008	5,369,337	6,017,929	7,463,021
3	4,513,008	5,369,337	6,017,929	7,463,021
4	20,308,535	24,162,018	27,080,682	33,583,595
5	25,949,795	30,873,690	34,603,094	42,912,372
6	24,821,543	29,531,355	33,098,611	41,046,616
7	11,282,519	13,423,343	15,044,823	18,657,553
Total	**100,414,423**	**119,467,756**	**133,898,928**	**166,052,220**

Summary of Forecast Scenarios

Table 26 summarizes the forecast scenarios presented in the previous sections, along with comparison to The FAA's TAF for the years 2023, 2028, 2033, and 2043.

Table 26. Summary of Forecast Scenarios

	Scenarios	2023	2028	2033	2043
Based Aircraft	Historical Trendline	11,287	11,007	10,438	9,193
	Regional Market Share	11,385	11,594	12,313	12,819
	Economic-Population	12,629	13,748	14,656	16,118
	TAF	11,635	12,392	13,197	15,017
GA Operations	Historical Trendline	6,884,315	7,277,803	7,658,240	8,322,191
	Regional Market Share	6,349,310	6,617,576	6,741,660	7,015,799
	Economic-Population	5,979,445	6,344,369	6,573,862	6,937,903
	TAF	6,704,703	7,286,087	7,531,358	8,078,515
Commercial/Air Taxi Ops	Historical Trendline	2,654,246	3,128,836	3,603,498	4,553,028
	Regional Market Share	2,108,798	2,484,125	2,709,540	3,248,654
	Economic-Population	2,276,900	2,519,084	2,734,501	3,080,662
	Economic-Per Capita Income	2,797,274	3,707,910	4,873,159	8,195,982
	Economic-Employment	2,396,624	2,726,598	3,063,478	3,766,544
	TAF	2,233,413	2,622,319	2,859,028	3,399,001
Enplanements	Historical Trendline	108,884,896	127,191,602	145,498,308	182,111,721
	Regional Market Share	100,414,423	119,467,756	133,898,928	166,052,220
	Economic-Population	104,583,708	121,480,137	135,398,253	157,801,735
	Economic-Per Capita Income	109,884,343	143,080,522	185,521,657	306,343,412
	Economic-Employment	99,899,614	109,809,045	119,854,715	141,138,221
	TAF	100,394,115	118,069,071	133,517,517	167,574,724

Figures 27-30 present visual comparisons of the statewide forecasts.

Figure 27. Statewide Based Aircraft Forecast Scenarios

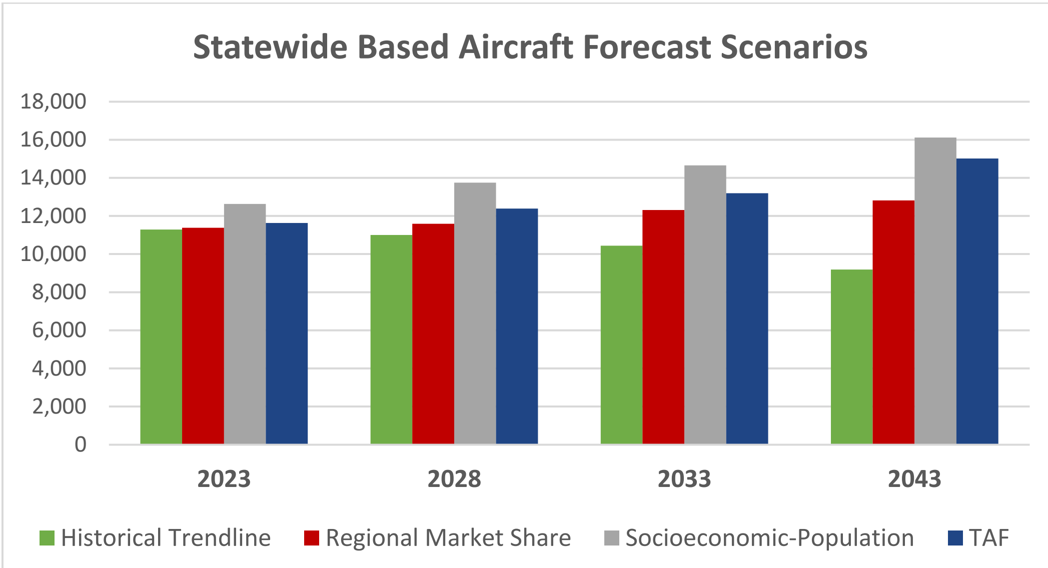


Figure 28. Statewide General Aviation Operations Forecast Scenarios

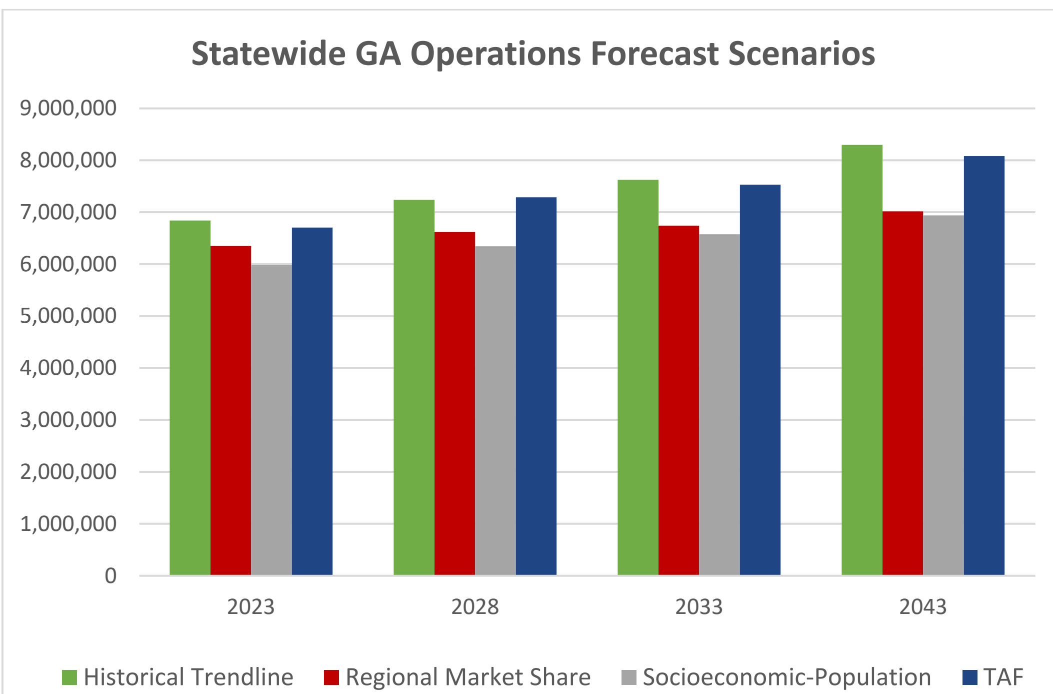


Figure 29. Statewide Commercial/Air Taxi Operations Forecast Scenarios

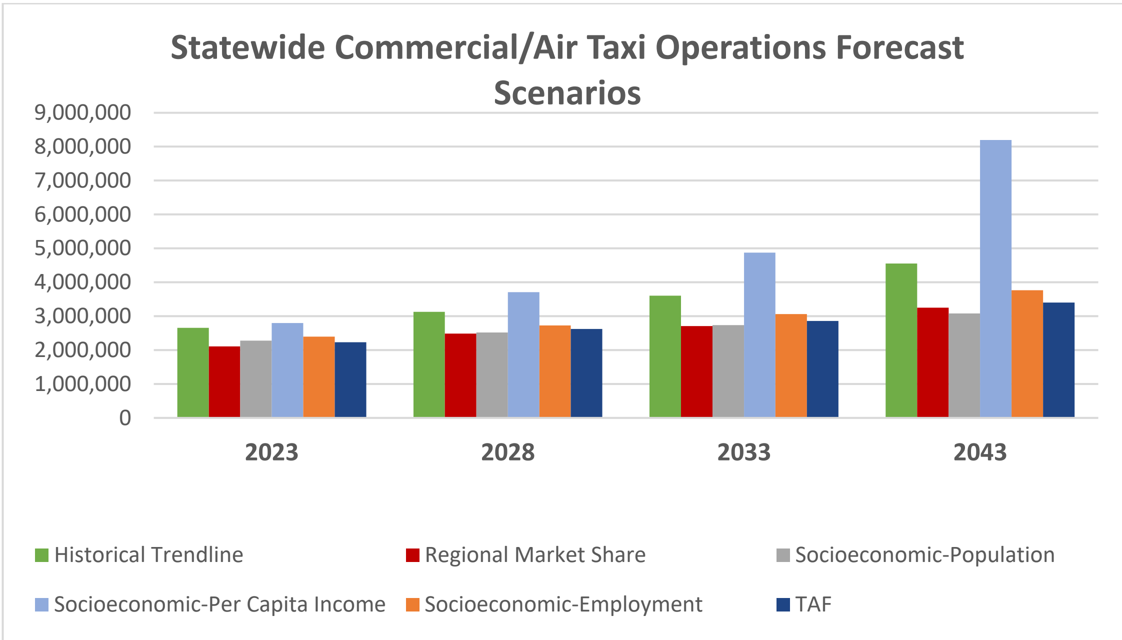
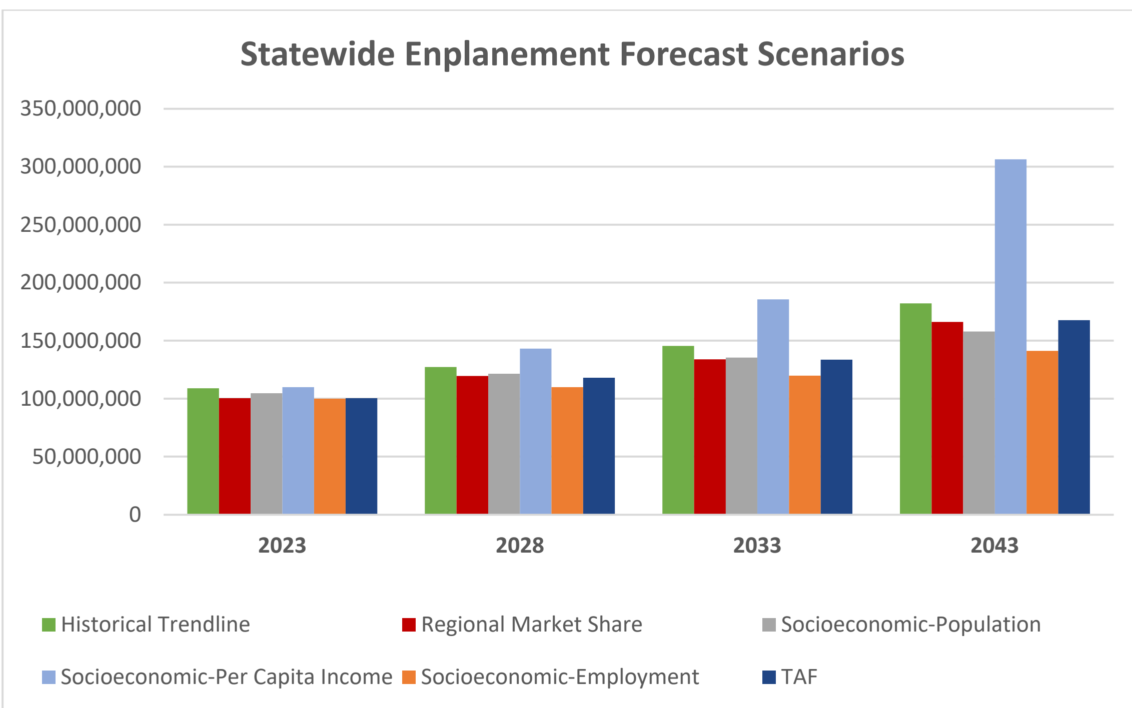


Figure 30. Statewide Enplanement Forecast Scenario



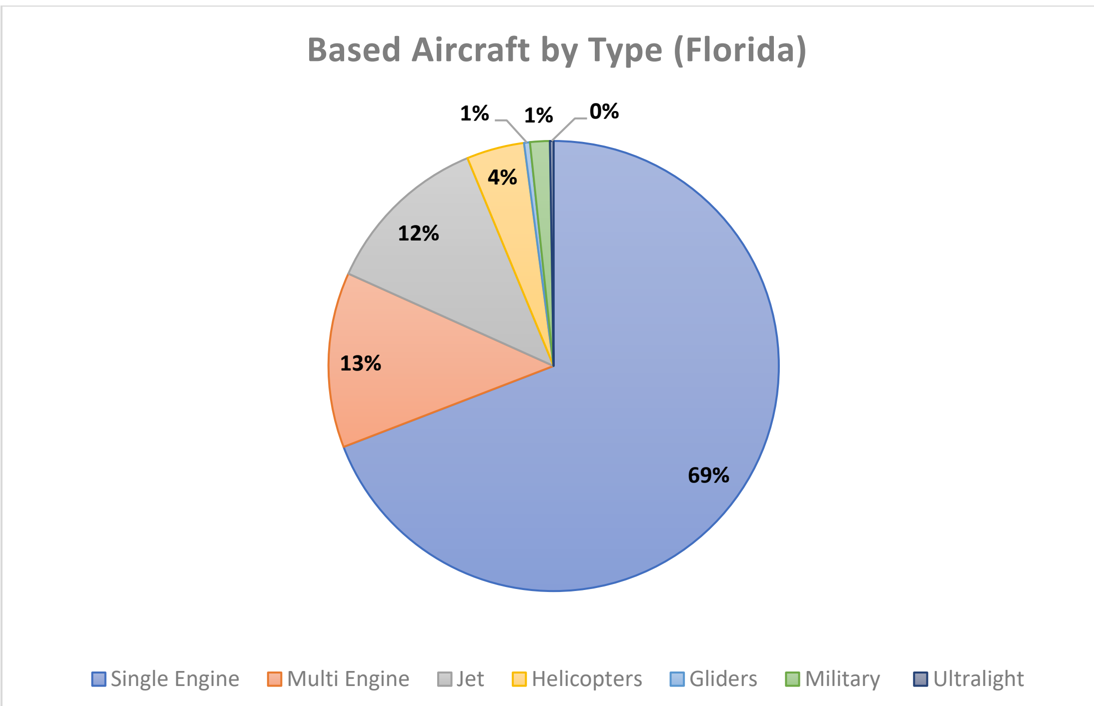
Aircraft Fleet Mix

The aircraft fleet mix examines the percentage of aircraft by type that operate or are based at an airport. This section examines based aircraft by type at Florida airports as well as critical aircraft that operate in and out of Florida airports.

Based Aircraft by Type

The based aircraft were examined further across all seven districts by determining the number of each aircraft type based at the districts' respective airports. The diversity of based aircraft types is important to understand the demands an airport can face. **Figure 31** groups the percentage of based aircraft by type in each district.

Figure 31. Based Aircraft by Type



In **Table 27**, the total number of based aircraft, along with the aircraft type, can be found for the state of Florida.

Table 27. Based Aircraft Type Totals (2023)

District	Aircraft Types							District Totals
	Single-Engine	Multi-Engine	Jet	Helicopter	Gliders	Military	Ultralight	
1	1,916	288	263	100	14	0	9	2,590
2	800	147	134	31	10	129	1	1,252
3	754	65	65	33	3	0	5	925
4	1,660	450	563	114	7	0	3	2,797
5	1,862	318	207	138	5	3	7	2,540
6	244	64	34	22	5	5	2	376
7	823	135	134	46	5	28	4	1,175
Florida Totals	**8,059**	**1,467**	**1,400**	**484**	**49**	**165**	**31**	**11,655**

Source: FAA 5010, September 2023

Critical Aircraft Analysis

Types of aircraft currently using airports in Florida provides insight into the facility needs of airports throughout the State. As defined by FAA Advisory Circular 150/5000-17, *Critical Aircraft and Regular Use Determination*, the critical aircraft can be a single aircraft type or a group of aircraft with similar operational and physical characteristics.

The combination of the Aircraft Approach Category (AAC) and the Airplane Design Group (ADG) yields the Runway Design Code (RDC). Specifications of the AAC and ADG from AC 150/5300-13B, *Airport Design*, are identified in **Tables 28** and **29**.

Table 28. Aircraft Approach Category (AAC)

AAC	Approach Speed
A	< 90 knots
B	91 to < 121 knots
C	121 to < 141 knots
D	141 to < 166 knots
E	166 knots or more

Table 29. Airplane Design Group (ADG)

ADG	Tail Height	Wing Span
I	< 20 feet	< 49 feet
II	> 20 feet, but < 30 feet	> 49 feet, but < 79 feet
III	> 30 feet, but < 45 feet	> 79 feet, but < 118 feet
IV	> 45 feet, but < 60 feet	> 118 feet, but < 171 feet
V	> 60 feet, but < 66 feet	> 171 feet, but < 214 feet
VI	> 66 feet, but < 80 feet	> 214 feet, but < 262 feet

Operations data by aircraft operating under FAA Instrument Flight Rules (IFR) for the Districts of Florida were obtained for fiscal year 2023 to determine the most recent aircraft usage within the State of Florida. The FAA's Traffic Flow Management System Count (TFMSC) data separates aircraft operations by AAC and ADG. The results of the TFMSC query are presented in **Table 30**.

Table 30. Traffic Flow Management System Count (TFMSC) Data, FY 2023

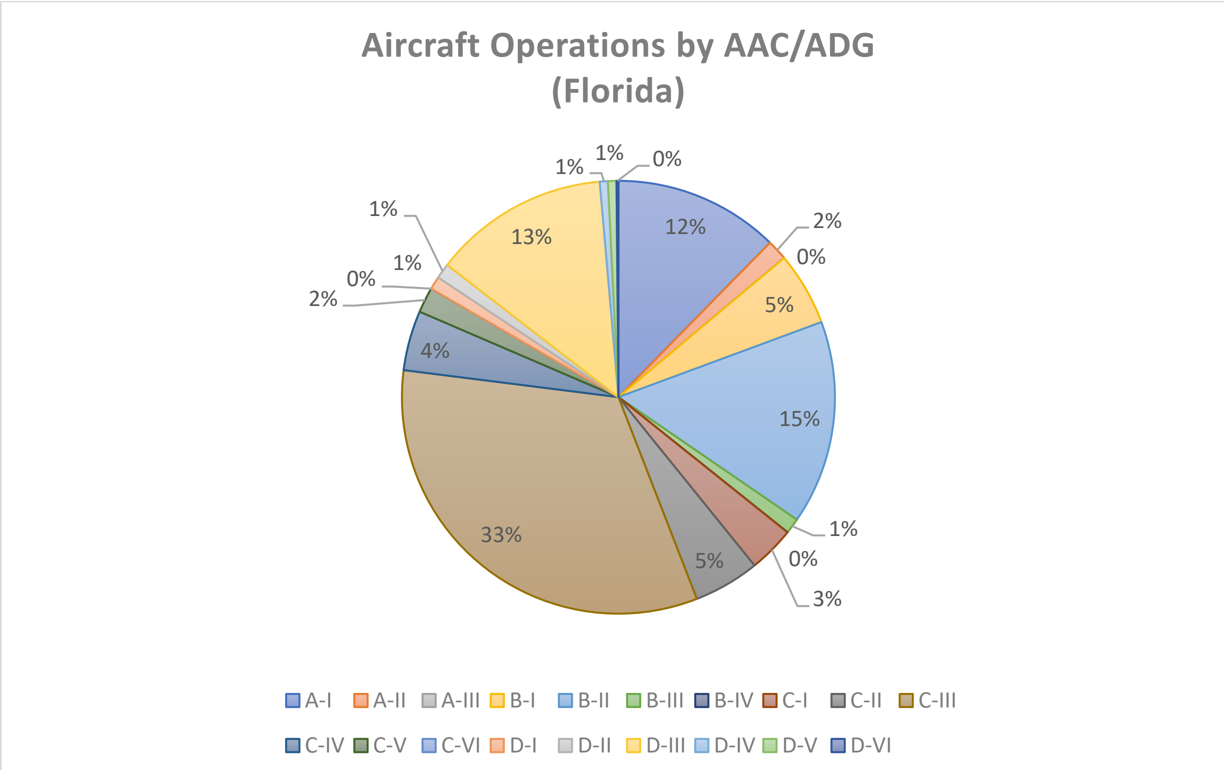
Airplane Approach Category (AAC)	Airplane Design Group (ADG)	District 1	District 2	District 3	District 4	District 5	District 6	District 7	Florida Total
A	I	49,554	37,211	21,097	57,302	67,058	17,085	24,816	**274,123**
A	II	5,429	4,043	3,867	8,256	4,732	3,210	4,286	**33,823**
A	III	1	2	0	3	5	43	2	**56**
B	I	23,673	12,221	15,407	32,485	15,941	15,886	6,286	**121,899**
B	II	64,146	25,023	24,216	112,974	40,501	58,654	12,642	**338,156**
B	III	537	931	2,685	9,080	4,098	8,159	37	**25,527**
B	IV	32	68	93	21	40	15	6	**275**
C	I	15,056	3,970	3,711	31,055	6,082	13,382	3,106	**76,362**
C	II	15,429	9,279	8,783	41,507	9,180	22,109	3,040	**109,327**
C	III	73,779	45,356	47,614	175,730	212,310	160,311	15,735	**730,835**
C	IV	11,240	11,092	4,249	13,275	16,501	41,626	1,112	**99,095**
C	V	199	14	3	2,223	7,492	32,107	0	**42,038**
C	VI	0	0	0	10	10	0	0	**20**
D	I	667	2,471	8,707	4,216	1,820	1,373	2,420	**21,674**
D	II	3,117	663	531	10,391	2,286	7,756	477	**25,221**
D	III	33,944	9,656	11,248	49,411	70,553	116,482	975	**292,269**
D	IV	1,188	240	28	2,242	7,931	1,651	4	**13,284**
D	V	22	52	4	56	1,578	12,433	0	**14,145**
D	VI	2	0	0	1	16	3,037	0	**3,056**

Source: FAA TFMSC Data, FY 2023

From the TFMSC data counts, it is clear that the most frequent aircraft AAC/ADG is a C-III aircraft with more than 700,000 operations over the course of the year. Common aircraft types with a RDC of C-III include the Airbus 320, Bombardier CRJ-900, and a Boeing 737-400. The C-III was followed in frequency by aircraft with an RDC of B-II and D-III. Common B-II aircraft include the Cessna Citation, and common D-III aircraft include the Gulfstream V and Boeing 737-800.

A breakout of aircraft operations by AAC/ADG, as reported in the TFMSC report, is illustrated in **Figure 32.**

Figure 32. Aircraft Operations by AAC/ADG



Recommended Forecast Scenarios

Figures 33-36 illustrate visual comparisons of the forecasts. Accompanying these figures, **Tables 31-34** provide the forecast scenario data results for the years 2023, 2028, 2033, and 2043. In addition, the compounded annual growth rate for the 20-year period is presented in the tables for each of the forecast scenarios. The recommended forecast scenario is highlighted for each forecast presented and is described in further detail below.

Recommended Based Aircraft Forecast

The recommended based aircraft forecast is the socioeconomic-population scenario. It yields the most aggressive growth rate when compared to the alternative forecast scenarios. Likewise, there has been a strong correlation between based aircraft and population over the past ten years. The socioeconomic-population forecast scenario for based aircraft results in a CAGR of 1.2 percent annually over the course of the forecast period. **Figure 33** and **Table 31** highlight the recommended forecast and compare it to the other forecast scenarios.

Figure 33. Statewide Based Aircraft Forecast Scenarios

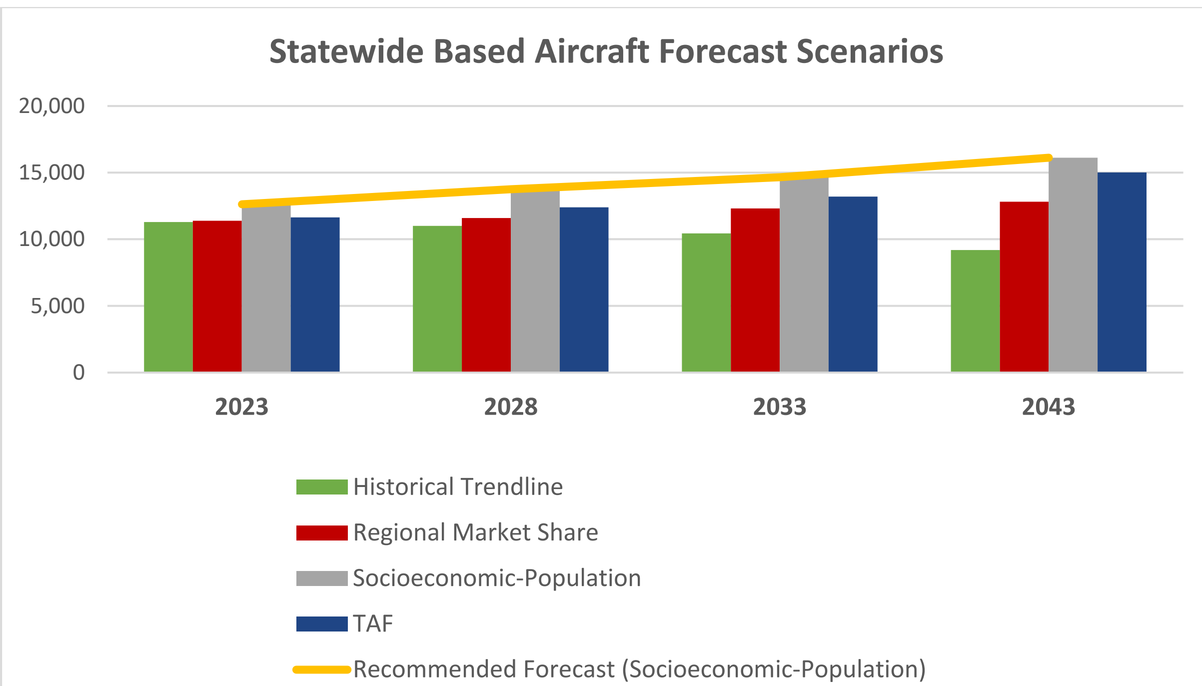


Table 31. Statewide Based Aircraft Forecast Scenarios

	Forecast Scenarios	2023	2028	2033	2043	CAGR
Based Aircraft	Historical Trendline	11,287	11,007	10,438	9,193	-1.0%
	Regional Market Share	11,385	11,594	12,313	12,819	0.6%
	Socioeconomic-Population	**12,629**	**13,748**	**14,656**	**16,118**	**1.2%**
	TAF	11,635	12,392	13,197	15,017	1.3%

Recommended GA Operations Forecast

Historical trendline forecast is the recommended forecast for GA operations. It is the most aggressive forecast of the four scenarios presented but represents consistent growth in GA operations within the state of Florida over the past decade. This recommended forecast results in a CAGR of 1.0 percent annually over the 20-year forecast period. **Figure 34** and **Table 32** provide a comparative display of the GA operations forecast.

Figure 34. Statewide GA Operations Forecast Scenarios

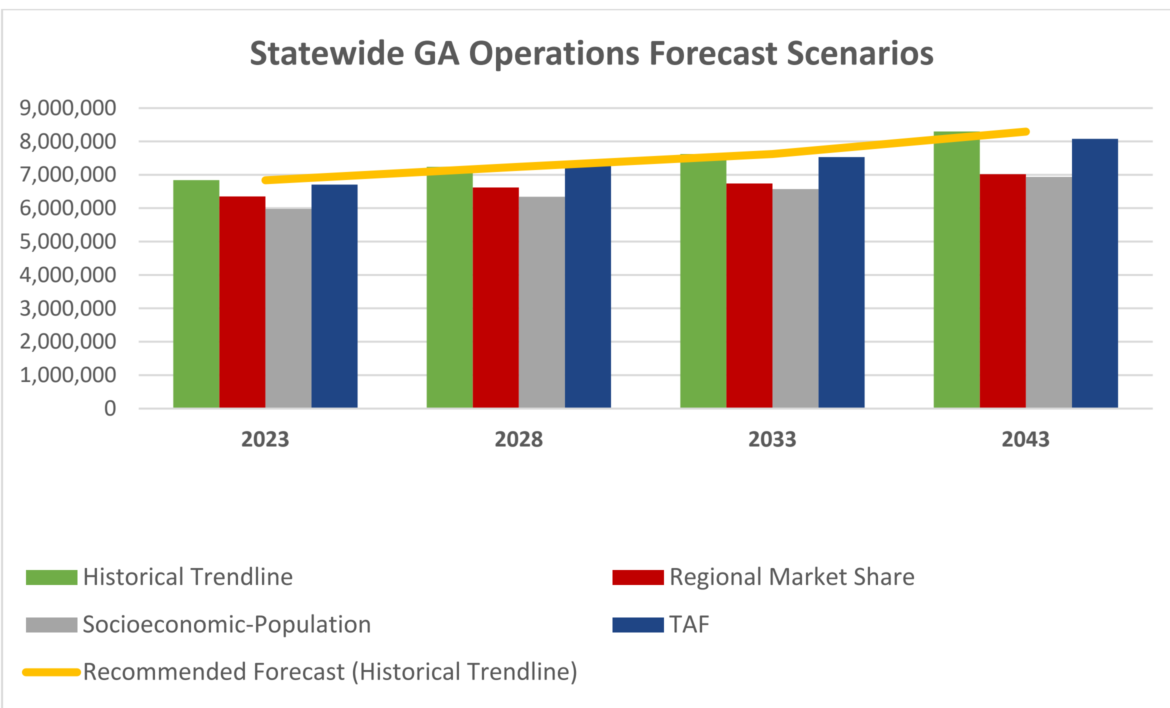


Table 32. Statewide GA Operations Forecast Scenarios

	Forecast Scenarios	2023	2028	2033	2043	CAGR
GA Operations	**Historical Trendline**	6,884,315	7,277,803	7,658,240	8,322,191	**1.0%**
	Regional Market Share	6,349,310	6,617,576	6,741,660	7,015,799	0.5%
	Socioeconomic-Population	5,979,445	6,344,369	6,573,862	6,937,903	0.8%
	TAF	6,704,703	7,286,087	7,531,358	8,078,515	0.9%

Recommended Commercial/Air Taxi Operations Forecast

Out of the six forecast scenarios presented for the commercial/air taxi operations forecast, the socioeconomic-employment based forecast is the recommended forecast. The correlation between employment and commercial/air taxi operations is .93, providing a high-level of confidence in this recommendation. This forecast does not yield the highest or the lowest annual growth rate but is moderate with a CAGR of 2.3 percent.

Figure 35. Statewide Commercial/Air Taxi Operations Forecast Scenarios

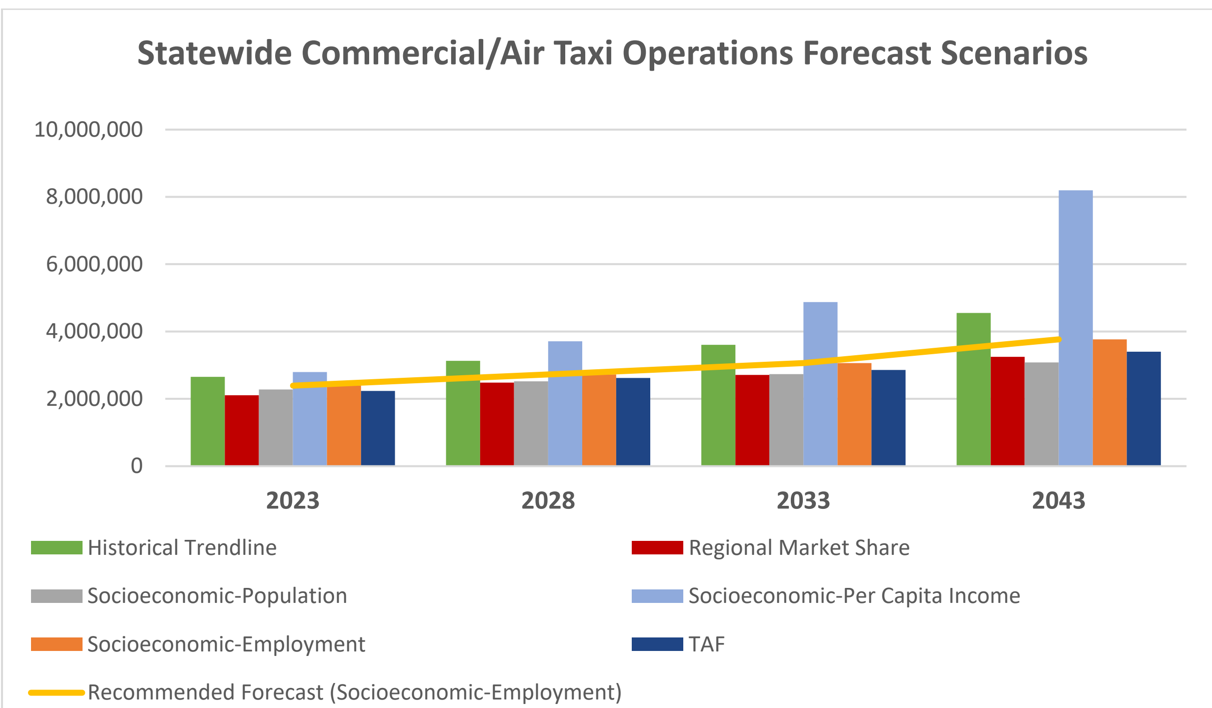


Table 33. Statewide Commercial/Air Taxi Operations Forecast Scenarios

	Forecast Scenarios	2023	2028	2033	2043	CAGR
Commercial/Air Taxi Ops	Historical Trendline	2,654,246	3,128,836	3,603,498	4,553,028	2.7%
	Regional Market Share	2,108,798	2,484,125	2,709,540	3,248,654	2.2%
	Socioeconomic-Population	2,276,900	2,519,084	2,734,501	3,080,662	1.5%
	Socioeconomic-Per Capita Income	2,797,274	3,707,910	4,873,159	8,195,982	5.5%
	Socioeconomic-Employment	**2,396,624**	**2,726,598**	**3,063,478**	**3,766,544**	**2.3%**
	TAF	2,233,413	2,622,319	2,859,028	3,399,001	2.1%

Recommended Enplanement Forecast

Like commercial/air taxi operations forecast, six forecast scenarios are also presented for enplanements. Regional market share forecast for enplanements is the recommended enplanement forecast for the FASP 2043. Since 2012, enplanements have consistently represented more than 40 percent of the market share in the Southern Region. The market share forecast predicts that enplanements are going to grow to exceed 166 million in the State of Florida by 2043, yielding a CAGR of 2.6 percent. **Figure 36** and **Table 34** present enplanement forecast scenarios and the resultant recommended forecast.

Figure 36. Enplanement Forecast Scenario

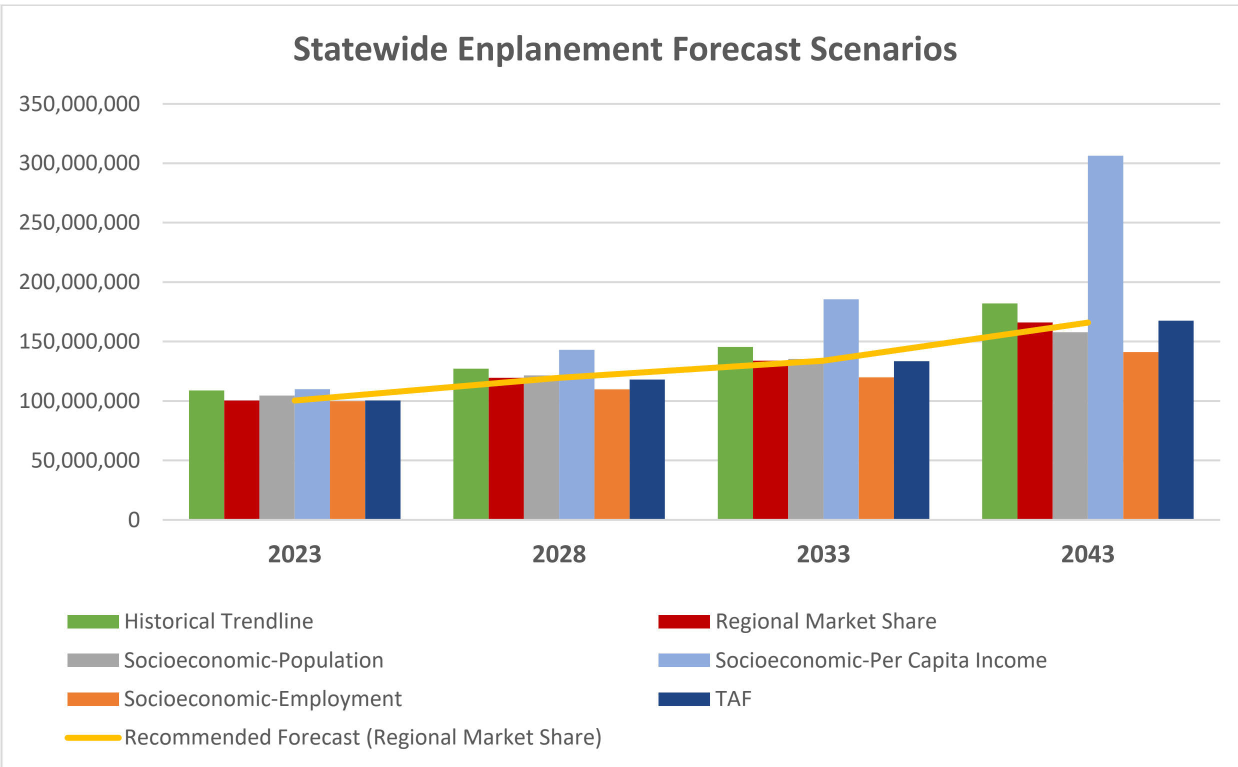


Table 34. Statewide Enplanement Forecast Scenarios

	Forecast Scenarios	2023	2028	2033	2043	CAGR
Enplanements	Historical Trendline	108,884,896	127,191,602	145,498,308	182,111,721	2.6%
	Regional Market Share	**100,414,423**	**119,467,756**	**133,898,928**	**166,052,220**	**2.6%**
	Socioeconomic-Population	104,583,708	121,480,137	135,398,253	157,801,735	2.1%
	Socioeconomic-Per Capita Income	109,884,343	143,080,522	185,521,657	306,343,412	5.3%
	Socioeconomic-Employment	99,899,614	109,809,045	119,854,715	141,138,221	1.7%
	TAF	100,394,115	118,069,071	133,517,517	167,574,724	2.6%

FASP 2043 Forecast Summary

Table 35 presents the forecast summary for aviation activity in the State of Florida through 2043.

Table 35. FASP 2043 Forecast Summary

Aviation Activity	2023	2028	2033	2043	CAGR
Based Aircraft	12,629	13,748	14,656	16,118	1.2%
GA Operations	6,884,315	7,277,803	7,658,240	8,322,191	1.0%
Commercial/Air Taxi Operations	2,396,624	2,726,598	3,063,478	3,766,544	2.3%
Enplanements	100,414,423	119,467,756	133,898,928	166,052,220	2.6%

E

FASP 2043 System Analysis

Click to download the Appendix E [FASP 2043 System Analysis] full data set Excel spreadsheet.

FDOT 2043 FASP FLORIDA AVIATION SYSTEM PLAN

F

Weather Reporting Systems Initiative

2043 FASP FLORIDA AVIATION SYSTEM PLAN

Appendix F

Weather Reporting Systems Initiative

A comprehensive system of weather reporting that covers the state of Florida is beneficial to pilots in making informed flight planning decisions when flying in Florida's airspace. In preparing the 2043 Florida Aviation System Plan (FASP), an inventory effort of weather reporting systems was conducted through a review of the Federal Aviation Administration's (FAA) Airport Data and Information Portal (ADIP) database and from a data collection effort through a survey of airports that comprise the FASP. This document summarizes the differences between these systems, presents the network of weather reporting coverage, and identifies gaps in coverage with suggested airport locations to improve coverage, all organized into the following sections:

- FAA-Certified and Non-Certified Emerging Technology Weather Reporting Systems.
- Network of Existing Florida Aviation System Weather Reporting Coverage.
- Gaps in Weather Reporting System Coverage and Suggested Enhancements.
- Conclusion.

FAA-Certified and Non-Certified Emerging Technology Weather Reporting Systems

Understanding the difference between FAA-certified and non-certified emerging technology weather reporting systems is important when evaluating how to improve the weather reporting capabilities of the Florida aviation system. FAA-certified system sources are the only ones that can be used for official flight planning purposes, especially in Instrument Flight Rules (IFR) conditions. Non-certified emerging technology weather observing systems are unable to be used to plan a flight but can be used to make preliminary decisions for that activity.

FAA-Certified Weather Reporting Systems

The accurate reporting and timely dissemination of weather conditions factors into flight planning and in-flight course corrections. It also factors into whether flights are conducted under Visual Flight Rules (VFR) or IFR. As such, the FAA certifies weather reporting equipment that can be used for flight planning. This certification includes maintenance procedures for equipment to ensure the accuracy and timeliness of reporting weather conditions. Certified equipment that can meet FAA standards[1] is listed on the FAA's Non-Federal Program website[2] presented in **Table 1**.

[1] Federal Aviation Administration (FAA). 2017. Advisory Circular 150/5220-16E, *Automated Weather Observing Systems (AWOS) for Non-Federal Applications.*
[2] FAA. 2023. "Buying, Operating, & Maintaining AWOS."
https://www.faa.gov/airports/planning_capacity/non_federal/awos

Table 1. Approved Weather Reporting Equipment for Airports

Manufacturer	Model
All Weather, Inc. (https://www.allweatherinc.com/)	AWOS 900*, AWOS 3000
Optical Scientific, Inc., formerly Belfort Instrument Company (https://www.opticalscientific.com/)	DigiWx (rebranded as OSI AWOS AV)
Mesotech International (https://mesotech.com/)	AWA
DBT Transportation Services LLC, formerly Vaisala, Inc. (https://dbttranserv.com/)	VC/VD, AW20*

Notes: *While system is still approved to operate in National Airspace System (NAS), it is no longer available for purchase as a new system.

Weather reporting systems are further categorized based on their instrumentation. **Table 2** lists the system definitions of weather observation systems based on their different combinations of instrumentation.

Table 2. Weather Observing System Definitions

System Definitions	Certified Data
ASOS	Wind speed, wind direction, wind gust, wind character, temperature, dew point, altimeter setting, visibility, present weather information including precipitation, cloud height, and cloud amount
AWOS A	Altimeter setting
AWOS A / V	Altimeter setting, visibility
AWOS I	Wind speed, wind direction, wind gust, variable wind direction, temperature, dew point, altimeter setting, and density altitude
AWOS II	Same as AWOS I plus visibility and variable visibility
AWOS III	Same as AWOS II plus precipitation accumulation, cloud height, and sky condition
AWOS III P	Same as AWOS III plus present weather identification
AWOS III T	Same as AWOS III plus thunderstorm/lightning reporting
AWOS III P/T	Same as AWOS III plus present weather identification and thunderstorm/lightning reporting
AWOS IV Z	Same as AWOS III P/T plus freezing rain detection
AWOS IV R	Same as AWOS III P/T plus runway surface condition
AWOS IV Z/R	Same as AWOS III P/T plus freezing rain detection and runway surface condition

Source: FAA Advisory Circular 150/5220-16, *Automated Weather Observing Systems (AWOS) For Non-Federal Applications*

As **Table 2** demonstrates, an Automated Weather Observing System (AWOS) is more modular than an Automated Surface Observing System (ASOS), providing some flexibility in terms of cost versus capability. The other major difference between AWOS and ASOS is the ownership and maintenance responsibility. Local sponsors, or in some cases, the FAA, are responsible for acquiring and maintaining AWOS while the National Weather Service and the Department of Defense own and upkeep ASOS sites.

Non-Certified Emerging Technology Weather Reporting Systems

Installation of ASOS or AWOS equipment can be costly, often in the range of $200,000, which is due to both the cost of the equipment and the supporting infrastructure needed to provide electricity, data communication landlines, and radio transmitting equipment. Emerging technology weather reporting systems, however, cost less to install and operate, giving airports without a certified ASOS or AWOS as well as other-non airport locations an opportunity to have weather reporting capabilities. Some of these systems offer internet-based equipment that can transmit weather information via wireless networks and very-high frequencies (VHF) that can eliminate the need for supporting landline infrastructure. These systems can also be equipped with solar panels, eliminating the need for supporting electrical utility infrastructure.

Non-certified emerging technology systems have also been used in many non-aviation applications such as weather condition reporting at schools, sports stadiums, beaches, bridge crossings, firefighting, industrial activities, and marine uses. Across the country, airports with FAA-certified AWOS or ASOS equipment have also installed non-certified systems as supplementary means of weather reporting. Fixed-Base Operators (FBOs), for example, have installed such systems as a supplementary means of weather information for their customers. Other aviation users such as pilot groups and flying clubs have also installed these systems to provide an alternate means of obtaining current weather conditions. The following provides a summary of five such systems that have been installed at airports in the United States and around the world as well as the weather reporting capabilities and features offered by each.

- **SayWeather** – SayWeather offers two weather reporting systems (Pro2 and PRO+) for airports that can transmit weather conditions on VHF bands such as universal communications frequencies (UNICOM) or common traffic advisory frequencies (CTAF) as well as to web-based resources. Based on the system purchased, these systems offer the ability to report wind speed, wind direction, temperature, dew point, barometric pressure, density altitude, runway surface condition, cloud ceiling height, sky condition, visibility, and weather conditions. Some airports in Florida already have SayWeather systems installed at their facilities.

- **WeatherSTEM** – WeatherSTEM's Protect Extreme system is designed for use at airports and is equipped with instrumentation to measure wind speed, wind direction, precipitation, weather conditions, temperature, barometric pressure, and humidity. Protect Extreme systems are rated for hurricane-force wind conditions and offer the option for the installation of equipment to report lightning conditions. The systems offer an option for a high-resolution camera to be installed that can broadcast live images of airfield conditions to web-based resources. In Florida, some airports already have WeatherSTEM systems.

- **Intellisense Systems** – Intellisense Systems offers the Micro Weather Station (MWS), with three models available based on type of instrumentation installed. MWS can report temperature, barometric pressure, humidity, wind speed, wind direction, precipitation, lightning, visibility, and cloud height. MWS units are compact, wireless, and can be repositioned easily. Information was not available regarding whether MWS units have been installed in Florida.

- **Earth Networks** – Earth Networks provides a weather station capable of measuring lightning, wind, temperature, and precipitation. Additional services include severe weather alerts and weather forecasting. In Florida, some airports already use Earth Networks systems.

- **Potomac Aviation Technology** – Potomac Aviation Technology offers MicroTower, a compact weather observing system that is equipped with instrumentation to measure wind speed, wind direction, visibility, barometric pressure, sky condition, temperature, and dew point. MicroTower systems have been installed in Florida.

Certifying Emerging Technology Weather Reporting Systems for Use

There is an option to certify emerging technology weather reporting systems as an official advisory source of weather information for flight planning use. The use of automated systems at airports not having an operational ASOS/AWOS is addressed in 47 Code of Federal Regulations (CFR) 87.219. An automated UNICOM may not provide weather information at an airport that has an operational, FAA-certified, automatic weather facility, unless the FAA has certified the UNICOM. If an automated UNICOM is used to provide weather information, then:

- Weather sensors must be placed to adequately represent the weather conditions at the airport(s) to be served;
- The weather information must be preceded by the word “advisory”;
- The phrase “automated advisory” must be included when the weather information is gathered by real-time sensors or within the last minute; and,
- The time and date of the last update must be included when the weather information was not gathered within the last minute.

In addition, the installation of weather observing systems at airports must also include the filing of Form 7460-1 with the FAA for airspace obstruction evaluation. Assignment of a VHF channel to transmit weather information via radio is also needed as part of the acquisition and installation of equipment.

A challenge, however, for FAA certification for weather reporting equipment is cost. The process needed to prove the reliability, accuracy, and dependability of weather reporting instrumentation that meets the standards defined in FAA Advisory Circular 150/5220-16 is comprehensive and costly. Likewise, the cost to develop, certify, and implement a robust equipment maintenance program needs to be considered when installing emerging technology systems and seeking FAA certification. Regardless, this process provides an option to seek FAA certification of emerging technology systems should it be desired to enhance weather reporting system coverage.

Network of Existing Florida Aviation System Weather Reporting Coverage

Airports that comprise the Florida aviation system are equipped with both certified and non-certified emerging technology equipment. The following section identifies the airports that are equipped with these two different categories of systems as well as those airports that do not have weather observing equipment. **Appendix A** presents a complete list of weather reporting systems found at airports in Florida.

Airports with FAA-Certified Weather Reporting Systems

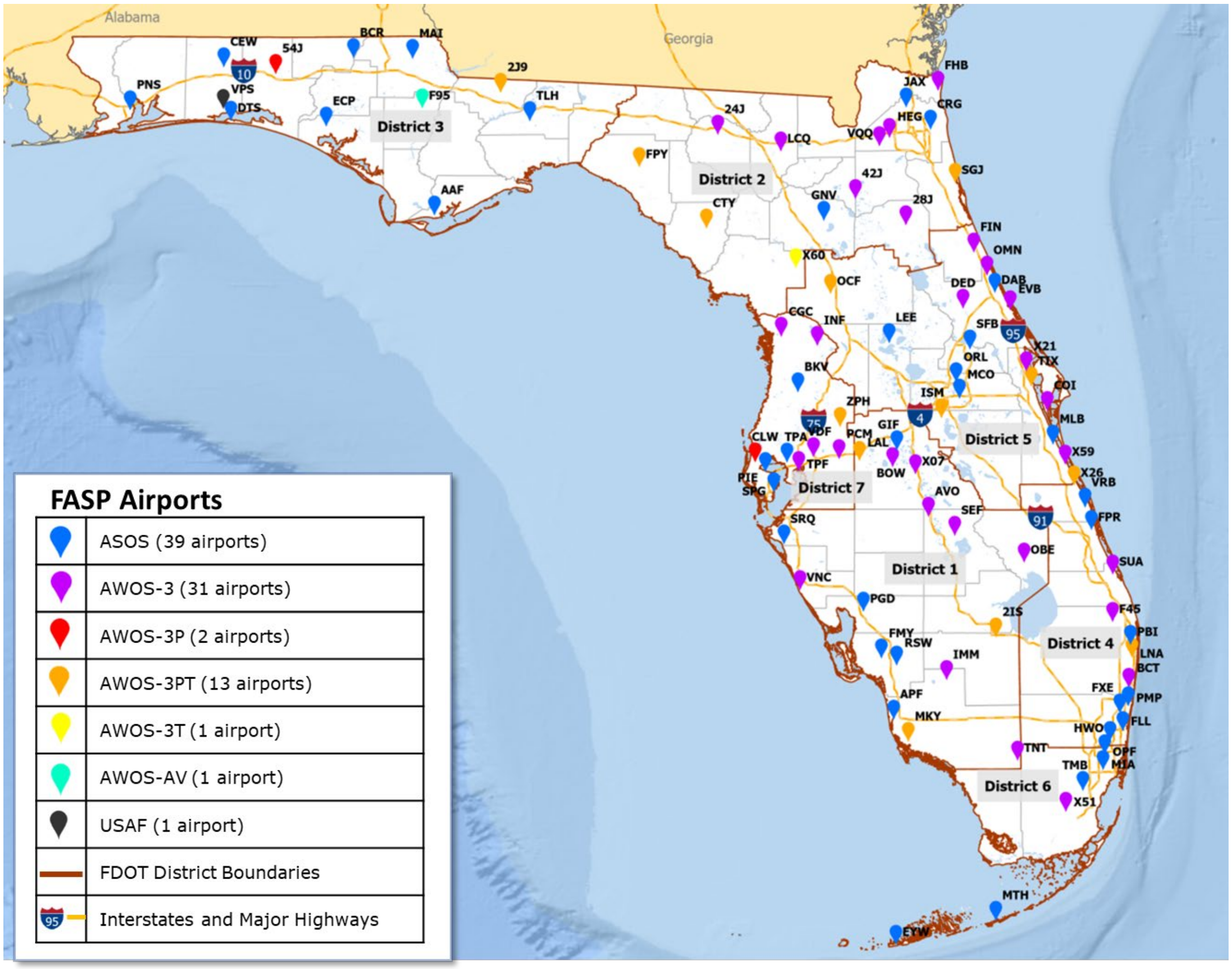
Figure 1 identifies the locations of FAA-certified weather reporting systems in Florida. These certified systems are either AWOS or ASOS. As shown in the figure, FAA-certified weather reporting systems are generally found within the most populous areas of Florida where the busiest airports are located. In total, there are 87 FAA-certified AWOS and ASOS systems at airports in Florida, plus certified weather reporting at Elgin AFB/Destin-Ft Walton Beach (VPS) by Air Force meteorologists.

Airports with Non-FAA Certified Emerging Technology Weather Reporting Systems

Figure 2 identifies the airports in Florida that have an emerging technology weather reporting system as indicated from the FASP 2043 survey effort:

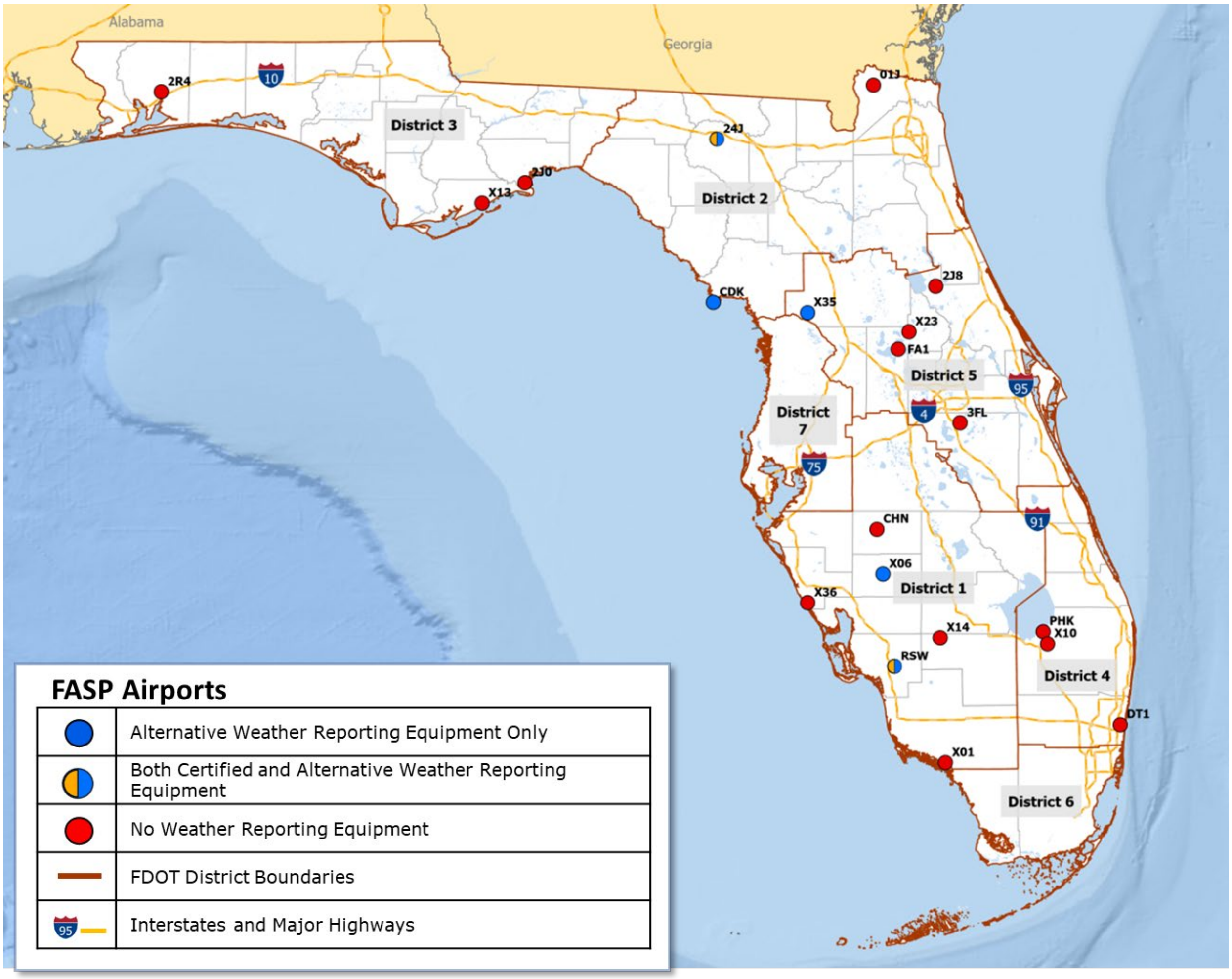
- Three airports only have an emerging technology weather reporting system and do not have an FAA-certified AWOS or ASOS:
  - Arcadia Municipal Airport (X06) in Arcadia.
  - George T. Lewis Airport (CDK) in Cedar Key.
  - Marion County Airport (X35) in Dunnellon.
- There are two airports that have both an FAA-certified AWOS or ASOS and an emerging technology system. Southwest Florida International Airport (RSW) has an Earth Networks weather system in addition to its ASOS, and Suwannee County Airport (24J) has a Weather STEM system in addition to its AWOS-3.
- There are 15 airports that do not have any kind of weather reporting system.
- There is one airport (Wauchula Municipal Airport – CHN) that presently does not have any kind of weather reporting system but is pursuing an AWOS.

Figure 1. FAA-Certified Weather Reporting System Network



Note: Appendix A presents a complete list of systems found at each airport.
Source: FAA Surface Weather Observation Stations (ASOS/AWOS) website (https://www.faa.gov/air_traffic/weather/asos), 2023

Figure 2. Non-Certified Weather Reporting System Locations



Source: FASP 2043 airport survey, 2023; Mead & Hunt, Inc., 2023

Table 3 presents airports without a weather reporting system. The Wakulla County Airport in Panacea is the greatest distance away (25 miles) from the nearest airport with an FAA-certified weather reporting system (Tallahassee International), while Tavares Airport in Tavares is the closest airport (four miles) without a weather reporting system to an airport that has an FAA-certified weather reporting system (Leesburg International). The Downtown Fort Lauderdale Heliport, which does not have a weather reporting system, is three miles from the closest FAA-certified weather reporting system at the Fort Lauderdale/Hollywood International Airport. On average, FASP airports without a weather reporting system are 14 miles from the nearest airport with FAA-certified weather reporting system equipment.

Table 3. Airports Without Weather Reporting System

Identifier	Airport	City	Nearest FAA-Certified Weather Station	Distance (nautical miles)
X10	Belle Glade State Municipal	Belle Glade	2IS – Airglades	21 miles
X36	Buchan	Englewood	VNC - Venice Municipal	6 miles
X13	Carrabelle-Thompson	Carrabelle	AAF - Apalachicola Regional	18 miles
DT1	Downtown Fort Lauderdale	Fort Lauderdale	FLL - Fort Lauderdale/Hollywood Intl	3 miles
X01	Everglades Airpark	Everglades	MKY - Marco Island Executive	18 miles
01J	Hilliard Airpark	Hilliard	JAX - Jacksonville International	16 miles
X14	La Belle Municipal	La Belle	IMM - Immokalee Regional	18 miles
PHK	Palm Beach County Glades	Pahokee	2IS - Airglades	19 miles
2R4	Peter Prince Field	Milton	PNS - Pensacola International	14 miles
2J8	Pierson Municipal	Pierson	DED - Deland Municipal	14 miles
3FL	St Cloud	St Cloud	ISM - Kissimmee Gateway	8 miles
FA1	Tavares	Tavares	LEE - Leesburg International	4 miles
X23	Umatilla Municipal	Umatilla	LEE - Leesburg International	10 miles
2J0	Wakulla County	Panacea	TLH - Tallahassee International	25 miles
CHN	Wauchula Municipal	Wauchula	AVO – Avon Park Executive	19 miles

Note: Airports in process of obtaining a weather reporting system are highlighted in gray.

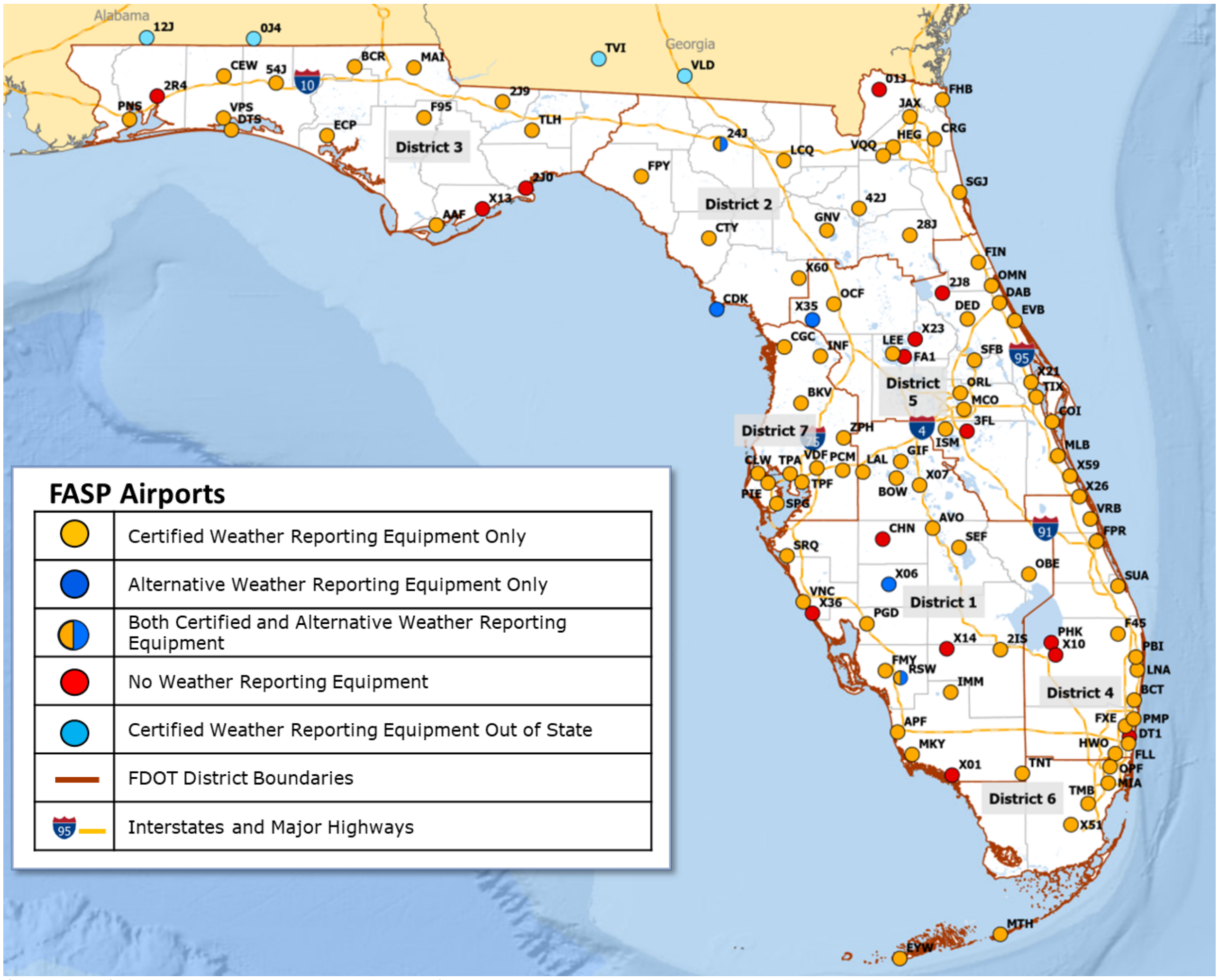
Source: FASP 2043 airport survey, 2023

Summary of Weather Reporting System Coverage

Figure 3 presents a summary of the weather reporting system coverage in Florida by airports that comprise the Florida aviation system. This includes airports that have FAA-certified and non-certified emerging technology weather reporting systems as well as airports that are absent of weather reporting equipment. As shown, Florida is well covered by these systems. Generally speaking, weather reporting equipment is prevalent at the busier airports across Florida.

Note the locations of four FAA-certified weather reporting systems just north of the Florida border in Alabama and Georgia that provide weather information for Florida's aviation system users. Two of these locations, Brewton Airport in Brewton, Alabama, and the Florala Municipal Airport in Covington, Alabama, are each located within three miles of the Florida border. In Georgia, the Thomasville Airport near Thomasville, Georgia, is within 16 miles of the Florida border, and the Valdosta Regional Airport near Valdosta, Georgia, is within 10 miles of the Florida border. While located outside of Florida, the presence of these systems is important as they provide a range of coverage for weather reporting conditions for Florida airports.

Figure 3. FASP Weather Reporting System Coverage

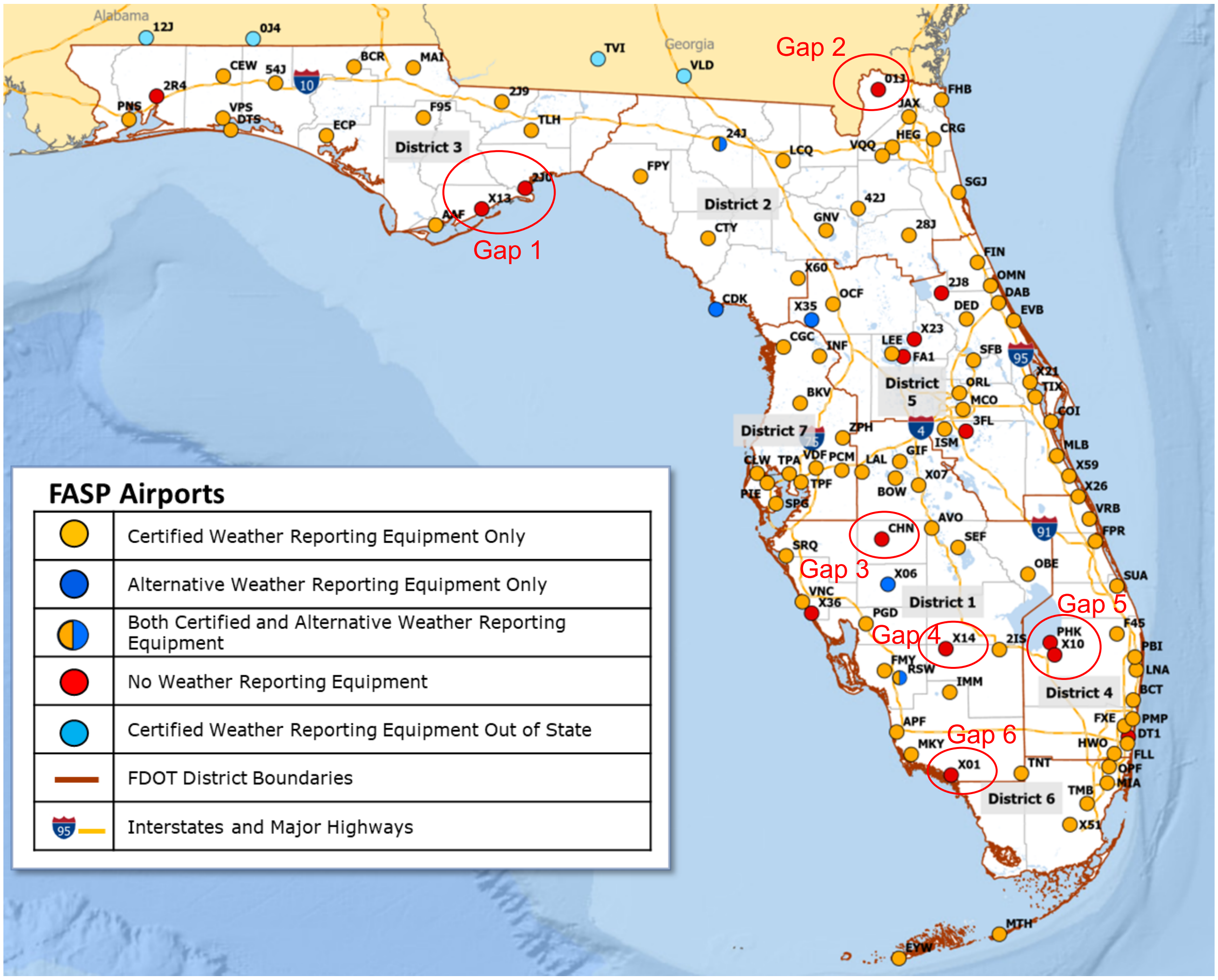


Source: FASP 2043 airport survey, 2023; Mead & Hunt, Inc., 2023

Gaps in Weather Reporting System Coverage and Suggested Enhancements

This section identifies gaps in weather reporting coverage and suggested airport locations to enhance coverage. Out of the 15 airports lacking automated weather reporting, eight are identified as recommended candidates for automated weather reporting equipment based on their distance from the nearest airport with weather reporting. In all cases, these airports are more than 15 miles from the closest airport with weather reporting. **Figure 4** highlights these gaps with red ovals around the airports recommended for automated weather reporting equipment.

Figure 4. Gaps in Weather Reporting System Coverage



Source: FASP 2043 airport survey, 2023; Mead & Hunt, Inc., 2023

Details on each gap area follow.

- **Gap 1** – There are two airports without automated weather reporting equipment in Gap 1. Carrabelle-Thompson Airport (X13) is 18 nautical miles from Apalachicola Regional Airport, while Wakulla County Airport (2J0) is 25 miles from Tallahassee International Airport. Wakulla County is farther from a weather reporting site than any other airport recommended for automated weather reporting equipment. Neither of these airports have an instrument approach procedure.
- **Gap 2** – The airport in Gap 2 without automated weather reporting equipment is Hilliard Airpark (01J). It is 16 nautical miles from Jacksonville International, making it the airport closest to a weather reporting site in this list. Hilliard Airpark does not have an instrument approach procedure.
- **Gap 3** – Wauchula Municipal Airport (CHN) is 19 nautical miles from the nearest weather reporting station. Wauchula Municipal has instrument approach procedures, so automated weather reporting

would enhance the ability of pilots to make use of these procedures. Wauchula Municipal is in the process of obtaining an AWOS.

- **Gap 4** – There is one airport in Gap 4 without automated weather reporting equipment – La Belle Municipal Airport (X14). It is 18 nautical miles from the nearest weather reporting station. There are multiple instrument approach procedures to La Belle Municipal, so automated weather reporting equipment would increase the utility of these approaches.
- **Gap 5** – There are two airports without automated weather reporting equipment in Gap 5. Belle Glade State Municipal Airport (X10) is 21 nautical miles from a weather reporting site, while Palm Beach County Glades (PHK) is slightly closer, at only 19 nautical miles. The two airports are only five nautical miles apart, so automated weather reporting at either one of the two airports should be sufficient. While Belle Glade State Municipal Airport is slightly farther from weather reporting than Palm Beach County Glades, Palm Beach County Glades has an instrument approach procedure that would benefit from having on-airport weather reporting.
- **Gap 6** – Everglades Airpark (X01) is the only airport in Gap 6 lacking automated weather reporting equipment. It is 18 nautical miles from the nearest weather reporting station and does not have an instrument approach procedure.

The other airports and heliport are found no more than 14 nautical miles from the closest airport with automated weather reporting. Assisting these airports with installing automated weather reporting equipment may be a consideration in the future but should be a lower priority than the airports previously discussed.

Conclusion

Florida already has a robust system of FAA-certified and non-certified weather reporting systems at airports across the state. Out of Florida’s 106 system airports, only 15 lack weather reporting capabilities. Some of these 15 airports are in areas where weather reporting system coverage could be enhanced. Airports identified for automated weather reporting system improvements were selected based on a minimum distance (15 nautical miles) from the nearest airport with automated weather reporting in an effort to best increase the geographic area with weather reporting available to pilots. Of course, the FDOT AO has the option to consider assisting airports under the 15 nautical mile threshold with obtaining automated weather reporting equipment, which would enhance weather coverage for pilots even further.

For those airports in Florida where a need for increased weather reporting system coverage has been identified, an option to improve coverage is to install non-certified emerging technology systems. Though these systems cannot be used for official flight planning purposes, they do benefit the users of Florida’s aviation system by providing weather information useful for preliminary flight planning decisions. Airports with smaller budgets and those not receiving Airport Improvement Program (AIP) funds find the possibility of installing FAA-certified AWOS and ASOS systems at their facilities cost-prohibitive. Installation of emerging technology systems at these airports provide a source of weather reporting information, even if only for preliminary flight planning purposes. Should it be desired, the FDOT AO could undertake a process to certify these emerging technology systems as official sources of advisory weather information.

Even if only for preliminary flight planning purposes, non-certified emerging technology systems still have great value for the Florida aviation system to enhance weather reporting system coverage. Through these system enhancements, Florida can continue to provide timely and accurate weather information to the many users of its aviation system.

Attachment 1 – List of Weather Reporting Systems by Airport

ID	Airport Name	City	Certified WX Equip	Equip Type	Other WX Equip	Notes
Commercial Service Airports						
DAB	Daytona Beach Intl	Daytona Beach	Yes	ASOS	No	
VPS	Eglin AFB/Destin-Ft Walton Beach	Valparaiso/Destin - Ft Walton Beach	Yes	USAF	No	
FLL	Fort Lauderdale / Hollywood Intl	Fort Lauderdale	Yes	ASOS	No	
GNV	Gainesville Rgnl	Gainesville	Yes	ASOS	No	
JAX	Jacksonville Intl	Jacksonville	Yes	ASOS	No	
EYW	Key West Intl	Key West	Yes	ASOS	No	
MLB	Melbourne Orlando Intl	Melbourne	Yes	ASOS	No	
MIA	Miami Intl	Miami	Yes	ASOS	No	
ECP	Northwest Florida Beaches Intl	Panama City	Yes	ASOS	No	
MCO	Orlando Intl	Orlando	Yes	ASOS	No	
SFB	Orlando Sanford Intl	Orlando	Yes	ASOS	No	
PBI	Palm Beach Intl	West Palm Beach	Yes	ASOS	No	
PNS	Pensacola Intl	Pensacola	Yes	ASOS	No	
PGD	Punta Gorda	Punta Gorda	Yes	ASOS	No	
SRQ	Sarasota/Bradenton Intl	Sarasota/Bradenton	Yes	ASOS	No	
RSW	Southwest Florida Intl	Fort Myers	Yes	ASOS	Yes	Earth Networks
PIE	St Pete-Clearwater Intl	St Petersburg - Clearwater	Yes	ASOS	No	
TLH	Tallahassee Intl	Tallahassee	Yes	ASOS	No	
TPA	Tampa Intl	Tampa	Yes	ASOS	No	
General Aviation Airports						
2IS	Airglades	Clewiston	Yes	AWOS-3PT	No	
SPG	Albert Whitted	St Petersburg	Yes	ASOS	No	
AAF	Apalachicola Rgnl-Cleve Randolph Fld	Apalachicola	Yes	ASOS	No	
X06	Arcadia Muni	Arcadia	No	n/a	Yes	SayWeather
X21	Arthur Dunn Air Park	Titusville	Yes	AWOS-3	No	
AVO	Avon Park Exec	Avon Park	Yes	AWOS-3	No	AWOS in need of upgrade
BOW	Bartow Exec	Bartow	Yes	AWOS-3	No	
X10	Belle Glade State Muni	Belle Glade	No	n/a	No	
CEW	Bob Sikes	Crestview	Yes	ASOS	No	
BCT	Boca Raton	Boca Raton	Yes	AWOS-3	No	
BKV	Brooksville-Tampa Bay Rgnl	Brooksville	Yes	ASOS	No	

ID	Airport Name	City	Certified WX Equip	Equip Type	Other WX Equip	Notes
X36	Buchan	Englewood	No	n/a	No	
F95	Calhoun County	Blountstown	Yes	AWOS-AV	No	
X13	Carrabelle-Thompson	Carrabelle	No	n/a	No	
VQQ	Cecil	Jacksonville	Yes	AWOS-3	No	
CLW	Clearwater Air Park	Clearwater	Yes	AWOS-3P	No	
CTY	Cross City	Cross City	Yes	AWOS-3PT	No	
CGC	Crystal River-Capt Tom Davis Fld	Crystal River	Yes	AWOS-3	No	
TNT	Dade-Collier Training And Transition	Miami	Yes	AWOS-3	No	
54J	Defuniak Springs	Defuniak Springs	Yes	AWOS-3P	No	
DED	Deland Muni-Sidney H Taylor Fld	Deland	Yes	AWOS-3	No	
DTS	Destin Exec	Destin	Yes	ASOS	No	
DT1	Downtown Fort Lauderdale	Fort Lauderdale	No	n/a	No	
X01	Everglades Airpark	Everglades	No	n/a	No	
ORL	Exec	Orlando	Yes	ASOS	No	
FHB	Fernandina Beach Muni	Fernandina Beach	Yes	AWOS-3	No	
FIN	Flagler Exec	Palm Coast	Yes	AWOS-3	No	Backup weather system to be installed in near future
FXE	Fort Lauderdale Exec	Fort Lauderdale	Yes	ASOS	No	
CDK	George T Lewis	Cedar Key	No	n/a	Yes	MicroTower
HEG	Herlong Recreational	Jacksonville	Yes	AWOS-3	No	
01J	Hilliard Airpark	Hilliard	No	n/a	No	
IMM	Immokalee Rgnl	Immokalee	Yes	AWOS-3	No	
INF	Inverness	Inverness	Yes	AWOS-3	No	
CRG	Jacksonville Exec At Craig	Jacksonville	Yes	ASOS	No	
42J	Keystone Heights	Keystone Heights	Yes	AWOS-3	No	
ISM	Kissimmee Gateway	Orlando	Yes	AWOS-3PT	No	
X14	La Belle Muni	La Belle	No	n/a	No	
LCQ	Lake City Gateway	Lake City	Yes	AWOS-3	No	
X07	Lake Wales Muni	Lake Wales	Yes	AWOS-3	No	
LAL	Lakeland Linder Intl	Lakeland	Yes	AWOS-3PT	No	
LEE	Leesburg Intl	Leesburg	Yes	ASOS	No	
MKY	Marco Island Exec	Marco Island	Yes	AWOS-3PT	No	
MAI	Marianna Muni	Marianna	Yes	ASOS	No	
X35	Marion County	Dunnellon	No	n/a	Yes	SayWeather
COI	Merritt Island	Merritt Island	Yes	AWOS-3	No	

ID	Airport Name	City	Certified WX Equip	Equip Type	Other WX Equip	Notes
TMB	Miami Exec	Miami	Yes	ASOS	No	
X51	Miami Homestead General Aviation	Homestead	Yes	AWOS-3	No	
OPF	Miami-Opa Locka Exec	Miami	Yes	ASOS	No	
APF	Naples Muni	Naples	Yes	ASOS	No	
EVB	New Smyrna Beach Muni	New Smyrna Beach	Yes	AWOS-3	No	
F45	North Palm Beach County General Aviation	West Palm Beach	Yes	AWOS-3	No	
HWO	North Perry	Hollywood	Yes	ASOS	No	
SGJ	Northeast Florida Rgnl	St Augustine	Yes	AWOS-3PT	No	
OCF	Ocala Intl-Jim Taylor Fld	Ocala	Yes	AWOS-3PT	No	
OBE	Okeechobee County	Okeechobee	Yes	AWOS-3	No	
OMN	Ormond Beach Muni	Ormond Beach	Yes	AWOS-3	No	
FMY	Page Fld	Fort Myers	Yes	ASOS	No	
28J	Palatka Muni - Lt Kay Larkin Fld	Palatka	Yes	AWOS-3	No	
PHK	Palm Beach County Glades	Pahokee	No	n/a	No	
LNA	Palm Beach County Park	West Palm Beach	Yes	AWOS-3PT	No	
FPY	Perry-Foley	Perry	Yes	AWOS-3PT	No	
TPF	Peter O Knight	Tampa	Yes	AWOS-3	No	
2R4	Peter Prince Fld	Milton	No	n/a	No	
2J8	Pierson Muni	Pierson	No	n/a	No	
PCM	Plant City	Plant City	Yes	AWOS-3	No	
PMP	Pompano Beach Airpark	Pompano Beach	Yes	ASOS	No	
2J9	Quincy Muni	Quincy	Yes	AWOS-3PT	No	
X26	Sebastian Muni	Sebastian	Yes	AWOS-3PT	No	
SEF	Sebring Rgnl	Sebring	Yes	AWOS-3	No	
TIX	Space Coast Rgnl	Titusville	Yes	AWOS-3PT	No	
3FL	St Cloud	St Cloud	No	n/a	No	
24J	Suwannee County	Live Oak	Yes	AWOS-3	Yes	WeatherSTEM
VDF	Tampa Exec	Tampa	Yes	AWOS-3	No	
FA1	Tavares	Tavares	No	n/a	No	
MTH	The Florida Keys Marathon Intl	Marathon	Yes	ASOS	No	
FPR	Treasure Coast Intl	Fort Pierce	Yes	ASOS	No	
BCR	Tri-County	Bonifay	Yes	ASOS	No	

ID	Airport Name	City	Certified WX Equip	Equip Type	Other WX Equip	Notes
X23	Umatilla Muni	Umatilla	No	n/a	No	
X59	Valkaria	Valkaria	Yes	AWOS-3	No	
VNC	Venice Muni	Venice	Yes	AWOS-3	No	
VRB	Vero Beach Rgnl	Vero Beach	Yes	ASOS	No	
2J0	Wakulla County	Panacea	No	n/a	No	
CHN	Wauchula Muni	Wauchula	No	n/a	No	AWOS scheduled to be installed in near future
X60	Williston Muni	Williston	Yes	AWOS-3T	No	
GIF	Winter Haven Rgnl	Winter Haven	Yes	ASOS	No	
SUA	Witham Fld	Stuart	Yes	AWOS-3	No	
ZPH	Zephyrhills Muni	Zephyrhills	Yes	AWOS-3PT	No	

Note: Buchan Airport (X36) did not provide a survey response, so their data was estimated.

Source: FAA ADIP and FASP 2043 airport survey

G

Airport Electrification Initiative

FDOT | 2043 FASP FLORIDA AVIATION SYSTEM PLAN

Appendix G

Airport Electrification Initiative

Background

Airport electrification can include energy generation, transmission, storage, and use cases that are not limited to aircraft. Traditionally, the conversation regarding electrification was focused on ways to reduce electrical consumption such as the transition to more energy efficient lighting systems including LED lighting for runway and taxiway lights, navigational aids and building lighting. Now, however, the conversation around electrification is taking on a whole new meaning with regards to impacts to air and ground transportation.

Emerging technologies may transform future generations of air and ground transportation, which may have significant impacts to airports of all sizes. A global initiative to reduce environmental impacts has a focus on airports to replace air and ground transportation with electric aircraft and vehicles. This document focuses on the latest trends and technology involving electric ground transportation, electric aircraft, and information pertaining to electric capacity and demand for all modes of transportation.

Electric Vehicles (EVs)

The easiest segment of electrification to observe is ground transportation since there are already numerous use cases available today with both passenger vehicles and some airport ground support vehicles being electric vehicles or hybrids.

The effect of vehicle electrification on airport infrastructure will be dependent on the airport's uses. Airports with high passenger levels and tenants that operate large fleets of rental vehicles as well as those that see a high volume of electrically powered automobiles may need to consider the provision of electrical charging infrastructure and to what effect this provision will have on power consumption on airport. ACRP Synthesis 54[1] in 2014 explored this topic for the airport industry. In 2021, the Federal Aviation Administration (FAA) reported that it provided more than $300 million in grants to help airports reduce vehicle emissions through electrification projects.

In a Zero Emissions Vehicle Transition Council dashboard titled *Zero-Emission Vehicles Progress Dashboard*[2], Bloomberg New Energy Finance (Bloomberg NEF) reports that over 122,000 public charging stations were installed in the U.S. as of the first half of 2022. In comparison, more than 145,000 retail

[1] National Academies of Sciences, Engineering, and Medicine. 2014. ACRP Synthesis 54: *Electric Vehicle Charging Stations at Airport Parking Facilities*. Washington, DC: The National Academies Press. https://doi.org/10.17226/22390
[2] ZEV Transition Council. 2022. "Zero-Emission Vehicles Progress Dashboard." BloombergNEF, September 21, 2022. https://assets.bbhub.io/professional/sites/24/BloombergNEF-ZEV-Dashboard-Sep-2022.pdf

locations in the United States sell fuel[3]. However, the U.S. lags other countries such as Canada, the United Kingdom, and several Nordic countries when comparing the number of chargers per electric vehicle in each country. This indicates that the public charging infrastructure in the U.S. market will need to grow if EV sales increase. A 2020 study by the Southern Alliance for Clean Energy found that Florida has the second highest number of EVs and the third highest number of electric busses in the United States.

The electrification of automobiles on airports is divided into four general categories: airport service vehicles, passenger and employee vehicles, rental vehicles, and transit vehicles. The sections that follow describe the technologies and market for each vehicle class and provide considerations for Florida's airports as they look to accommodate these vehicles at their facilities.

Airport Service Vehicles

Airport service vehicles include trucks and cars used by airport operations and maintenance staff as well as ground service equipment such as baggage carts and push-back tugs. As battery technology has improved, some vehicle types previously thought off-limits for electrification are seeing hybrid and fully electric models come to the market. An example is the hybrid Oshkosh Striker Volterra aircraft rescue and firefighting vehicle. Pickup trucks used by airport operations and maintenance staff are also seeing more EV options, such as the Ford F-150 Lightning and the Chevrolet Silverado EV.

A challenge associated with airport service vehicles is that they are expected to work for extended periods of time in a wide variety of weather conditions. While internal combustion engine vehicles can be refueled in a matter of minutes, EVs can take significant amounts of time to recharge, requiring backup vehicles or a recharging plan to avoid periods where there is no coverage. Although cold weather is unlikely to affect many of Florida's airports for extended periods of time, the American Automobile Association reports in a web-based article titled "Icy Temperatures Cut Electric Vehicle Range Nearly in Half[4]" that battery-powered vehicles suffer a reduction in range as the temperature drops.

[3] American Petroleum Institute. "Service Station FAQs." https://www.api.org/oil-and-natural-gas/consumer-information/consumer-resources/service-station-faqs
[4] AAA. 2019. "Icy Temperatures Cut Electric Vehicle Range Nearly in Half." Newsroom, February 7, 2019. https://newsroom.aaa.com/2019/02/cold-weather-reduces-electric-vehicle-range/

The EV industry is making progress towards addressing these challenges, and airport service EVs continue to become more capable and reliable. Airports looking to accommodate more EVs in their fleet should consider the placement of charging infrastructure; the ability of existing maintenance shops to perform repairs to batteries, electric motors, and drivetrains; and what contingency plans may need to be in place should the airport lose power in the event of disaster or outage. Hybrid vehicles can be an alternative to fully electric vehicles for airports looking to reduce emissions and fuel expenditure without losing the reliability of gasoline as a backup.

Passenger, Employee, and Rental Vehicles

As more EVs are sold, passengers and rental car operators will expect to find charging infrastructure at airports. Airports may contemplate the revenue potential of providing this service to passengers using their parking facilities. A consideration is that vehicles can charge in the span of a few hours, while cars parked at airports can remain for days and weeks. A charger for each stall is unlikely to be necessary, and airports may need to work with the industry to develop solutions that enable charging cables to be disconnected from unattended cars when charging is complete so other customers can use them.

The charging of rental car fleets, if this activity takes place on airport property and is connected to the same power supply as the rest of the airport, requires a detailed analysis of peak demand patterns and usage. During busy periods, rental car companies clean, fuel, and return rental cars into service in a matter of hours. Customers expect a full tank, or full battery, when they pick up their car. In 2022, rental car company Hertz announced a plan to develop a network of charging stations to support the tens of thousands of EVs that the rental car company has already purchased. The demand from these chargers, especially when fleets are connected and charging at the same time, will strain the local electrical grid. This could lead to failures during peak times. A study is recommended to determine what types of upgrades – from grid capacity improvements to onsite electricity generation to on-site battery storage – are needed to avoid system failures.

EVs tend to weigh more than their internal combustion powered counterparts. This is due to the weight of the batteries powering the EV. This may have implications for the design of future passenger and rental car parking structures in terms of how much weight each level is designed to accommodate. Currently, EVs make up such a small percentage of the existing vehicle fleet that their added weight is not a concern for parking structures. But should EVs grow to become a significant portion of the vehicle fleet, their additional weight will need to be a consideration in the design of parking structures.

Transit Vehicles

Transit vehicles are another segment of the transportation system that is increasingly going electric. There are numerous grant programs designed to help transit operators electrify their fleet. In Florida, transportation agencies received $14.7 million to support local efforts between 2016 and

2020. It is likely that electric busses and other transit vehicles will charge off airport property, but there may be opportunities for airports to sell electricity to transit operators if their vehicles are sitting at airport stops between routes.

In addition to public transit, some airports use busses to move passengers and employees between terminals, parking, rental car lots, hotels, and other points of interest. Planning to accommodate the electrical needs to operate these vehicles on-airport may also be an important consideration. As with other forms of electrification, this underscores the importance for an airport to reach out to tenants when preparing comprehensive plans for electrification.

Electric Aircraft

Urban air mobility (UAM) uses automated aircraft to carry goods and people to and from place to place. UAM includes a wide range of vehicle configurations powered by electric and other sustainable fuels. Whether or not the general public realizes, they are already familiar with UAMs like drones and their use cases such as recreational use, military use, and aerial imagery. It is possible that, in the near future, electric aircraft will be as familiar to the public as drone use is in 2023.

There are several families of electric aircraft: electric conventional takeoff and landing aircraft (eCTOLs) and electric vertical takeoff and landing aircraft (eVTOLs). A third family is typically grouped with eCTOLs: electric short takeoff and landing aircraft (eSTOLs).

- **eCTOLs** use conventional aircraft designs and replace the original internal combustion engines with electric ones, allowing the aircraft to use existing runways, taxiways, flight paths, and airport infrastructure. Examples include Cessna 208 Caravans and de Havilland Canada DHC-2s that have been fitted with batteries and electric motors.

- **eVTOLs** operate similarly to a helicopter with their ability to take off and land vertically. They have various types of configurations – fixed and rotary wing models. With their ability to take off vertically, they are suitable for environments with less space to maneuver.

- **eSTOLs** differ from eCTOLs in their facility needs. eSTOLs can operate on much shorter runways than eCTOLs. This provides some of the flexibility that eVTOLs offer without the excessive energy requirements associated with vertical takeoffs and landings. Leaders in eSTOL technology include Electra.aero, Inc.

Canadian airline Harbour Air has been testing an electric float plane (**Figure 1**) that will provide passenger and cargo service between the communities in southwestern British Columbia. This aircraft performed its first all-electric, point-to-point test flight in August 2022 and is most similar to an eCTOL.

Figure 1. Harbour Air ePlane

Source: https://harbourair.com/eplane-update/

Design of eVTOL aircraft vary greatly. Some fly like multi-engine helicopters while others take off vertically before switching the orientation of the motors to fly like a conventional airplane. Most have propellers driven by independent electric motors, but some, such as Germany's Lilium, are developing aircraft with a vectored thrust engine that operates like a jet turbine. A core attribute of the eVTOL family is that their takeoff and landing characteristics mean that they can operate outside of traditional airport environments. The concept of advanced air mobility (AAM) envisions a world where eVTOLs can connect passengers and cargo from point-to-point within a city or region without requiring a stop at an airport.

In addition to purely electric aircraft, another category is hybrid electric aircraft designs with the potential to increase flight range compared to aircraft that are solely electric. Hybrid aircraft may run on conventional aircraft fuel, sustainable aviation fuel (SAF), or hydrogen fuel cells, in addition to battery power.

Design Standards and Guidance

The FAA sets the standards for engineering, design, and construction for various airport-related equipment, facilities, and structures. With eVTOLs and eCTOLs operating similarly to conventional aircraft, design standards that govern airport development are expected to be applicable for the near future. The eVTOLs and eCTOLs currently in design are on the smaller side of the aircraft size spectrum, largely due to range and power limitations with current battery systems. The largest eVTOLs and eCTOLs in development have wingspans of up to 49 feet, which puts them in FAA Aircraft Design Group II.

Siting and installing electrical charging infrastructure follows a similar process to any other type of airport construction. Form 7460-1 will still need to be submitted so that the FAA can perform an airspace review on any infrastructure of height that is installed on an airfield. Airfield design standards identified in FAA Advisory Circular (AC) 150/5300-13B, *Airport Design*[5], also need to be considered.

[5] FAA. 2022. Advisory Circular (AC) 150/5300-13B – Airport Design. March 31, 2022. Washington, D.C. https://www.faa.gov/airports/resources/advisory_circulars/index.cfm/go/document.current/documentnumber/150_5300-13

An additional consideration is the source of the power supply. Electrical supply infrastructure may need to be improved to enable fast charging, which is critical for high volumes of electric aircraft operations. Similar to conventional aircraft turnaround times, optimizing electric aircraft turnaround times is just as critical in order to generate the most revenue. To optimize electric aircraft turnaround times, the power to fast charge electric aircraft is vital. If the power supply needs come from another part of the airport, consideration may be needed in how the cables will be located, either below ground in a trench or above ground on towers. Above ground options may be less expensive but could present obstructions to airspace surfaces if not considered during planning.

Since eVTOLs operate like helicopters in the sense that they take off and land vertically, this may allow operators to use existing heliports to support eVTOL operations. Heliports could provide convenient access to urban environments and previously underserved areas, but they must have the correct operating certificates and air rights before they support eVTOL operations. FAA Advisory Circular (AC) 105/5390-2D – *Heliport Design* contains heliport guidance that may be considered for eVTOL operations. If heliports are to be repurposed for the use of eVTOL operations, they may need to be modified with other amenities such as passenger amenities and charging facilities.

Vertiport design is described in FAA *Engineering Brief (EB) 105, Vertiport Design*[6]. The FAA states that this guidance, particularly for airspace surfaces associated with flight corridors, is subject to change as more details about eVTOL flight characteristics are learned. As of March 2023, airports planning a vertiport should consult the updated version of EB 105 and consider how the vertiport will interface with the rest of the airport environment. The updated version of EB 105 defines electric battery systems and provides guidance on the airspace approval process, vertiport design, markings, lightings, and visual aids.

Electric Vehicle and Aircraft Infrastructure

As airports prepare to plan for the increased use of electric vehicles, they will need to consider both aircraft needs as well as ground vehicles including passenger vehicles and airport vehicles. Both of these segments are discussed below to generally outline infrastructure that is expected to be required.

Electric Vehicle Infrastructure

Selection of EV charging infrastructure for vehicles at airports depends on its intended use and type of demand. Before addressing these issues, understanding the terminology used to describe the three existing levels of EV charging infrastructure for automobiles is useful:

- **Level 1 (120 Volts, 1.4 kilowatts [kW])** – Level 1 charging stations are the equivalent of a typical electrical receptacle and are the least expensive to install. Level 1 charging stations have the longest charging time.

[6] FAA. 2023. Engineering Brief No. 105, Vertiport Design. March 13, 2023. Washington, D.C. https://www.faa.gov/airports/engineering/engineering_briefs/engineering_brief_105_vertiport_design

- **Level 2 (208 or 240 Volts, 7.7 kW)** – Level 2 charging stations are approximately six times more expensive to install compared to a Level 1 charger but complete the charge much faster. These are the most common charging stations because airports are able to use existing electrical infrastructure present at most facilities.
- **Level 3 (480V, 50-350 kW)** – Level 3 charging stations such as the Tesla Supercharger typically require the installation of utility infrastructure sized to accommodate 480 Volts/3 phase/350 kW systems with a direct current converter. These charging stations offer the fastest charging option. Level 3 charging stations are the most expensive to install and are not as prominent as Level 1 or Level 2 charging stations.

For example, Level 1 charging infrastructure could be well suited for charging electrical vehicles parked in long-term parking lots or in charging motorcycles, scooters, and bicycles by those commuting to the airport. Level 3 charging infrastructure, on the other hand, could be installed as a fast-charging option for short-term airport visitors picking up or dropping off travelers. Other considerations such as the installation of solar panels to power charging stations, conduit routing to supply electricity to charging stations, and communication infrastructure to link power consumed with an airport's revenue control network could also factor into the level of charging infrastructure installed at an airport. A comprehensive energy use study is recommended to determine what level of infrastructure investment is needed to support the anticipated demand of tenants and users.

Electric Aircraft Infrastructure

Two of the primary considerations are whether any of the existing physical infrastructure needs to change to accommodate the way electric aircraft operate, and what is necessary for the recharging of electric aircraft on the airfield. Both issues are somewhat speculative since no standards have emerged for how electric aircraft function and are resupplied with energy. The following sections address both issues using the current line of thinking in this evolving market.

Electric aircraft, such as eCTOLs, have more similarities with conventional aircraft than they have differences. Aircraft in design are expected to be flown by a pilot, carry passengers and cargo, operate on runways, and move around the airport on a taxiway system. eVTOLs will operate similarly to conventional helicopters with hover and lift. All electric aircraft will need space to park, maintenance facilities, and a way to "refuel" before their next flight. While the design of some aircraft, particularly multi-rotor eVTOLs, may appear different from that of traditional aircraft, electric aircraft require minimal changes in airport infrastructure to accommodate electric aircraft facilities. The following discusses airport infrastructure considerations that may impact airports in Florida.

Charging infrastructure needed to support electric aircraft may vary widely based on the frequency and type of operations being conducted at each airport. It may be premature to assume what that charging infrastructure will be, but it is possible that a charging network with multiple levels – similar to that described above for cars – may be developed.

Some airports may consider installing chargers on the transient apron, while others may want to provide conduit and electrical lines with capacity sized appropriately to meet anticipated demand when building new hangars or vertiports. Airports in other states have placed empty conduit under new and rehabilitated aprons in anticipation of the need for electrification of the ramp. Airports with a high volume of flight training, cargo, and regional passenger traffic may see considerably more demand that could require upgrades to the electrical power infrastructure serving the airport. They also may require consideration of on-site electricity generation and storage. Alternatively, a future electric aircraft design may accommodate battery swapping technology where depleted batteries are replaced with fully charged batteries and the depleted batteries are charged off site.

A comprehensive overview of airport electrification infrastructure is included in ACRP Report 236, *Preparing Your Airport for Electric Aircraft and Hydrogen Technologies*[7]. Other considerations include constructing infrastructure to support aircraft operations powered by alternative fuels. Manufacturers are developing new engines that run on hydrogen fuel cells, are entirely electric, or are hybrid-electric aircraft. Alternative fuels that Florida airports may consider include:

- SAF.
- Hydrogen: Can be used to generate electricity to fuel or power aircraft.
- Hybrid: A hybrid configuration consists of multiple types of energy sources to optimize the efficiency of an aircraft's power.

Regardless of fuel type, understanding what type of aircraft activity is expected in a planning period is critical for infrastructure planning to meet the operational needs of the airport. Possible electrification of the Florida airports includes preparing the electric infrastructure needed to charge both aircraft and automobiles and to supply energy for buildings and navigational aids (NAVAIDs). Further consideration should be given to the electrical needs of tenants as some aeronautical and non-aeronautical businesses may have electrification plans of their own. Electrical infrastructure can take years to go from planning to implementation, so airports should work to stay ahead of demand.

Outside of charging infrastructure and the design of supporting infrastructure for aircraft hangars, electric aircraft do not necessarily need specialized facilities to operate at established airports. As stated earlier, eVTOLs and eCTOLs can use existing runways, taxiways, and parking aprons like other aircraft. Airports that expect high volumes of electric aircraft, particularly of eVTOLs, and airports with runway capacity challenges may want to consider providing dedicated landing facilities for the eVTOL fleet. This could help keep slow-moving eVTOLs out of the traffic pattern, freeing it up for more demanding business jets and airlines. This strategy could also help consolidate support

[7] National Academies of Sciences, Engineering, and Medicine. 2022. Preparing Your Airport for Electric Aircraft and Hydrogen Technologies. Washington, DC: The National Academies Press. https://doi.org/10.17226/26512

facilities, such as cargo, passenger processing, and charging, in a dedicated location instead of having these activities spread across the airport.

Siting a vertiport may affect the overall layout and infrastructure at an airport and could be more involved than siting a helicopter landing area since the FAA has only provided guidance in EB 105 and not published an AC pertaining to vertiports. Therefore, the following process is recommended in coordinating with the FAA on planning, designing, constructing, and operating a vertiport:

- Prepare a site plan in coordination with the FAA Airports District Office.
- Complete an environmental review.
- Update the Airport Layout Plan (ALP).
- Design and construct the vertiport.
- Operate the vertiport according to grant assurances and aviation regulations.

Terminals for eVTOL aircraft are another component that could be either a stand-alone facility, integrated into an existing passenger terminal, or operated as a fixed-base operator. The first full-scale, functional eVTOL terminal debuted in April 2022 in Coventry, England. The terminal, named Air One, was built by Urban-Air Port and occupies 20,000 square feet in an urban parking lot. The building features a rooftop landing deck that can be lowered to ground level for boarding and access to charging infrastructure, battery storage, and on-site command and control. The terminal has areas for check-in, waiting, concessions, security, and cargo. The landside features personal car parking, rental cars, Lyft and Uber pick up, and transit. Other concepts will develop over time, with developers like Skyports and Ferrovial bringing other options to the market.

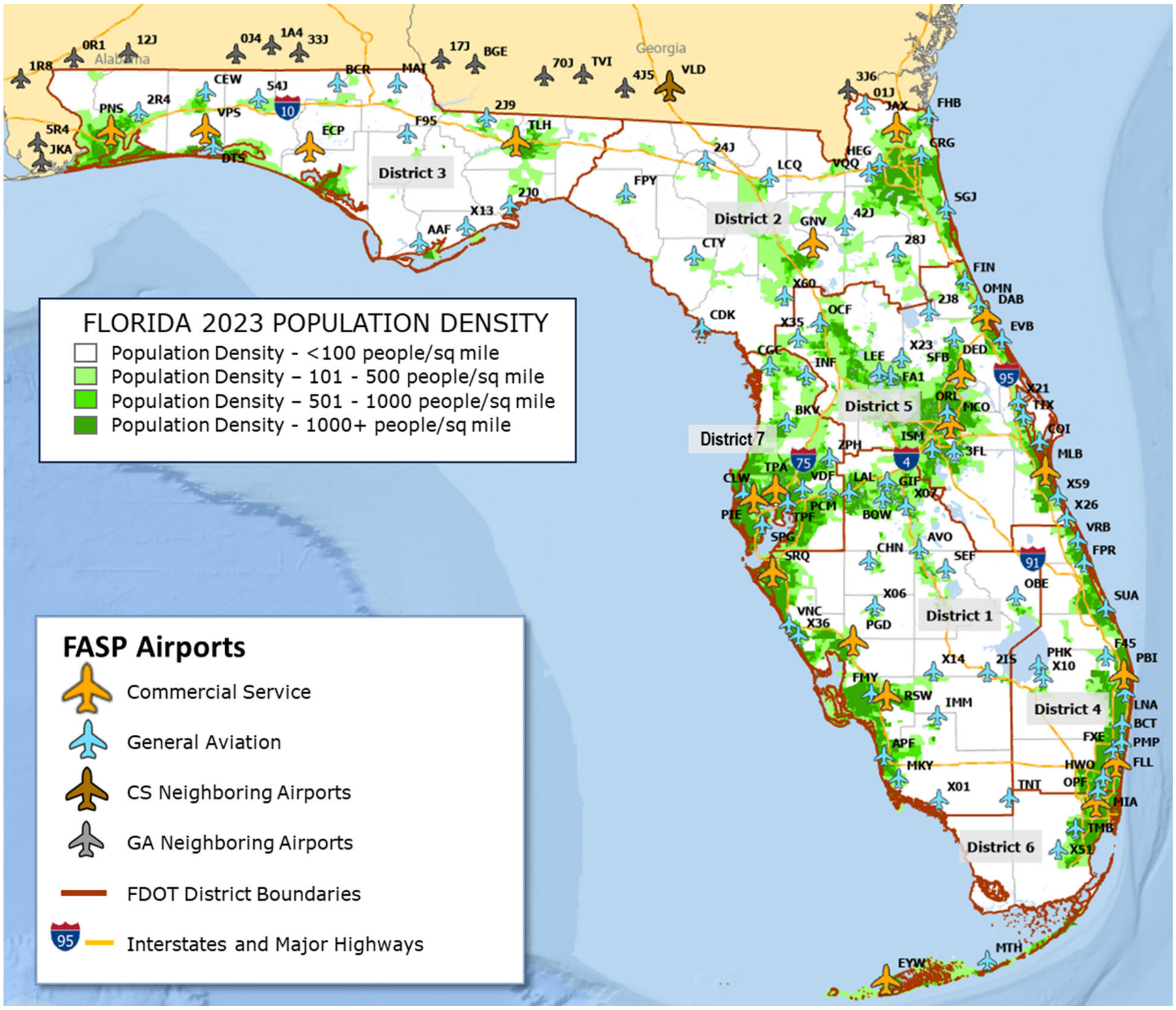
Electrification Trends at Florida Airports

The Florida Department of Transportation has seven districts which are home to 106 public use airports in Florida[8].The location of these districts and the airports are shown in **Figure 2**, along with the relative population distribution in the state.

- **District 1 (Southwest Florida):** Consists of 12 counties, and approximately 2.7 million residents.
- **District 2 (Northeast Florida):** Consists of 18 counties, and approximately 1.9 million residents.
- **District 3 (Northwest Florida):** Consists of 16 counties, and approximately 1.4 million residents.
- **District 4 (Southeast Florida):** Consists of five counties, and approximately 4.0 million residents.
- **District 5 (Central Florida):** Consists of nine counties, and approximately 4.1 million residents.
- **District 6 (South Florida):** Consists of two counties, and approximately 2.7 million residents.
- **District 7 (West Central Florida):** Consists of five counties, and approximately 2.8 million residents.

[8] Florida Department of Transportation (FDOT). 2022. Districts. Florida Department of Transportation: Tallahassee, Florida. https://www.fdot.gov/agencyresources/districts/index.shtm

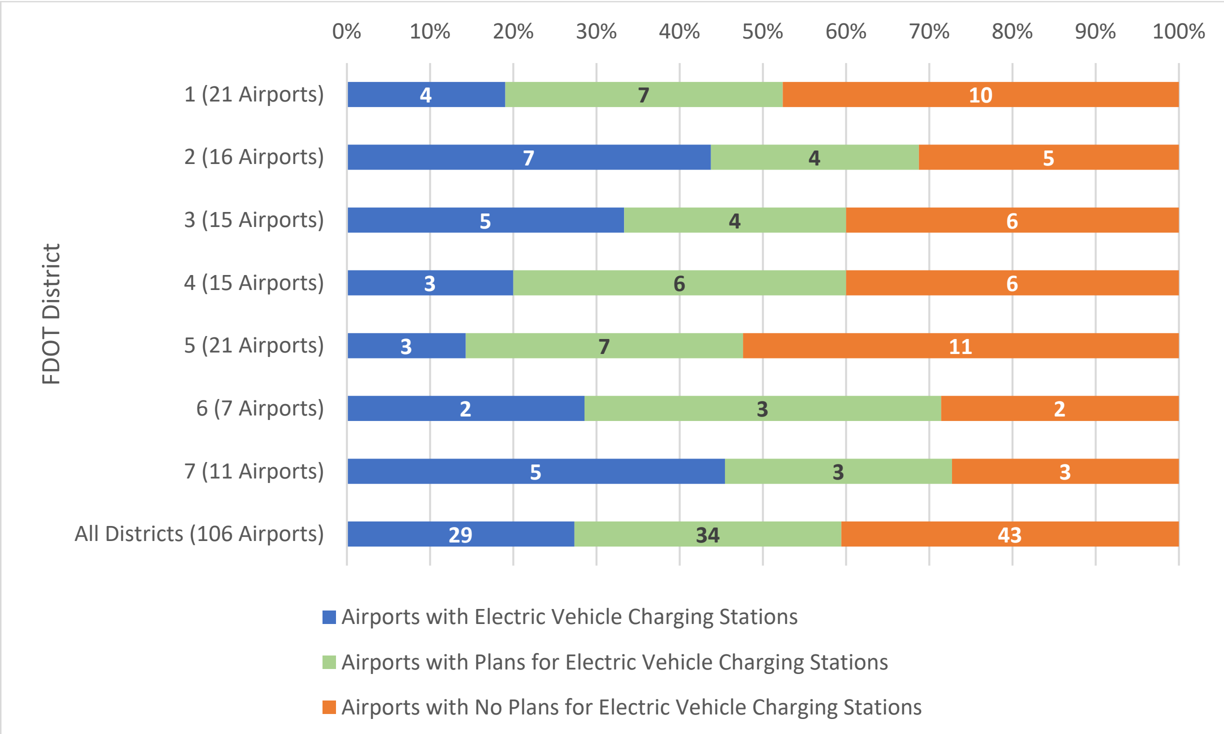
Figure 2. Florida Aviation System



Note: Areas shown in green denote significant population densities.
Source: Mead and Hunt, 2023

As part of the FASP 2043 update, an electronic survey was distributed to each of the public use airports within Florida. The survey consisted of yes or no questions asking if individual airports had existing, or future, electrification plans for automobiles (**Figure 3**) and aircraft (**Figure 4**). A free response section allowed airports to provide additional information or written comment. Only one of the 106 airports did not participate.

Figure 3. Electric Vehicle Charging Station Status at Florida Airports

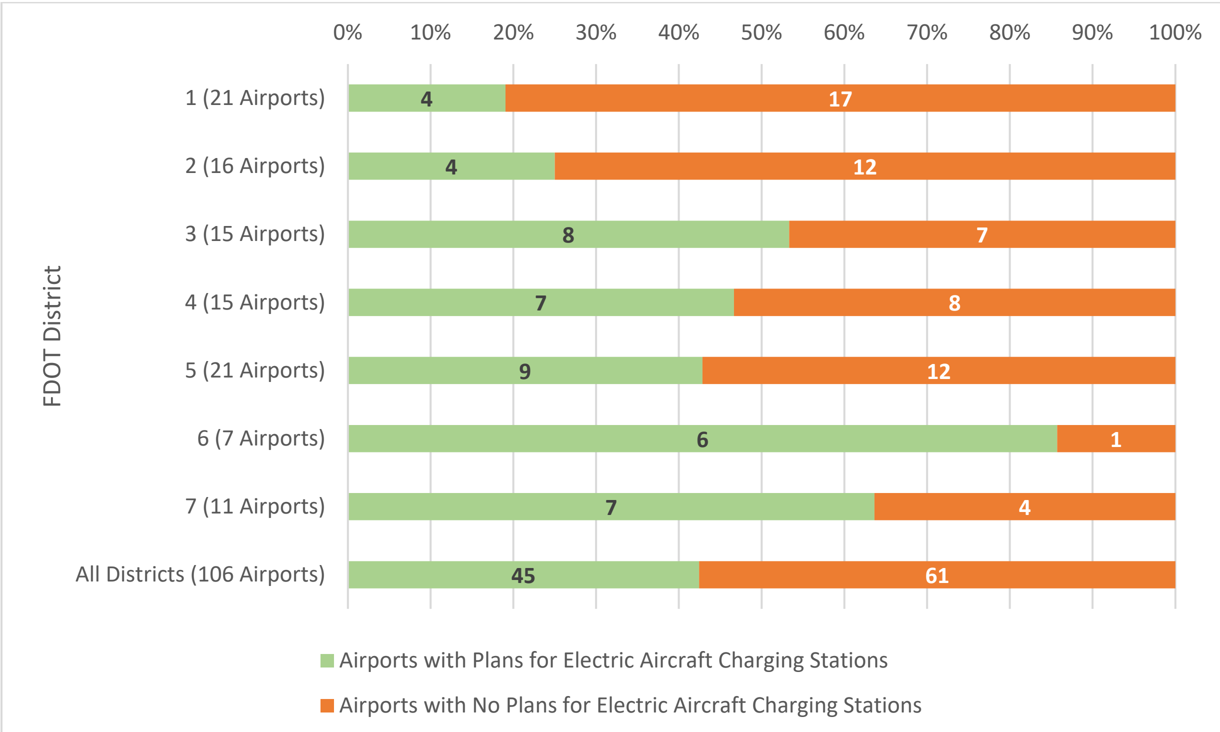


Source: Mead & Hunt, 2023

Takeaways from **Figure 3** include:

- 27 percent of airports have existing EV charging stations.
- 32 percent of airports are planning to have EV charging stations.
- 41 percent of airports do not have a plan to accommodate for EV charging stations.

Figure 4. Electric Aircraft Charging Station Status at Florida Airports

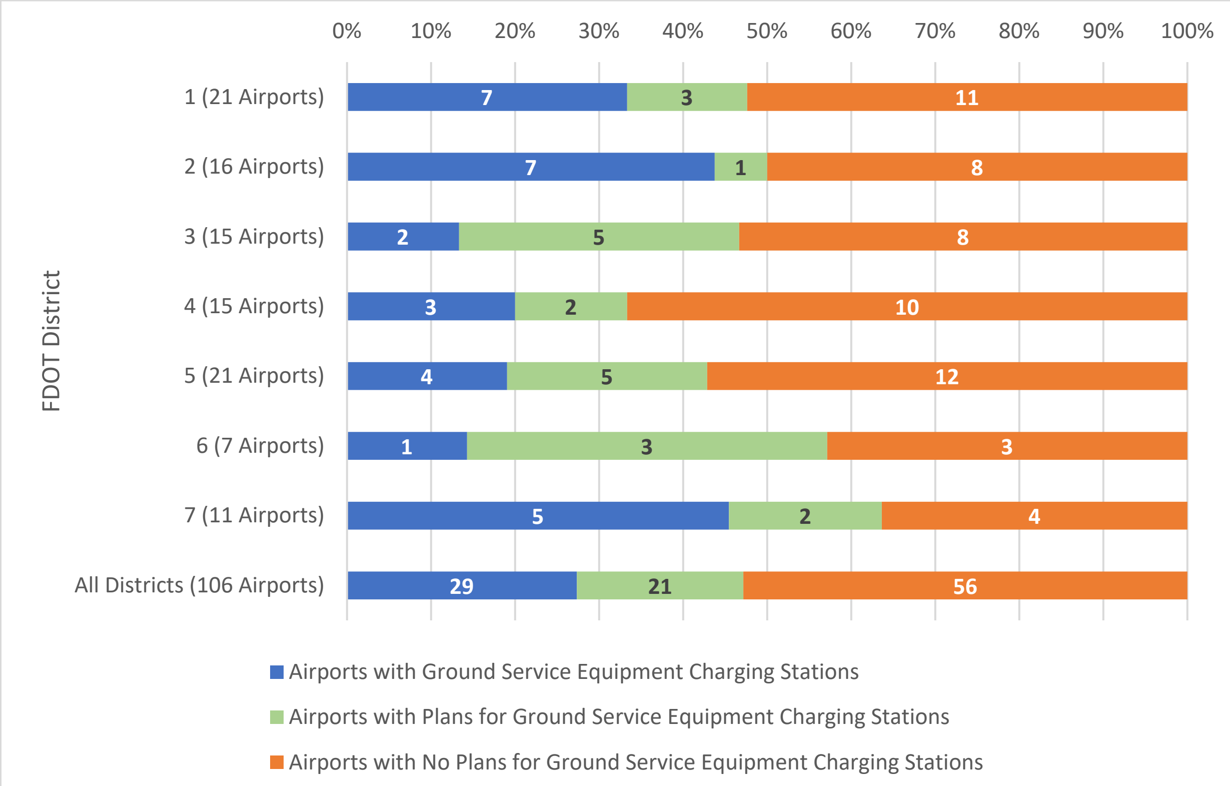


Source: Mead & Hunt, 2023

Takeaways from **Figure 4** include:

- No airports have existing electric aircraft charging stations.
- 42 percent of airports are planning to have electric aircraft charging stations.
- 58 percent of airports do not have a plan to accommodate electric aircraft charging stations.

Figure 5. Ground Service Equipment Charging Station Status at Florida Airports



Source: Mead & Hunt, 2023

Figure 5 shows the responses related to airport GSE charging stations. Takeaways from **Figure 5** include:

- 27 percent of airports have existing infrastructure for electric GSE.
- 20 percent of airports are planning to have infrastructure for electric GSE.
- 53 percent of airports do not have a plan to accommodate for electric GSE.

Figures 3, 4, and **5** indicate that electric charging stations for automobiles and GSE have established similar footholds at Florida airports, while charging stations for electric aircraft have yet to materialize. This should come as no surprise since electric aircraft development is still in its infancy compared to the more mature technology of electric vehicles and GSE. The certification requirements for electric aircraft face multiple hurdles that are expected to slow the deployment of electric aircraft for several years, at least.

These figures indicate that Florida's airports are primarily focused on serving EVs, with more than half planning to provide, or already providing, charging stations for EVs. The outlook for charging stations for GSE and electric aircraft is less rosy, with slightly more than 40 percent of Florida's airports planning to provide, or already providing (in the case of GSE), charging stations for these segments. In the case of electric aircraft, airports may be waiting for FAA certification before putting their plans into action. For GSE, other forms of propulsion, such as propane powered tugs, may be taking airport's attention away from electrification.

Sources of Funding

The electrification of airports is not limited to preparing for electric aircraft; the incentive to reduce emissions encompasses the use of vehicles for passenger transport, aircraft refueling and servicing, cargo loaders, ground service equipment (GSE), and security and emergency vehicles.

EVs have been in commercial production for decades and include hybrid internal combustion/electric motors and fully electric powertrains. Automobile electrification has been growing rapidly in the U.S. resulting from increasing consumer demand driven by government incentives and emissions reduction goals. This has encouraged automobile manufacturers to add more hybrid and fully EVs to their lineups. Market research firm IHS Markit released a report in April 2021 titled, *Pivoting to an Electrified Future: The Automotive Industry Amps Up*[9]. The report forecast up to 50 percent of U.S. passenger car sales will be electric automobiles by 2035.

Federal Funding

The FAA has committed to make aviation cleaner, quieter, and more sustainable by 2050 through a Climate Action Plan[10]. The United States Aviation Climate Action Plan was published in November 2021 and identifies electrification as a way to achieve net-zero emissions and offset carbon. Typical electric projects at commercial airports include the electrification of gates, ground support vehicles, geothermal vehicles, and solar hot water systems. Several programs provide funding to airports within the National Plan of Integrated Airport Systems (NPIAS) to incentivize them to reduce emissions. The programs authorized and funded by the FAA include the following:

Voluntary Airport Low Emissions Program (VALE): VALE was created in 2004 to encourage Airport Sponsors meet responsibilities listed in the Clean Air Act. Since then, several projects pertaining to electrification have been funded.

- **Funding Amounts:** Airport Sponsors can use Airport Improvement Program (AIP) Passenger Facility Charges (PFCs); funding varies depending on the Airport Sponsor.[11] In fiscal year 2023, the VALE program funded five projects with a total of $13.9 million. Funding levels in fiscal year 2022 were similar, with five projects funded with $14.5 million.
- **Eligible Projects:** Alternative Fuel Vehicles, Gate Electrification, Remote Ground Power, Ground Support Equipment (GSE), Geothermal Systems, Solar Thermal Technologies, and Underground Fuel Hydrant Systems.[12]

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[9] HIS Markit. 2021. "Pivoting to an Electrified Future." April 21, 2021. https://cdn.ihsmarkit.com/www/pdf/0421/675485260-0421-CU-AUT-ZEV-Whitepaper.pdf
[10] Federal Aviation Administration (FAA). n.d. "Working to Build a Net-Zero Sustainable Aviation System by 2050." https://www.faa.gov/sustainability#climate-action-plan-international-leadership
[11] Voluntary Airport Low Emissions Program Grant Summary Fiscal Year (F Y) 2005 - 2023, October 2023 (faa.gov)
[12] Voluntary Airport Low Emissions (VALE) Program (faa.gov)

Zero Emission Vehicle (ZEV) Program: This program incentivizes airports to use zero emission technologies.

- **Funding Amount(s):** Airport Sponsors can use AIP funding to purchase ZEVs; funding varies depending on the Airport Sponsor.[13] The ZEV program funded 20 programs in fiscal year 2023 with $19.5 million. This was a significant increase over fiscal year 2022, when only $13.2 million was awarded for seven projects.
- **Eligible Projects:** A 12-page Technical Guidance document was published by the FAA on March 8, 2022 to guide Airport Sponsors on eligibility and the application process.[14]
- **Eligible Airports:** All public use airports that are classified in the NPIAS are eligible for funding.

The following two projects are listed in the FAA's Climate Action Plan. However, eligible projects and funding are not disclosed on the website.

- **Energy Efficiency Program:** Typical projects include light-emitting diode lighting or other energy efficiency measures.

- **Sustainability Program:** This program has since been eligible for inclusion in Airport Master Plans addressing a broad array of environmental and energy activities (e.g., recycling, green construction and operations, energy efficiency, renewable energy, water quality, and climate resilience).

State Funding

Projects eligible for state funding vary state to state. There are several state funding opportunities that support the electrification of airports. One example is the Washington State Department of Transportation (WSDOT), which lists the following sustainable aviation projects online that support the electrification of eligible state airports[15]:

- Sustainable aviation fuel storage.
- Electrification of ground support equipment.
- Electric aircraft charging infrastructure.
- Airport clean power production.
- Electric vehicle (EV) charging stations or fuel cell electric vehicle (FCEV) stations (hydrogen) whose infrastructure may also support ground support equipment and/or electric aircraft charging.

In addition, WSDOT provides application guidance, evaluation criteria, and defines eligible applicants. Not all states provide electrification funding opportunities.

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[13] Zero Emission Vehicle and Infrastructure Pilot Program Grant Summary Fiscal Year (FY) 2015 - 2023 (faa.gov)
[14] Zero Emission Vehicle Pilot Program Technical Guidance, version 2, 2022 (faa.gov)
[15] Aviation grants | WSDOT (wa.gov)

Next Steps and Challenges

Several infrastructure companies and original equipment manufacturers (OEMs) are working to obtain the first Airworthiness Certification from the FAA to support the global initiative of electrification. The certification process includes[16]:

- A review of any proposed designs and the methods that will be used to show that these designs and the overall airplane comply with FAA regulations.
- Ground tests and flight tests to demonstrate that the airplane operates safely.
- An evaluation of the airplane's required maintenance and operational suitability for introduction of the airplane into service.
- Collaboration with other civil aviation authorities on their approval of the aircraft for import.

While most electric aircraft are considered experimental, many designers are aiming for certification as early as 2024 and an entry into the national airspace system soon thereafter. Financial firm Morgan Stanley released a market assessment in 2019 titled *Are Flying Cars Preparing for Takeoff?*[17] predicting that the electric aircraft market could exceed 15 trillion dollars by 2040. As of November 2023, the Advanced Air Mobility Reality Index (ARI), published quarterly, shows the top 25 primary companies designing and flight-testing electric aircraft and dozens of smaller players and suppliers. There are over 800 entrants in the AAM industry that are not listed within the ARI.[18] ARI is published to reflect the OEMs predicted to be first to market based on level of funding, established corporate leadership, technology readiness, and ability to reach full-scale manufacturing in a short timeframe. **Table 1** reflects the top ten leading OEMs as of November 2023.

[16] FAA. 2023. Airworthiness Certification. January 6, 2023. Washington, D.C., https://www.faa.gov/aircraft/air_cert/airworthiness_certification
[17] Morgan Stanley. 2019. Ideas: "Are Flying Cars Preparing for Takeoff?" January 23, 2019. https://www.morganstanley.com/ideas/autonomous-aircraft
[18] SMG Consulting, LLC. 2023. "Advanced Air Mobility Reality Index." https://aamrealityindex.com/aam-reality-index

Table 1. Top 10 Leading OEMs According to the ARI

OEM (stock ticker)	Funding ($M)	Use Case	Vehicle Type	Propulsion	Operation	Vehicle(s)	First Flight	EIS[1]	Country
Joby Aviation (NYSE: JOBY)	$2,251.30	Air Taxi	Vectored Thrust	Electric	Piloted	N/A	2018	2025	USA
Beta Technologies	$796.0*	Cargo, Regional, Air Taxi	Conventional/ Lift + Cruise	Electric	Piloted	CX300/Alia-250	2020/2022	2025	USA
Volocopter	$761.0*	Air Taxi	Multicopter/ Lift + Cruise	Electric	Piloted	VoloCity/ VoloRegion	2021/2022	2024/ 2026	Germany
Archer (NYSE: ACHR)	$1,096.30	Air Taxi	Vectored Thrust	Electric	Piloted	Midnight	2023	2025	USA
Ehang (NASDAQ: EH)	$160.40	Tourism, EMS, Firefighting	Multicopter/ Lift + Cruise	Electric	Autonomous	EH216-S/ VT-30	2018/2021	2023	China
Wisk (Boeing)	Corporate backed	Air Taxi	Vectored Thrust	Electric	Autonomous	Generation 6	N/A	N/A	USA
Elroy Air	$50.00	Cargo	Lift + Cruise	Hybrid	Autonomous	Chaparral C1	2023	2024	USA
AutoFlight	$200.00	Air Taxi	Lift + Cruise	Electric	Piloted	Prosperity I	2022	2026	China
Eve Holding (NYSE: EVEX)	$377.40	Air Taxi	Lift + Cruise	Electric	Piloted	Eve	2024	2026	Brazil
Pipistrel (Textron)	Corporate backed	Cargo	Lift + Cruise	Hybrid	Autonomous	Nuuva V300	2024	2025	USA

Notes:

1. Estimated Entry into Service (EIS)
2. Information not available (N/A)

Source: SMG Consulting, LLC, "Advanced Air Mobility Reality Index," Accessed November 1, 2023.

The FAA and the European Union Aviation Safety Agency (EASA) are tasked with certifying electric aircraft in the U.S. and European Union, respectively. While many manufacturers have entered flight-testing, they are still adjusting their aircraft for certification. These manufacturers, working with the FAA and EASA as well as the aviation regulatory authorities of other countries, are charting a path to certification. Some of the more ambitious companies are predicting an entry-into-service (EIS) date of 2024 (e.g., Volocopter and Elroy Air), while others are expecting to enter service as late as 2026 (i.e., Eve Holding and AutoFlight). Historically, OEMs have published optimistic estimated EIS dates. For example, in 1998 Bell and Boeing partnered to design the AugustaWestland (AW609), a civil tiltrotor aircraft. In 2002, the certification of the AW609 was projected for 2007[19]. Despite its first flight[20] in 2003, as of November 2023, the AW609 is still

[19] FlightGlobal. 2002. "Bell Aiming for BA609 Certification in 2007," *Flight International via FlightGlobal*, October 7, 2002.

[20] Bogaisky, J. 2020. "After 24 Years, the Civilian Version of the Marines' V-22 Osprey Tiltrotor is Finally Nearing Takeoff," *Forbes*, March 9, 2020.

not certified[21]. This is in large part due to the new nature of the aircraft and the FAA having to develop aircraft certification standards to address its unique tiltrotor capabilities. These same aircraft certification standards are expected to apply to similar types of eVTOL aircraft, so certification of these eVTOL aircraft is dependent on when the FAA finalizes these aircraft certification standards, or any changes the FAA decides to implement to the standards.

This illustrates why the certification of electric aircraft is more than likely to take longer than OEMs anticipate. A key challenge for certification is that they require a ground up design, and the FAA is still developing certification standards for electric aircraft. This is the case for both electric propulsion systems, and some of the eVTOL aircraft designs that fall under what the FAA classifies as powered lift. The AW609 example cited previously is planning to obtain certification under the forthcoming FAA powered lift rules.

As an example of these challenges, Joby has collaborated with the FAA to establish a five-stage process for certifying its aircraft. Joby has managed to work its way to the third stage, but the FAA has yet to settle on finalized rules for certification of powered lift aircraft.

How FDOT AO May Prepare for Electrification at Airports

Electrification is one of the many solutions the FDOT AO can implement to prepare Florida airports for work towards the FAA's Sustainability 2050 initiative, but there are other sustainable fuels like hydrogen and SAF. The full extent of market forces and engineering challenges are still unknown and are being discovered as technology emerges. FDOT AO may encourage plans for electric aircraft and vehicle electrification through the following recommendations:

- **Encourage and Help Airports Plan for Electrification Infrastructure** – The FDOT AO could both encourage and help airports plan for the installation of charging infrastructure for electric aircraft and vehicles. This includes helping airports decide how to determine the number and layout of charging stations placed at airports for electric aircraft and airport operations/maintenance vehicles, as well as rental car parking facilities and passenger vehicle parking lots. The FDOT AO could also assist airports in how to initiate a comprehensive energy use study to determine future power demands including evaluation of the capacity needed from transmission line infrastructure. Finally, the FDOT AO could encourage and assist airports in developing emergency contingency plans in the event a temporary loss of power is experienced from public utilities.
- **Involvement with Development of eVTOL Airways and Vertiport Siting** – With the possible growth of eVTOL use, the FDOT AO could play an important role in working with the FAA to develop dedicated flight corridors for these vehicles between vertiports so that operations do not interfere with other aeronautical activity within Florida's aviation system. This could help establish flight paths and dedicated corridors that could safely accommodate growing use without interfering with other fixed-

[21] Johnson, O. 2023. "FAA pilots fly Leonardo AW609 for first time as certification enters 'final stage'." *AvFoil News*, March 7, 2023.

and rotary-wing aircraft operations while also considering compatible and non-compatible land uses under these flight paths.

- **Encourage Airports to Electrify Vehicle Fleets** – Airports with large operations, maintenance, and emergency service vehicle fleets, such as at air carrier service airports, could be encouraged to purchase electrified models of vehicles and be encouraged to install associated charging infrastructure, where feasible. This includes encouraging the use of electrified transit vehicles to shuttle passengers between terminal buildings, parking lots, and rental car facilities. Creating financial incentives for electric vehicle purchases to assist airports with the cost of these purchases could encourage their use.
- **Support Initiatives to Improve Power Transmission to Airports** – The FDOT AO could assist airports in improving power supplies through public utility transmission by facilitating conversation with suppliers about the energy demands anticipated from electric aircraft and vehicle operations. This could include initiating a system-wide study to evaluate the potential power demands of airports across the state. Carrying out coordination with airports directly could also help to evaluate existing and anticipated power demands as a part of determining the overall electrical demand of the system's airports.
- **Continual Evaluation of Airport System in Meeting Electrical Demands** – As part of a system-wide study, an effort to develop performance metrics measuring how well electrification demands are being met at Florida's airports could be implemented. Similar to performance measures that are developed for other system goals, these metrics could be used to focus resources in areas where improvements are needed to meet demand. These performance measures could be included as part of the overall evaluation of the system of airports in the next update of the Florida Aviation System Plan.

Conclusion

The electrification of airports may have short- and long-term impacts on the economy, environment, and community. Florida airports may need to engage government agencies, the business community, educational partners, utility providers, nonprofit organizations, and residents to develop a plan that benefits all stakeholders.

Planning for electrification should follow a process similar to other types of facility planning. Airports should inventory what exists, determine future demand, prepare a gap analysis, develop improvements to address deficiencies, and prepare a capital plan that considers the expenditures and potential revenues. Electric aircraft and vehicles are already operating and may grow in popularity in the coming decades. Due to the extended lead time needed to update electrical grids, airports and their neighbors should incorporate electrical studies into their planning documents and engage with their stakeholders and utility providers during the planning and implementation processes. The FDOT AO could assist by encouraging system airports to install electrification infrastructure and help initiate planning exercises to determine the level of demand. The FDOT AO could also help identify the power demands of airports in working with public utilities to understand the improvements in transmission infrastructure that may be needed. Finally, continually evaluating trends and how airports are accommodating the electrification demands will support efforts to focus resources to improve areas of deficiency, which allows Florida's airports to be well positioned to accommodate this growing emerging trend and align with the FAA's Aviation Climate Action Plan.

Additional Resources

A list of international, federal, state, and other resources are listed below for consideration:

International:

- **European Union Aviation Safety Agency Urban Air Mobility Resource Library[22]:** A study conducted by EASA to provide a better understanding of society's acceptance of Urban Air Mobility (UAM) operations throughout the European Union.
- **EASA – *Prototype Technical Specifications for Vertiports*[23]:** The report contains suggestions and ideas regarding the design of vertiports in Europe. Factors considered include obstacles, vertical landing operations, noise abatement, and environmental impacts.

Federal:

- **ASTM F2490-20[24]:** A standard guide that analyzes the electric load and power source capacities of aircraft that meet FAA requirements. The guide does not address safety concerns associated with the use of electric propulsive power or electrical loads.
- ***Advanced Air Mobility Implementation Plan*[25]:** The FAA published a working paper to document the work required to enable the initial AAM operations in a variety of operational settings.
- ***Urban Air Mobility (UAM), Concept of Operations, Version 2.0*[26]:** The FAA published a working paper to provide a technical roadmap to enable UAM operations with a focus on urban areas.

State:

- ***FDOT Advanced Air Mobility*** (https://www.fdot.gov/aviation/advanced-air-mobility). FDOT maintains a web page that explains many aspects of advanced air mobility (AAM). It also has links to other useful AAM pages, and several documents published by FDOT, including *FDOT*

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22 European Union Aviation Safety Agency. 2023. "Urban Air Mobility." https://www.easa.europa.eu/en/light/topics/urban-air-mobility
23 European Union Aviation Safety Agency. 2022. "Prototype Technical Design Specifications for Vertiports." https://www.easa.europa.eu/en/document-library/general-publications/prototype-technical-design-specifications-vertiports
24 ASTM International. 2020. ASTM F2490-20: Standard Guide for Aircraft Electrical Load and Power Source Capacity Analysis. West Conshohocken, PA, Jul 27, 2020. https://www.astm.org/f2490-20.html
25 FAA. 2023. *Advanced Air Mobility (AAM) Implementation Plan, Version 1.0*. July 2023. Washington, D.C. https://www.faa.gov/sites/faa.gov/files/AAM-I28-Implementation-Plan.pdf
26 FAA. 2023. *Urban Air Mobility (UAM) Concept of Operations Version 2.0*. April 26, 2023. Washington, D.C. https://www.faa.gov/sites/faa.gov/files/Urban%20Air%20Mobility%20%28UAM%29%20Concept%20of%20Operations%202.0_0.pdf

Advanced Air Mobility Working Group (August 2023), and *FDOT AAM Implementation and Public Outreach Plan* (September 2023).

- ***Electric Aircraft Working Group Report* (WSDOT)[27]:** The report explores how electric aircraft technology could be used to expand regional air mobility (RAM) markets in Washington State.
- ***Advanced Air Mobility Roadmap*[28]:** The FDOT published a paper in June 2022 to better define AAM and the relationship between AAM and the state of Florida.
- **City of Los Angeles's *Advanced Air Mobility Vertiport Considerations: A List and Overview*[29]:** The document addresses 450 considerations for various groupings pertaining to the AAM ecosystem and its stakeholders.
- ***Advanced Air Mobility, Ohio AAM Framework*[30]:** Ohio DOT provided a strategic framework to provide readers a better understanding of the AAM industry. The document summarizes the infrastructure, policies, and technologies in place as of July 2022.
- ***Report and Recommendations of the Urban Air Mobility Advisory Committee*[31]:** The document assesses current (September 2022) state law regarding UAM and provides suggestions for potential changes, as well as providing guidance on the development of UAM operations and infrastructure for the State of Texas.
- ***Advanced Air Mobility & Unmanned Aircraft Systems Legislative Report*[32]:** The report summarizes the working group's findings regarding the implementation and growth of drone package delivery, aerial taxis and electric aircraft use in Utah.

Other:

- **ACRP Report 236 – *Preparing Your Airport for Electric Aircraft and Hydrogen Technologies*[33]:** Explores the potential growth market of AAM and provides guidance to help estimate the future impacts of electric aircraft to airports.

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[27] Washington Department of Transportation. 2019. https://wsdot.wa.gov/sites/default/files/2021-11/ElectricAircraftWorkingGroupReport-June2019.pdf

[28] Florida Department of Transportation. 2022. "Advanced Air Mobility Roadmap." Tallahassee, Florida. https://fdotwww.blob.core.windows.net/sitefinity/docs/default-source/aviation/fdot-aam-roadmap-report---june-28-2022-final.pdf

[29] Mendonca, N. , Murphy, J., Patterson, M., Alexander, R., Juarez, G., and Harper, C. Advanced Air Mobility Vertiport Considerations : A List and Overview. City of Los Angeles https://ntrs.nasa.gov/api/citations/20220007100/downloads/Vertiport%20Considerations%20Paper%20Final%20v2.pdf

[30] Ohio Department of Transportation. 2022. *Advanced Air Mobility: Ohio AAM Framework*. https://uas.ohio.gov/wps/wcm/connect/gov/ad6a839a-13fa-4266-b0ee-e9590d82d3e2/Aug2022_AAM+Planning+Framework_Sm.pdf?MOD=AJPERES

[31] Texas Department of Transportation. 2022. *Report and Recommendations of the Urban Air Mobility Advisory Committee*. https://ftp.txdot.gov/pub/txdot/avn/uam-report.pdf

[32] Utah Department of Transportation. 2023. https://www.udot.utah.gov/connect/employee-resources/uas/

[33] National Academies of Sciences, Engineering, and Medicine. 2022. *Preparing Your Airport for Electric Aircraft and Hydrogen Technologies*. Washington, DC: The National Academies Press. https://doi.org/10.17226/26512

- **ACRP Project 11-02/43 – *Successful Community Inclusion of Advanced Air Mobility*[34]:** Assesses potential impacts of urban air mobility at airports, which includes a primer for the coordination of community, airport, and applicable agencies relative to AAM activity. This report also recommends steps to successfully integrate AAM activity in their communities.
- **ACRP Research Report 243 – Urban Air Mobility: An Airport Perspective[35]:** The document provides a comprehensive examination of the emerging UAM industry, with a particular focus on its impacts and opportunities for airports.

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[34] Transportation Research Board Airport Cooperative Research Program. 2023. ACRP 11-02/Task 43: *Successful Community Inclusion of Advanced Air Mobility.* Washington, D.C. https://apps.trb.org/cmsfeed/TRBNetProjectDisplay.asp?ProjectID=5213

[35] National Academies of Sciences, Engineering, and Medicine. 2023. *Urban Air Mobility: An Airport Perspective*. Washington, DC: The National Academies Press. https://doi.org/10.17226/26899

H

Hangar Demand Initiative

Appendix H

Hangar Demand Initiative

There is a significant demand at airports throughout the State of Florida for new hangars to be constructed to provide additional aircraft storage capabilities. The hangars at nearly every publicly owned (and public use) airport in the state are at full capacity and most airports maintain long waiting lists of aircraft owners seeking hangar storage. Most aircraft owners prefer to store their aircraft in a hangar to protect the plane from harsh weather conditions and to prevent vandalism, particularly as the cost for new General Aviation (GA) planes, parts, and maintenance has skyrocketed over the decades. According to a *Forbes* article dated April 28, 2021, titled “The High Cost of New General Aviation Aircraft May Be Pricing Pilots Out of the Market,” the price of a new Cessna 172 was $12,500 in 1970 and was $432,000 in 2021. With such extreme price increases for new GA aircraft, which are significantly above the typical rate of inflation, most aircraft owners today have a greater desire to protect their aircraft/investment in an enclosed hangar as opposed to leaving it exposed on an apron tiedown. It may also mean that if most aircraft owners today can afford to fly, they likely have the disposable income available to afford hangar storage, which appears to be the trend at airports throughout Florida.

This Inventory of Hangar Demand for the Hangar Demand Initiative was conducted in conjunction with the Florida Aviation System Plan (FASP) 2043. The purpose of this effort is to provide the Florida Department of Transportation Aviation Office (FDOT AO) with an inventory of the number of T-hangars and box hangars currently present at the 106 publicly owned facilities in Florida included in the FASP 2043 including 103 airports, two seaplane bases, and one heliport. It also identifies how many T-hangars and box hangars are currently occupied at each facility, the number of existing based aircraft, and the number of aircraft owners seeking hangar storage at each facility. The intent is to present an understanding of the current hangar deficiencies in the state and to project a generalized 20-year outlook on the number of new T-hangars and box hangars that would need to be constructed to meet long-term demands.

This effort illustrates that most facilities throughout the Florida aviation system have fully occupied hangars and the number of existing based aircraft at most airports far exceeds the capacity of existing hangars. Therefore, without considering funding constraints, there is an immediate need to construct additional hangars at facilities throughout the Florida aviation system to support both existing based aircraft demands, known waiting list demands, and the expected growth in based aircraft throughout the state over the course of the 20-year planning period of the FASP 2043.

The following sections are included in this document:

- Data Collection Methodology.
- Existing Hangar Demand by FDOT District and Airport.
- Projected 20-Year Hangar Demand by FDOT District and Conclusions.

Data Collection Methodology

A detailed survey effort was conducted for the FASP 2043 and was distributed to the 106 publicly owned facilities in Florida that are included in the Florida aviation system. The survey included several questions about recent studies that airports have conducted, Federal Aviation Administration (FAA) airfield design standards, present number of T-hangar and box hangar units available and occupied, and various other airport features. The specific questions that pertain to the Inventory of Hangar Demand are shown below:

- What is the current number of T-hangar units at your airport (both number available and number occupied)?
- What is the current number of box hangar units at your airport (both number available and number occupied)?
- What is the current number of operators on the hangar waitlist?

It was the intent of the survey to document the number of T-hangar and box hangar units available and occupied at each facility and then to determine if they had a waiting list for hangar storage space. It is noted that only airports responded to this question because neither seaplane base nor the heliport currently provide aircraft hangar storage. While survey responses were received from all 106 facilities, some surveys were not completed in full, and for that reason, the information presented in this document only represents a portion of the overall hangar demand in the state. For example, some airports indicated that their fixed base operator (FBO) manages their hangars and then did not provide a response to this question, and other airports simply left it blank. While some attempts were made to reach out to individual airports for clarification to this question, it was not possible to obtain full participation to ensure that the data provided in this document accurately reflects the entirety of the hangar availability in Florida. However, the results speak for themselves across the board that there is a significant deficiency in hangar storage availability at airports throughout the state, and the hangar deficiency condition will continue well into the future unless hangar development is rapidly accelerated.

Existing Hangar Demand by FDOT District and Airport

Table 1 presents the number of available and occupied T-hangar units by FDOT district. Again, this only represents data from those airports that responded to this question and does not represent every facility in the FASP 2043. As shown, the T-hangars in nearly every district are at full capacity, and 5,951 of the sampled 5,992 T-hangar units are occupied statewide. It is interesting to note that some airports that indicated that they have available T-hangar units also have very substantial waiting lists for based aircraft hangar storage.

Table 1. Available and Occupied T-Hangar Units by FDOT District

FDOT District	District Name	Number of Airports	2023 Based Aircraft	T-Hangars Available	T-Hangars Occupied	% Occupied
1	Southwest	21	2,537	1,657	1,637	98.79%
2	Northeast	16	1,121	581	578	99.48%
3	Northwest	15	969	557	557	100.00%
4	Southeast	15	2,841	979	979	100.00%
5	Central	21	2,676	1,231	1,221	99.19%
6	South	7	783	170	170	100.00%
7	West Central	11	1,404	817	809	99.02%
Total		**106**	**12,332**	**5,992**	**5,951**	**99.32%**

Notes: FDOT-Florida Department of Transportation.
Source: AVCON, INC.

Table 2 presents the number of available and occupied box hangar units by FDOT district. Again, this only represents data from those airports that responded to this question and does not represent every facility in the FASP 2043. As shown, the box hangars in nearly every district are at full capacity, and 1,102 of the sampled 1,106 box hangar units are occupied statewide.

Table 2. Available and Occupied Box Hangar Units by FDOT District

FDOT District	District Name	Number of Airports	2023 Based Aircraft	Box Hangars Available	Box Hangars Occupied	% Occupied
1	Southwest	21	2,537	252	252	100.00%
2	Northeast	16	1,121	80	80	100.00%
3	Northwest	15	969	164	162	98.78%
4	Southeast	15	2,841	169	169	100.00%
5	Central	21	2,676	328	327	99.70%
6	South	7	783	34	34	100.00%
7	West Central	11	1,404	79	78	98.73%
Total		**106**	**12,332**	**1,106**	**1,102**	**99.64%**

Notes: FDOT-Florida Department of Transportation.
Source: AVCON, INC.

Table 3 presents a summary of the number of available and occupied T-hangar units and box hangar units for all 106 airports in the FASP. It also shows whether each facility has a waiting list for based aircraft hangar storage. Where information in the table is left blank, it indicates that the airport did not provide a response as part of the survey effort. The based aircraft hangar waiting list information is provided to show the demand for each airport and should not be construed as that many aircraft owners who collectively want hangar storage at each airport. Although the waiting list information was not viewed for each airport to conduct the Inventory of Hangar Demand, it is assumed that multiple aircraft owners have their names on waiting lists at multiple different airports.

Table 3. Available and Occupied T-Hangar and Box Hangar Units by Airport

Airport ID	Airport Name	Based Aircraft[1]	T-Hangar Units			Box Hangar Units			Wait List
			Available	Occupied	% Occupied	Available	Occupied	% Occupied	
	FDOT District 1 - Southwest								
2IS	AIRGLADES	35	30	30	100.00%	3	3	100.00%	30
APF	NAPLES MUNICIPAL	348	212	212	100.00%	100	100	100.00%	172
AVO	AVON PARK EXECUTIVE	36	58	51	87.93%	0	0	N/A	51
BOW	BARTOW EXECUTIVE	170	120	120	100.00%	10	10	100.00%	
CHN	WAUCHULA MUNICIPAL	24	36	23	63.89%	1	1	100.00%	70
FMY	PAGE FIELD	252	132	132	100.00%	4	4	100.00%	191
GIF	WINTER HAVEN REGIONAL	145	135	135	100.00%	29	29	100.00%	72
IMM	IMMOKALEE REGIONAL	43	30	30	100.00%	3	3	100.00%	34
LAL	LAKELAND LINDER INTERNATIONAL	298	75	75	100.00%	35	35	100.00%	26
MKY	MARCO ISLAND EXECUTIVE	24	12	12	100.00%	11	11	100.00%	54
OBE	OKEECHOBEE COUNTY	22	10	10	100.00%	6	6	100.00%	12
PGD	PUNTA GORDA	396	288	288	100.00%	19	19	100.00%	320
RSW	SOUTHWEST FLORIDA INTERNATIONAL	5							
SEF	SEBRING REGIONAL	97	80	80	100.00%	8	8	100.00%	15
SRQ	SARASOTA BRADENTON INTERNATIONAL	333	158	158	100.00%	0	0	0.00%	50
VNC	VENICE MUNICIPAL	187	192	192	100.00%	9	9	100.00%	374
X01	EVERGLADES AIRPARK	3	8	8	100.00%	0	0	N/A	6
X06	ARCADIA MUNICIPAL	26	23	23	100.00%	0	0	N/A	33
X07	LAKE WALES MUNICIPAL	28	16	16	100.00%	8	8	100.00%	39
X14	LA BELLE MUNICIPAL	57	42	42	100.00%	6	6	100.00%	82
X36	BUCHAN	8							
	FDOT District 1 Totals	**2,537**	**1,657**	**1,637**	**98.79%**	**252**	**252**	**100.00%**	
	FDOT District 2 – Northeast								
01J	HILLIARD AIRPARK	23	0	0	N/A	23	23	100.00%	15
24J	SUWANNEE COUNTY	41	32	32	100.00%	0	0	N/A	41
28J	PALATKA MUNICIPAL - LT KAY LARKIN	72	73	73	100.00%	5	5	100.00%	90
42J	KEYSTONE HEIGHTS	50	44	44	100.00%	6	6	100.00%	28
CDK	GEORGE T. LEWIS	1							
CRG	JACKSONVILLE EXECUTIVE AT CRAIG	185							
CTY	CROSS CITY	13	8	8	100.00%	3	3	100.00%	
FHB	FERNANDINA BEACH MUNICIPAL	69	51	51	100.00%	7	7	100.00%	82
FPY	PERRY-FOLEY	12	8	8	100.00%	1	1	100.00%	10
GNV	GAINESVILLE REGIONAL	173	98	95	96.94%	11	11	100.00%	0
HEG	HERLONG RECREATIONAL	90	114	114	100.00%	0	0	N/A	50
JAX	JACKSONVILLE INTERNATIONAL	58							
LCQ	LAKE CITY GATEWAY	28	21	21	100.00%	4	4	100.00%	22
SGJ	NORTHEAST FLORIDA REGIONAL	205	132	132	100.00%	20	20	100.00%	314
VQQ	CECIL	15							
X60	WILLISTON MUNICIPAL	86							
	FDOT District 2 Totals	**1,121**	**581**	**578**	**99.48%**	**80**	**80**	**100.00%**	
	FDOT District 3 – Northwest								
2J0	WAKULLA COUNTY	3	10	10	100.00%	0	0	N/A	12
2J9	QUINCY MUNICIPAL	95	76	76	100.00%	14	14	100.00%	41
2R4	PETER PRINCE FIELD	134	135	135	100.00%	3	3	100.00%	169
54J	DEFUNIAK SPRINGS	35	36	36	100.00%	7	7	100.00%	40
AAF	APALACHICOLA REGIONAL	44	33	33	100.00%	6	6	100.00%	10
BCR	TRI-COUNTY	41	0	0	N/A	43	43	100.00%	10
CEW	BOB SIKES	23	0	0	N/A	5	3	60.00%	0
DTS	DESTIN EXECUTIVE	74	17	17	100.00%	33	33	100.00%	
ECP	NORTHWEST FLORIDA BEACHES INTL	111	60	60	100.00%	15	15	100.00%	210
F95	CALHOUN COUNTY	26	36	36	100.00%	5	5	100.00%	25
MAI	MARIANNA MUNICIPAL	37	43	43	100.00%	2	2	100.00%	8
PNS	PENSACOLA INTERNATIONAL	152	43	43	100.00%	5	5	100.00%	158
TLH	TALLAHASSEE INTERNATIONAL	178	68	68	100.00%	15	15	100.00%	4
VPS	DESTIN-FORT WALTON BEACH	2							
X13	CARRABELLE-THOMPSON	14	0	0	N/A	11	11	100.00%	
	FDOT District 3 Totals	**969**	**557**	**557**	**100.00%**	**164**	**162**	**98.78%**	
	FDOT District 4 – Southeast								
BCT	BOCA RATON	183	117	117	100.00%	14	14	100.00%	
DT1	DOWNTOWN FORT LAUDERDALE HELIPORT	0	0	0	N/A	0	0	N/A	0
F45	NORTH PALM BEACH COUNTY GA	192	190	190	100.00%	11	11	100.00%	150
FLL	FORT LAUDERDALE - HOLLYWOOD INTL	91	0	0	N/A	29	29	100.00%	
FPR	TREASURE COAST INTERNATIONAL	150							
FXE	FORT LAUDERDALE EXECUTIVE	571	291	291	100.00%	0	0	N/A	
HWO	NORTH PERRY	430	154	154	100.00%	5	5	100.00%	
LNA	PALM BEACH COUNTY PARK	245	0	0	N/A	53	53	100.00%	31
PBI	PALM BEACH INTERNATIONAL	196	0	0	N/A	29	29	100.00%	20
PHK	PALM BEACH COUNTY GLADES	10	10	10	100.00%	0	0	N/A	10
PMP	POMPANO BEACH AIRPARK	138	141	141	100.00%	15	15	100.00%	
SUA	WITHAM FIELD	351							
VRB	VERO BEACH REGIONAL	202	36	36	100.00%	13	13	100.00%	137
X10	BELLE GLADE	5							
X26	SEBASTIAN MUNICIPAL	77	40	40	100.00%				30
	FDOT District 4 Totals	**2,841**	**979**	**979**	**100.00%**	**169**	**169**	**100.00%**	
	FDOT District 5 – Central								
2J8	PIERSON MUNICIPAL	21	1	1	100.00%	3	3	100.00%	
3FL	ST CLOUD SEAPLANE BASE	0	0	0	N/A	0	0	N/A	0
COI	MERRITT ISLAND	153	151	151	100.00%	14	14	100.00%	79
DAB	DAYTONA BEACH INTERNATIONAL	249	24	24	100.00%	8	8	100.00%	
DED	DELAND MUNICIPAL - SIDNEY H. TAYLOR	137	101	101	100.00%	45	45	100.00%	77
EVB	NEW SMYRNA BEACH MUNICIPAL	104	72	72	100.00%	2	2	100.00%	120
FA1	TAVARES SEAPLANE BASE	5	0	0	N/A	0	0	N/A	0
FIN	FLAGLER EXECUTIVE	89	56	56	100.00%	13	13	100.00%	135
ISM	KISSIMMEE GATEWAY	269	76	76	100.00%	10	10	100.00%	56
LEE	LEESBURG INTERNATIONAL	127	33	33	100.00%	10	10	100.00%	65
MCO	ORLANDO INTERNATIONAL	37	0	0	N/A	13	13	100.00%	0
MLB	MELBOURNE ORLANDO INTERNATIONAL	264	40	30	75.00%	2	2	100.00%	

Table 3. Available and Occupied T-Hangar and Box Hangar Units by Airport

Airport ID	Airport Name	Based Aircraft[1]	T-Hangar Units			Box Hangar Units			Wait List
			Available	Occupied	% Occupied	Available	Occupied	% Occupied	
OCF	OCALA INTERNATIONAL - JIM TAYLOR	168	101	101	100.00%	39	39	100.00%	39
OMN	ORMOND BEACH MUNICIPAL	109	61	61	100.00%	36	35	97.22%	49
ORL	ORLANDO EXECUTIVE	292	72	72	100.00%	5	5	100.00%	60
SFB	ORLANDO SANFORD INTERNATIONAL	293	148	148	100.00%	87	87	100.00%	103
TIX	SPACE COAST REGIONAL	92	80	80	100.00%	12	12	100.00%	61
X21	ARTHUR DUNN AIRPARK	54	51	51	100.00%	5	5	100.00%	45
X23	UMATILLA MUNICIPAL	38	7	7	100.00%	9	9	100.00%	40
X35	MARION COUNTY	73	68	68	100.00%	9	9	100.00%	62
X59	VALKARIA	102	89	89	100.00%	6	6	100.00%	300
FDOT District 5 Totals		**2,676**	**1,231**	**1,221**	**99.19%**	**328**	**327**	**99.70%**	
	FDOT District 6 – South								
EYW	KEY WEST INTERNATIONAL	59	8	8	100.00%	10	10	100.00%	3
MIA	MIAMI INTERNATIONAL	28							0
MTH	FLORIDA KEYS/MARATHON INTERNATIONAL	59	32	32	100.00%	11	11	100.00%	8
OPF	MIAMI-OPA LOCKA EXECUTIVE	232							0
TMB	MIAMI EXECUTIVE	320	130	130	100.00%	11	11	100.00%	180
TNT	DADE-COLLIER TRAINING AND TRANSITION	0							0
X51	MIAMI HOMESTEAD GENERAL AVIATION	85	0	0	0.00%	2	2	100.00%	0
FDOT District 6 Totals		**783**	**170**	**170**	**100.00%**	**34**	**34**	**100.00%**	
	FDOT District 7 - West Central								
BKV	BROOKSVILLE-TAMPA BAY REGIONAL	177	76	76	100.00%	9	9	100.00%	
CGC	CRYSTAL RIVER-CAPTAIN TOM DAVIS FIELD	48	32	32	100.00%	5	5	100.00%	22
CLW	CLEARWATER AIRPARK	140	57	57	100.00%	3	3	100.00%	50
INF	INVERNESS	36							
PCM	PLANT CITY	69	50	49	98.00%	3	3	100.00%	78
PIE	ST. PETE CLEARWATER INTERNATIONAL	279	200	200	100.00%	25	25	100.00%	150
SPG	ALBERT WHITTED	182	96	96	100.00%	10	10	100.00%	200
TPA	TAMPA INTERNATIONAL	79	0	0	N/A	18	18	100.00%	6
TPF	PETER O. KNIGHT	102	69	66	95.65%	2	2	100.00%	85
VDF	TAMPA EXECUTIVE	181	100	96	96.00%	4	3	75.00%	114
ZPH	ZEPHYRHILLS MUNICIPAL	111	137	137	100.00%	0	0	N/A	80
FDOT District 7 Totals		**1,404**	**817**	**809**	**99.02%**	**79**	**78**	**98.73%**	
Grand Totals		**12,332**	**5,992**	**5,951**	**99.32%**	**1,106**	**1,102**	**99.64%**	

Notes: FDOT-Florida Department of Transportation.

[1]Based aircraft counts in the table represent the airport provided counts from the FASP 2043 Update survey effort.

Source: AVCON, INC.

Projected 20-Year Hangar Demand by FDOT District and Conclusions

Forecasts of based aircraft were produced for the FASP 2043 for each FDOT district as shown in **Table 4**. To analyze the potential 20-year hangar demand for the sample of airports that provided responses to the survey effort for the FASP 2043, the existing number of T-hangar and box hangar units and each FDOT district were increased by the respective forecast Average Annual Growth Rate (AAGR) through 2043. The respective and anticipated 20-year hangar demand forecast is presented in **Table 5** for informational purposes only by applying the AAGRs for each FDOT district shown in Table 4. The information in Table 5 only represents a cross section of Florida airports and therefore does not represent the potential hangar demand for all 106 facilities included in the FASP. It also does not consider the immediate needs for airports to construct hangars to satisfy their based aircraft waiting lists nor does it consider changing trends in based aircraft storage practices (i.e., the current T-hangar, box hangar, and apron tiedown storage preferences were held constant through 2023).

Table 4. FASP 2043 Update Forecast of Based Aircraft (2023-2043)

FDOT District	District Name	2023 Based Aircraft	2043 Based Aircraft	AAGR 2023-2043
1	Southwest	2,537	3,204	1.17%
2	Northeast	1,121	1,339	0.89%
3	Northwest	969	1107	0.67%
4	Southeast	2,841	3,962	1.68%
5	Central	2,676	3,367	1.15%
6	South	783	913	0.77%
7	West Central	1,404	1,664	0.85%
Total		**12,332**	**15,557**	**1.17%**

Notes: FDOT-Florida Department of Transportation, Average Annual Growth Rate-AAGR.
Source: AVCON, INC. and FASP 2043 Update.

Table 5. Forecast of Additional T-Hangar and Box Hangar Needs by 2043

FDOT District	District Name	2043 New T-Hangar Units	2043 New Box Hangar Units
1	Southwest	435	66
2	Northeast	113	16
3	Northwest	80	23
4	Southeast	386	67
5	Central	315	84
6	South	28	6
7	West Central	151	15
Total		**1,509**	**276**

Notes: FDOT-Florida Department of Transportation.
Source: AVCON, INC.

Based on this analysis, it is anticipated that at least 1,509 T-hangar units and 276 box hangar units will be needed to accommodate based aircraft hangar demands in the state by 2043, but the actual requirement is likely higher and more immediate considering the sample size of airports that were analyzed.

Stormwater Management Program Initiative

2043 FASP
FLORIDA AVIATION SYSTEM PLAN

Appendix I

Stormwater Management Plans Initiative

The Florida Department of Transportation Aviation Office (FDOT AO) has a Statewide Airport Stormwater Management Program that is intended "to improve airport safety by reducing wildlife attractants, while meeting all state and federal water quality and water management requirements." As part of the Statewide Airport Stormwater Management Program, the FDOT AO conducted a multi-year study called the Florida Statewide Airport Stormwater Study that was completed in 2005 and revised in 2008 to evaluate stormwater systems at airports throughout the state. Following the 2008 revision, the FDOT AO prepared the Statewide Airport Stormwater Best Management Practices Manual (BMP Manual) in 2013 to identify effective strategies and procedures for managing and improving stormwater systems at airports.

Over the years, several airports in Florida have developed Stormwater Management Plans (SWMPs) either as stand-alone documents or in conjunction with other planning and design efforts. This inventory of SWMPs was conducted in conjunction with the Florida Aviation System Plan 2043 (FASP 2043). The purpose is to provide the FDOT AO with a listing of all Florida airports that have recently updated SWMPs by FDOT district and by airport classification as identified in the Federal Aviation Administration's (FAA's) National Plan of Integrated Airport Systems (NPIAS), or by non-NPIAS classification. It is noted that this effort did not include a review of any specific SWMPs nor the effectiveness of those plans and was not intended to provide recommendations for any new best management practices for airports and consultants to consider in new SWMPs. The following sections are included in this document:

- Data Collection Methodology.
- Florida Airport SWMPs by FDOT District.
- Florida Airport SWMPs by FAA NPIAS Classification.
- Conclusions.

Data Collection Methodology

A detailed survey effort was conducted for the FASP 2043 and was distributed to 106 publicly owned facilities in Florida that are included in the FASP including 103 airports, two seaplane bases, and one heliport. The survey included several questions about different types of studies that airports have conducted including whether they have SWMPs, the most recent dates for their Master Plans and Airport Layout Plans (ALPs), and if they have Wildlife Hazard Management Plans (WHMPs). Regarding SWMPs, airports were asked to respond either '*yes*' or '*no*' as to whether they have made recent updates to such a plan. Responses were received from all 106 facilities and a total of 57 respondents indicated '*yes,*' that they have made recent updates to their SWMP. All 57 '*yes*' responses were received from airport facilities that are included in the NPIAS (i.e., no non-NPIAS airports and no seaplane bases or heliports). Therefore, 53.77 percent of all facilities included in the FASP 2043 have made recent updates to their SWMPs. **Table 1** summarizes the breakdown of Florida airports with SWMPs by NPIAS Commercial Service Airports, NPIAS General Aviation (GA) Airports, and Non-NPIAS Airports.

Table 1. Summary of Airports in Florida with SWMPs by NPIAS Classification

NPIAS Classification	Number of Airports	Number with SWMPs	% with SWMPs
NPIAS Commercial	21	16	76.19%
NPIAS GA	78	41	52.56%
Non-NPIAS	7	0	0.00%
Total	**106**	**57**	**53.77%**

Notes: GA-General Aviation, NPIAS-National Plan of Integrated Airport Systems, SWMP-Stormwater Management Plan.
Source: AVCON, INC.

Florida Airport SWMPs by FDOT District

Table 2 presents an overall listing of airports that responded '*yes'* to having recently updated SWMPs by FDOT district. **Table 3** shows all 106 facilities included in the FASP 2043 by FDOT district and indicates whether they responded '*yes'* to having a recently updated SWMP. If a date for the most recent update to the SWMP was provided by the respondent, it is also included in Table 3.

Table 2. Summary of Airports in Florida with SWMPs by FDOT District

FDOT District	District Name	Number of Airports	Number with SWMPs	% with SWMPs
1	Southwest	21	10	47.62%
2	Northeast	16	6	37.50%
3	Northwest	15	9	60.00%
4	Southeast	15	7	46.67%
5	Central	21	11	52.38%
6	South	7	6	85.71%
7	West Central	11	8	72.73%
Total		**106**	**57**	**53.77%**

Notes: FDOT-Florida Department of Transportation, GA-General Aviation, SWMP-Stormwater Management Plan.
Source: AVCON, INC.

Table 3. Detailed Listing of Airports in Florida with SWMPs by FDOT District

Airport ID	Airport Name	Yes SWMP	No SWMP	Year (if provided)
District 1 - Southwest				
2IS	Airglades Airport	Yes		2010
APF	Naples Municipal Airport	Yes		2017
BOW	Bartow Executive Airport	Yes		
LAL	Lakeland Linder International Airport	Yes		
PGD	Punta Gorda Airport	Yes		2023
SRQ	Sarasota Bradenton International Airport	Yes		2019
VNC	Venice Municipal Airport	Yes		2020
X06	Arcadia Municipal Airport	Yes		2021
X07	Lake Wales Municipal Airport	Yes		2023
X14	La Belle Municipal Airport	Yes		2011
AVO	Avon Park Executive Airport		No response	
CHN	Wauchula Municipal Airport		No response	
FMY	Page Field		No	
GIF	Winter Haven Regional Airport		No response	
IMM	Immokalee Regional Airport		No	
MKY	Marco Island Executive Airport		No	
OBE	Okeechobee County Airport		No	
RSW	Southwest Florida International Airport		No	
SEF	Sebring Regional Airport		No	
X01	Everglades Airpark		No	
X36	Buchan		No response	
District 1 Totals	**21 Total Airports**	**10**	**11**	**47.62%**
District 2 - Northeast				
24J	Suwannee County Airport	Yes		
42J	Keystone Heights Airport	Yes		2020
HEG	Herlong Recreational Airport	Yes		2021
JAX	Jacksonville International Airport	Yes		
LCQ	Lake City Gateway Airport	Yes		2023
VQQ	Cecil Airport	Yes		
01J	Hilliard Airpark		No	
28J	Palatka Municipal - Lt Kay Larkin Field		No	
CDK	George T. Lewis Airport		No	
CRG	Jacksonville Executive at Craig Airport		No	
CTY	Cross City Airport		No	
FHB	Fernandina Beach Municipal Airport		No	
FPY	Perry-Foley Airport		No	
GNV	Gainesville Regional Airport		No	
SGJ	Northeast Florida Regional Airport		No	
X60	Williston Municipal Airport		No	
District 2 Totals	**16 Total Airports**	**6**	**10**	**37.50%**
District 3 - Northwest				
2J9	Quincy Municipal Airport	Yes		2020
2R4	Peter Prince Field	Yes		
BCR	Tri-County Airport	Yes		
CEW	Bob Sikes Airport	Yes		2023
DTS	Destin Executive Airport	Yes		2023
ECP	Northwest Florida Beaches International Airport	Yes		
PNS	Pensacola International Airport	Yes		2023
TLH	Tallahassee International Airport	Yes		
VPS	Destin-Fort Walton Beach Airport	Yes		2023
2J0	Wakulla County Airport		No	
54J	DeFuniak Springs Airport		No	
AAF	Apalachicola Regional - Cleve Randolph Field		No	
F95	Calhoun County Airport		No	
MAI	Marianna Municipal Airport		No	
X13	Carrabelle-Thompson Airport		No	
District 3 Totals	**15 Total Airports**	**9**	**6**	**60.00%**
District 4 - Southeast				
FLL	Fort Lauderdale - Hollywood International Airport	Yes		
FPR	Treasure Coast International Airport	Yes		2018
PMP	Pompano Beach Airpark	Yes		
SUA	Witham Field	Yes		2022
VRB	Vero Beach Regional Airport	Yes		
X10	Belle Glade	Yes		2019
X26	Sebastian Municipal Airport	Yes		

Table 3. Detailed Listing of Airports in Florida with SWMPs by FDOT District

Airport ID	Airport Name	Yes SWMP	No SWMP	Year (if provided)
BCT	Boca Raton Airport		No	
DT1	Downtown Fort Lauderdale Heliport		No	
F45	North Palm Beach County General Aviation Airport		No	
FXE	Fort Lauderdale Executive Airport		No	
HWO	North Perry Airport		No	
LNA	Palm Beach County Park Airport		No	
PBI	Palm Beach International Airport		No	
PHK	Palm Beach County Glades Airport		No	
District 4 Totals	**15 Total Airports**	**7**	**8**	**46.67%**
District 5 - Central				
DAB	Daytona Beach International Airport	Yes		
FIN	Flagler Executive Airport	Yes		2021
ISM	Kissimmee Gateway Airport	Yes		2022
LEE	Leesburg International Airport	Yes		2000
MCO	Orlando International Airport	Yes		Current
OCF	Ocala International - Jim Taylor Field	Yes		2012
OMN	Ormond Beach Municipal Airport	Yes		
ORL	Orlando Executive Airport	Yes		2023
SFB	Orlando Sanford International Airport	Yes		2009
X35	Marion County Airport	Yes		
X59	Valkaria Airport	Yes		
2J8	Pierson Municipal Airport		No	
3FL	St Cloud Seaplane Base		No	
COI	Merritt Island Airport		No	
DED	DeLand Municipal - Sidney H. Taylor Field		No	
EVB	New Smyrna Beach Municipal Airport		No	
FA1	Tavares Seaplane Base		No	
MLB	Melbourne Orlando International Airport		No response	
TIX	Space Coast Regional Airport		No	
X21	Arthur Dunn Airpark		No	
X23	Umatilla Municipal Airport		No	
District 5 Totals	**21 Total Airports**	**11**	**10**	**52.38%**
District 6 - South				
EYW	Key West International Airport	Yes		2018
MIA	Miami International Airport	Yes		
MTH	Florida Keys/Marathon International Airport	Yes		2018
OPF	Miami-Opa Locka Executive Airport	Yes		
TMB	Miami Executive Airport	Yes		
X51	Miami Homestead General Aviation Airport	Yes		
TNT	Dade-Collier Training and Transition Airport		No	
District 6 Totals	**7 Total Airports**	**6**	**1**	**85.71%**
District 7 - West Central				
BKV	Brooksville-Tampa Bay Regional Airport	Yes		2023
PCM	Plant City Airport	Yes		2022
PIE	St. Pete Clearwater International Airport	Yes		2021
SPG	Albert Whitted Airport	Yes		2020
TPA	Tampa International Airport	Yes		2021
TPF	Peter O. Knight Airport	Yes		2022
VDF	Tampa Executive Airport	Yes		2022
ZPH	Zephyrhills Municipal Airport	Yes		
CGC	Crystal River-Captain Tom Davis Field		No	
CLW	Clearwater Airpark		No response	
INF	Inverness Airport		No response	
District 7 Totals	**11 Total Airports**	**8**	**3**	**72.73%**
Grand Total	**106 Total Airports**	**57**	**49**	**53.77%**

Notes: FDOT-Florida Department of Transportation, GA-General Aviation, SWMP-Stormwater Management Plan.
Source: AVCON, INC.

Florida Airport SWMPs by FAA NPIAS Classification

Table 4 presents a further breakdown of the airports with recently updated SWMPs by NPIAS classification as reported in the FAA's 2023-2027 NPIAS. It is noted that 100.00 percent of Primary Large Hub Commercial Service Airports as well as Primary Small Hub Commercial Service Airports have recently updated SWMPs. As previously mentioned, none of the non-NPIAS airports have recently updated SWMPs and there are no seaplane bases or heliports with recently updated SWMPs.

Table 4. Summary of Airports in Florida with SWMPs by NPIAS Classification

NPIAS Classification	Number of Airports	Number with SWMPs	% with SWMPs
Primary CS Large Hub	4	4	100.00%
Primary CS Medium Hub	3	1	33.33%
Primary CS Small Hub	8	8	100.00%
Primary CS Non Hub	4	2	50.00%
Commercial Service (CS) National	2	1	50.00%
Reliever National	5	3	60.00%
Reliever Regional	10	6	60.00%
Reliever Local	2	1	50.00%
GA National	5	4	80.00%
GA Regional	24	13	54.17%
GA Local	23	13	56.52%
GA Basic	7	0	0.00%
General Aviation (GA) Unclassified	2	1	50.00%
Non-NPIAS	7	0	0.00%
Total	**106**	**57**	**53.77%**

Notes: NPIAS-National Plan of Integrated Airport Systems, SWMP-Stormwater Management Plan.
Source: AVCON, INC.

Conclusions

This inventory of SWMPs is intended to provide the FDOT AO with information to facilitate discussions with airport sponsors about future airport drainage improvements and updates to SWMPs. It is noted that SWMPs are eligible for funding through the FAA's Airport Improvement Program (AIP) as well as FDOT's Aviation Grant Program. Because Florida is a state that is vulnerable to the negative impacts from stormwater due to its extensive coastline, rainy summers, history of hurricane events, rapid growth, and low elevations, it is important that airports keep their SWMPs up-to-date and consider the potential long-term vulnerabilities in conjunction with the demand for future aviation development.

J
Unleaded Avgas Emerging Trends

FDOT

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FLORIDA AVIATION SYSTEM PLAN

Appendix J

Unleaded Avgas Emerging Trends

For years, attempts have been made to remove lead from aviation gasoline (avgas) used to power piston engines on fixed- and rotary-wing aircraft. With unleaded aviation fuels entering the market, airports will need to make changes to accommodate this emerging trend. The following provides background information on leaded aviation fuels and the efforts to approve unleaded aviation fuel for the market. How this emerging trend will affect Florida airports and what the Aviation Office of the Florida Department of Transportation (FDOT AO) can do to accommodate its implementation is also discussed.

Background

Avgas containing tetraethyllead (lead) has been used to power piston engines on aircraft since the advent of aviation in the early 20th century. The presence of lead in avgas is used to boost the octane rating of fuel while preventing engine knocking, also known as premature detonation, a phenomenon caused when combustion of some of the air/fuel mixture in engine cylinders does not occur at the precise point in the piston stroke cycle. This resulting detonation can increase pressure within the engine cylinder significantly, resulting in potential damage and engine failure. Since engine failure in aviation is a significant safety concern, inclusion of lead in avgas has been seen as necessary to improve the reliability and performance of piston engines used to power aircraft.

Humans can be exposed to lead in many ways; however, inhalation of fumes with lead is considered a significant risk. Efforts began in the 1970s to limit and eliminate methods of human exposure to lead from engine emissions. Through the 1980s and 1990s, use of lead as an additive was lessened, removed, and eventually banned in most forms of gasoline; however, additives of lead were still permitted for use in aviation gasolines due to their trusted performance reliability in aviation piston engines and the lack of a suitable unleaded alternative. Though still allowed, the United States Environmental Protection Agency (EPA) has taken steps towards eliminating the lead in avgas. These steps are expected to culminate in the banning of 100-octane low lead aviation fuel (100LL). In fact, some communities in other states, such as Santa Clara County, sponsor of the Reid-Hillview Airport near San Jose, California, have already enacted local regulations banning the sale of avgas with lead additives.

The aviation industry has made multiple efforts, driven by the environmental protection regulatory community, to develop a reliable unleaded avgas that can deliver an adequate octane rating to avoid engine knocking and can be used as a “drop-in” replacement for existing leaded aviation fuels. In 2010, General Aviation Modifications, Inc. (GAMI) announced that it was in the process of developing a “drop-in” replacement for 100LL avgas with an unleaded aviation fuel that was eventually named G100UL. Taking over 12 years to refine, and after multiple reviews by the Federal Aviation Administration (FAA), G100UL was approved for use for all piston-engine aircraft and engine combinations through supplemental type certificates (STCs) in 2022. Likewise, in 2015, the FAA certified an additional unleaded blend of 94-octane aviation fuel named UL94 that was developed by Swift Fuels, which was also approved for use by the FAA through an STC. It is important to note that UL94 and G100UL are not interchangeable with each other as each has different octane levels. Use of these fuels will depend on the fuel octane rating specified by the aircraft engine manufacturer.

In addition to these approved fuels, the FAA announced in early 2022 the initiation of a public-private partnership with aviation and petroleum industry stakeholders to develop and evaluate additional unleaded aviation fuels for piston-engine aircraft by the end of 2030. This initiative, called the Eliminate Aviation Gasoline Lead Emissions (EAGLE), will also develop the infrastructure and access viability needed for unleaded aviation fuels, as well as establish necessary related regulations and policies. These recent developments, along with at least two other unleaded aviation fuels that are undergoing approval testing, have accelerated the industry's interest in the use of unleaded aviation fuel.

Next Steps and Challenges

With the success of UL94 and G100UL fuel, the industry is considering the next steps and challenges in how it will move forward with the larger industry-scale use and implementation. UL94 and G100UL have achieved success as a drop-in replacement for leaded fuels because modifications to engines are not required other than obtaining an STC and placarding the approved engine for its use. To be successful, other fuels under development will also need to be drop-in replacements free of engine modifications and able to be used with other blends of unleaded aviation fuel for larger scale industry implementation.

Large scale production and distribution of these fuels are challenges the industry is working to resolve. For example, it is anticipated to take at least 12 months to establish and refine the logistics of production and distribution for G100UL, with greater availability of the fuel not expected to be achieved until 2024. GAMI has entered into an agreement with AvFuel, a global supplier of aviation fuel and related services, to assist with logistics in coordinating large scale production and industry distribution of the fuel. Other fuel manufacturers will face a similar challenge to bring product to the market since infrastructure is currently lacking for large scale manufacturing and distribution. Compounding this are supply chain issues and labor shortages that have been affecting all aspects of the economy since the COVID-19 pandemic in 2020.

The cost of unleaded aviation fuels is also a challenge. Its price is higher per gallon than aviation fuels with lead additives. This increased cost may discourage pilots and aircraft operators from using it if cheaper leaded fuels remain available. The increase, however, may be offset over the long run by reduced maintenance costs since unleaded aviation fuels have been found to reduce spark plug fouling and valve contamination.

Though unleaded aviation fuels are intended to be a drop-in replacement, another challenge is that airports may need to construct separate fuel storage and distribution systems. Multiple factors could drive this need. First, pilots and aircraft operators may desire to purchase one fuel over the other if both remain available. Next, there will likely be a need for separate storage and distribution of unleaded fuel to assist airports and fuel providers with inventory and sales. Also, state and federal regulations may dictate that the product be stored separately from those tanks used to store leaded fuels in the past. Finally, the fuel manufacturers themselves may require separate storage and distribution, and airports may also prefer separate storage.

Lengthy testing and certification processes are also potential challenges. Fuel reliability testing in different types of piston engines in varying operating environments and conditions is necessary; however, such testing impacts the timing of supply and demand relative to the overall industry desire to use these fuels.

Finally, in addition to the production, supply chain, and distribution logistic considerations, communication presents a challenge. Communications must address the inquiries and concerns of pilots, mechanics, regulators, fixed based operators (FBOs), and fuel distributors about the reliability, storage, distribution, and approval process for the fuel's use. GAMI, for example, as a part of their agreement with AvFuel, have established an industry outreach and communications campaign that includes press releases, web resources, communications with customers, education sessions, personalized outreach to customers, e-mails, newsletters, videos, and trade show appearances to promote G100UL. Other unleaded aviation fuel manufacturers will likely need to take a similar approach. Without an effective communications strategy, potential customers may be confused about what is needed to use these fuels and potentially have a misguided loss of confidence in the product.

How Does This Affect Florida Airports?

Florida has one of the largest, busiest, and most dynamic state aviation systems in the country. Home to over 8,300 based aircraft and over 75,600 pilots (the most in the country), the impact of use of unleaded aviation fuel is likely to be greater on aviation and airports in Florida than other states.

In fact, unleaded aviation fuel has already been used in Florida. The flight training fleet of Embry-Riddle Aeronautical University in Daytona Beach served as a test facility for both Swift's UL94 and GAMI's G100UL. The following summarizes the potential effects this emerging trend might have on users and airports across Florida:

- **Logistical Challenges** – Initial availability of unleaded fuel is expected to be limited until production and distribution logistics have increased. Availability is anticipated to take multiple years to match the level of industry demand. As a result, airports are initially expected to face supply challenges. This could create challenges for airports in not only acquiring the fuel from distributors but also in acquiring the adequate level of supply to meet demand. Likewise, production and distribution challenges could be compounded should federal, state, or local regulations ban the use of lead in aviation fuel before sufficient supply of unleaded aviation fuel is available to meet market demands.

- **Storage and Distribution Infrastructure** – The intent is that unleaded aviation fuels will be a drop-in replacement for leaded fuel with the same octane rating, allowing the unleaded fuels to be used at any ratio or volume. While this does not require modifications to the piston engines found in fixed-wing and rotary-wing aircraft, airports likely will need to store and distribute these fuels separately from their leaded counterparts. This will likely require installation of separate facilities. Even if existing tanks and distribution systems are emptied of leaded fuels, the lead residue within the linings of the tanks may raise contamination concerns and prevent them from being used for the unleaded fuels. Should new facilities be needed, that would add cost to airports to provide these fuels to users.

- **Cost of Unleaded Aviation Fuels** – Unleaded aviation fuels cost more per gallon than leaded fuels such as 100LL. The significant difference in cost may discourage pilots from purchasing unleaded aviation fuels if leaded fuels are still available and could lead to competing fuel prices between the two products between airports. This cost differential could affect where pilots will base aircraft and what airports itinerant operators choose to use, potentially affecting airport revenues.

- **Hesitation to Change** – Finally, should leaded aviation fuels remain on the market, the aviation community may hesitate to use unleaded aviation fuels. Price alone will likely be a barrier to convincing the aviation community to switch. Some aircraft operators may also be hesitant out of personal preference given the trusted engine reliability provided by leaded fuels. Florida airports prepared to distribute unleaded aviation fuel systems could encounter challenges if the local pilot community is not willing to use this product.

Ways that the FDOT AO Can Assist

While the FDOT AO may not have the direct ability to increase production and distribution, it does have the ability to facilitate communication among different stakeholders to resolve the implementation challenges associated with unleaded aviation fuel. The following recommendations offer methods to assist airports in the transition to the use of this fuel by its users. They are categorized into items that can be addressed through implementation of the Florida Aviation System Plan (FASP) 2043 and other broader actions that the FDOT AO can promote.

FASP 2043 Recommendations

Provide Funding for Installation of Fuel Storage / Distribution Systems – The FDOT AO could assist airports by providing funding for the installation of fuel storage and distribution systems for unleaded aviation fuels. This could be from the establishment of a dedicated funding source or through prioritizing the installation of these systems when distributing funds from existing funding sources. This would be beneficial to airports especially when the installation of such infrastructure is not eligible for funding from other traditional sources like the FAA Airport Improvement Program (AIP).

- **Include Measurement for the Provision of Unleaded Aviation Fuel as a Part of FASP 2043 Performance Metrics** – Inclusion of how well airports across Florida are providing unleaded aviation fuels as this market grows can help airports and the FDOT AO understand where gaps and deficiencies lie with meeting user demand. This includes the development of performance metrics to measure this emerging trend and the continual evaluation of these metrics based on changing trends each time the state aviation system is evaluated. This can help focus the development of infrastructure to provide unleaded aviation fuels as well as future financial planning efforts for both airports and the FDOT AO in accommodating this emerging trend.

Other Recommendations

- **Encourage Airports to Provide Unleaded Aviation Fuels** – The FDOT AO could encourage Florida airports to coordinate with fuel distributors to provide unleaded aviation fuel at their facilities. With initial supplies of the fuel being limited, airports will likely have to be proactive and notify their fuel distributor that they would like to be supplied the fuel. Likewise, the FDOT AO could serve as an advocate for state airports in communicating with fuel manufacturers and distributors so that Florida airports can be among the first to receive blends of unleaded aviation fuel since initial demand is expected to be high. This will be beneficial for airports in the state given the level of aviation activity that occurs in Florida and the demand for unleaded aviation fuel elsewhere in the country.

- **Encourage Production / Distribution Facilities of Unleaded Aviation Fuels to be in Florida** – Florida has one of the busiest state aviation systems in the country; thus, demand for all aspects of aviation is generally higher than compared to other states. With this level of activity, the FDOT AO could encourage the fuel producers and distributors to locate manufacturing facilities and expand distribution facilities in Florida. These efforts would potentially improve access to these fuels. Financial incentives such as tax breaks could also be used to encourage fuel producers and distributors to locate / expand operations in Florida.

- **Inform Pilots on the Application Process for STCs to Use Unleaded Aviation Fuels** – The FDOT AO could assist in the communication efforts initiated by fuel producers to inform pilots and aircraft operators how to apply for an STC to use unleaded aviation fuels. GAMI, for example, with the rollout of their unleaded G100UL fuel, published resources that include pamphlets, web resources, and trade show appearances. The FDOT AO could help facilitate this information awareness campaign by publishing information on its website, e-mailing news releases, and using social media sites to direct interested parties to the STC process.

- **Promote Benefits and Reliability of Unleaded Aviation Fuels** – The FDOT AO could encourage the users of its state aviation system to use unleaded fuel through an information campaign about its benefits and reliability. Benefits of these fuels include reduction in lead-fouled spark plugs and longer intervals between required engine maintenance. Some hesitation about use of the fuel is likely given the proven reliability of leaded aviation fuels. The FDOT AO could use e-mail, publications, social media, and other communication channels to share information about the results of performance testing and to provide resources to answer other inquiries about their use. The FDOT AO could also provide links to the communication campaigns of unleaded aviation fuel producers to learn more about these products. Additionally, the FDOT AO could also invite producers to conferences and other events to discuss unleaded aviation fuels with attendees.

- **Coordinate with Environmental Regulators** – As unleaded aviation fuels are introduced to the market, the FDOT AO could advocate with federal and state environmental regulators regarding the time needed to transition the entire piston-engine aviation fleet to its use. Although the fuels may be approved, regulators may be unaware of duration of implementation and challenges encountered as refineries and distribution networks ramp up production. This lack of awareness could result in new regulations that further limit and ban the lead additive to aviation fuels before the industry can meet the demand / supply equilibrium for piston-powered aviation engine fuels. By communicating with regulators, the FDOT AO could help prevent potential environmental regulation from grounding the aviation fleet until supply meets demand.

Conclusion

In conclusion, the implementation of unleaded aviation fuels in Florida is a long-awaited milestone for both aviation users and the environmental regulatory community. As with any emerging trend and its transition to mainstream industry acceptance, the production and distribution of unleaded aviation fuel will take time before it can be available at Florida airports for the users of its aviation system. The FDOT AO serves an important role in helping to facilitate this industry change by leading communication efforts about its benefits to the pilots and aircraft operators of its system. Likewise, the FDOT AO also serves an important role in assisting its airports in transitioning to unleaded aviation fuels and helping them coordinate with fuel producers and distributors, including methods to communicate this change to their pilot communities. Finally, the FDOT AO could also facilitate the installation of secondary fueling systems to contain these unleaded fuels. By implementing the recommendations for the FDOT AO to promote and provide access to unleaded aviation fuel, Florida can continue to be a world-class leader in supporting the needs of its airports and aviation community.

K

Sustainable Aviation Fuel Emerging Trends

FDOT | 2043 FASP FLORIDA AVIATION SYSTEM PLAN

Appendix K

Sustainable Aviation Fuels Emerging Trends

Like other forms of transportation, aviation is working to become more sustainable; however, it has different challenges from modes of surface transportation due to the enormous energy required to fly heavy aircraft long distances. One promising solution that has already been implemented in the industry is the use of sustainable aviation fuels (SAFs). These fuels can power turbine-powered propeller driven aircraft, turbine-powered rotary wing aircraft, jet-engine aircraft, and piston-engine aircraft powered by diesel fuels. Unlike traditional aviation fuels, which are petroleum-based and produce carbon dioxide (CO2) and greenhouse gas (GHG) emissions, SAFs are produced using biomasses. Biomass sources include waste oil and fats, greases, algae, agricultural and forestry residues, municipal waste, manures, wastewater treatment sludge, and non-food dedicated crops. The Florida Department of Transportation Aviation Office (FDOT AO) is uniquely positioned to help further the advancement and promotion of SAFs in Florida. This summary provides background on SAFs as well as challenges and next steps associated with implementation. How SAF use can affect Florida's aviation system and users, as well as recommended actions for the FDOT AO to support its airports and users, are also presented.

Background

SAF is like traditional jet fuel; however, its use reduces CO2 emission by up to 80 percent. In addition to the environmental benefits of reduced emissions, using SAFs can improve the performance of turbine- and jet-aircraft engines because SAFs contain fewer aromatic components and burn cleaner during combustion. In addition, SAF is a "drop-in" replacement for existing fuels, meaning that no modifications to engine elements are needed.

Commercial air carriers began to incorporate the use of SAFs in 2008. Since then, airlines have operated commercial flights using SAF fuel blends that include up to 50 percent biomass product. The continued demand for SAF fuels has led to the development and implementation of policies to not only regulate their use, but also to ensure that ecological balances in producing biomasses avoid a subsequent depletion of natural resources for their production. Fuel manufacturers, industry trade groups, air carriers, and aviation and environmental regulatory agencies have initiated policies and procedures to address the demand for the increased production, distribution, and use of SAFs; however, further advancement of these initiatives is needed as the demand for SAFs continues to grow.

Challenges and Next Steps

In September 2022, the United States Department of Energy (DoE) released the SAF Grand Challenge Roadmap, which identifies an approach for the DoE to work with industry stakeholders to reduce the cost, enhance the sustainability, and expand the production of SAF. The goals of this plan are to:

- Achieve a minimum of a 50 percent reduction in GHG emitted by aircraft by 2030.
- Increase production of SAFs to meet 100 percent of industry demand by 2050.

Achieving these goals will be challenging. The most significant challenge is associated with the shortfall in available biomass to meet the demand for its use in all sustainable energy production needs. In addition to SAFs, biomasses are in demand to produce other forms of sustainable energy including renewable diesel and energy to power homes, businesses, and industries. In the United States, approximately 1 billion dry tons of biomass is potentially available each year. If used solely to produce SAFs, this biomass supply could produce 50-60 billion gallons of fuel, enough to meet the 26 billion gallons in demand that was estimated to be needed in 2019; however, only 3 million gallons of SAF was produced in the United States 2019 due, in part, to biomasses being used for other higher demand sustainable energy producing needs. Sustainably producing a sufficient volume of biomass is also a challenge. To address this challenge, the aviation industry and the agricultural industry have forged partnerships to research and identify methods to increase biomass production sustainably.

Perhaps cost is the most significant challenge associated with SAF production and implementation. SAF prices are currently two to four times greater than prices for traditional jet fuel. This is an important consideration for air carriers and air taxi operators that operate with low profit margins. In response, fuel producers, members of the aviation industry, and governmental agencies have developed partnerships to develop methods to make SAF fuel costs more competitive with traditional turbine- and jet-engine powered fuels. The development of new and innovative technologies will be key to making SAF a more cost-effective option for aircraft operators.

Collaboration of all stakeholders such as governmental entities, air carriers, fuel producers and distributors, farmers and biomass producers, and environmental regulators will be needed to successfully expand the production and availability of these fuels. Systemwide collaboration to implement policies and procedures for SAF development, certification, and use will be critical. An example is the development of accepted practices to ensure that crop production for biomass is undertaken in a sustainable manner. The development of accepted production practices will also help to streamline SAF approval processes and standardize production methods to reduce costs.

SAF and Florida Airports

Florida is home to one of the busiest air carrier and general aviation (GA) markets in the country. With 19 primary air-carrier airports and dozens of GA airports with users capable of using SAFs, it is important to understand how Florida airports are affected by this emerging trend. The following considerations are important in gauging the effects of the growing use of SAFs for the users and airports that comprise Florida's aviation system:

- **Availability** – The insufficient supply of biomasses means SAF production cannot meet demand. Airlines wanting to implement SAFs may be challenged to obtain the amount of SAF desired or necessary to support their fleets.

- **Sustainable Fuel Infrastructure** – Though sustainable aviation fuels are considered a drop-in replacement for existing turbine- and jet-engine fuels, airport operators will be required to provide additional storage and distribution infrastructure to accommodate SAF use. The initial small volume rollout of SAFs may require blending with existing fuels. Options for this blending include storing sustainable and existing fuels in separate tanks and then blending them as needed for use and/or installing equipment for blending traditional and sustainable fuels stored in the same tank. In addition, Florida airports must also consider the delivery mechanism of these fuels. Jet-A fuels are typically piped across the country to major airports and to distribution centers for delivery at other airports. Installation of separate pipeline delivery systems for sustainable fuels will incur additional costs and may pose logistical challenges for both airports and aviation system users.

- **Cost** – As noted previously, the cost of SAFs is comparatively greater than the cost for traditional Jet-A fuels. As a result, airports face fuel pricing challenges in promoting SAF use. The associated cost to install SAF fuel storage and distribution infrastructure may also be a challenge. Air carriers using SAFs are also affected by the high price, which could result in increases to airline ticket prices and changes in route structures to maintain profit. GA users will also likely be discouraged from using SAF because of its comparatively higher cost.

How the FDOT AO Can Assist

As home to one of the largest air carrier and GA markets in the country, it is important that the FDOT AO help accommodate the growing trend of SAF use given the importance of aviation to the state's economy. The FDOT AO has opportunities to assist airport sponsors statewide in response. Some of these opportunities involve facilitation with other industry stakeholders on methods to increase production, while others involve communication campaigns to address challenges and respond to inquiries. Implementation of the following recommendations is encouraged so that the FDOT AO can assist airports and facilitate growth in the use of SAFs in the state.

- **Encourage Use of SAFs** – While air carriers who are already using SAFs may not need encouragement, the FDOT AO could establish programs to promote its use with the portion of the GA community that uses turbine- and jet-engine powered aircraft. Promotional campaigns through use of the FDOT AO's communication channels such as e-mail, social media, website, and conference / tradeshow appearances can inform airports and aviation users about the technical elements of SAFs and benefits of their use. In addition, through the same channels, the FDOT AO could help encourage airports and fuel distributors to increase their supply of SAFs in the state.

- **Encourage Production of Biomasses** – The FDOT AO could support efforts by stakeholders and other state governmental entities to increase biomass production in Florida. One way this could be accomplished is by promoting the growth of crops and algae that can be harvested for biomass fuel production, which has the potential to be a job / economic generator for the Florida economy. The FDOT AO could also help by supporting the establishment of methods to retrieve biomasses from the collection of wastes and other materials. Additionally, the FDOT AO could also support efforts from other state governmental and economic development entities to provide financial incentives and tax breaks for biomass harvesting activities.

- **Support Installation of SAF Storage and Distribution Infrastructure** – The FDOT AO could help airports with the installation of storage and distribution infrastructure for sustainable fuels by providing grant funding for such projects. While such grant funding could only include localized efforts to install these infrastructure elements on airport property, the FDOT AO could also provide non-financial support of efforts to improve larger distribution infrastructure logistics from refinery facilities. This includes coordination with industry and fuel distribution stakeholders to improve pipelines or establish other methods of delivery to increase the availability and supply of the product for system airports. Pursuit of federal funding for airports to construct fuel storage and distribution infrastructure for SAFs is another means of supporting these efforts.

- **Assist Federal and State Regulators and Industry Stakeholders to Establish SAF Policies** – The FDOT AO could collaborate with regulators, fuel producers and distributors, and other industry stakeholders to establish SAF policies that benefit the interests of Florida's airports and citizens. Involvement could occur on national and international levels and in the development of state SAF policies. The FDOT AO could also represent the interests of Florida airports on the federal and state regulatory levels should efforts be made to restrict the use of traditional Jet-A fuel. Serving as an advocate for the interest of Florida airports in the development of SAF-related policies will help to ensure that challenges facing airports in the state are represented.

Conclusion

An industry-wide effort that involves fuel producers and distributors, airlines, aircraft technology manufacturers, government, and the finance community will be required to adopt larger-scale SAF production and use at Florida airports. Industry-wide acceptance on use of the fuel is also needed to achieve the goal of environmental sustainability. The FDOT AO can play an important role with these developments by being involved to represent the interests and challenges of airports across the state. By doing so and adopting the recommendations from this emerging trend paper, Florida will be well positioned to be able to accommodate the increase in use of SAFs.

L

Power Alternatives Emerging Trends

FDOT

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Appendix L

Power Alternatives Emerging Trends

Renewable energy sources such as wind farms and solar arrays are beginning to reach mainstream prominence for municipalities around the world. The latest trends in renewable energy generation have begun at airports, where unused property may house wind turbines or solar panels capable of supplementing the energy needs of airport facilities. Underused landside areas, rooftops, and many other areas have become prime locations to install renewable energy sources. As airports around the country begin installation of these systems, many changes are required. The following document provides background information and describes the efforts to improve their viability at airports. How this emerging trend will affect Florida airports and what the Aviation Office of the Florida Department of Transportation (FDOT AO) can do to accommodate its implementation are also discussed.

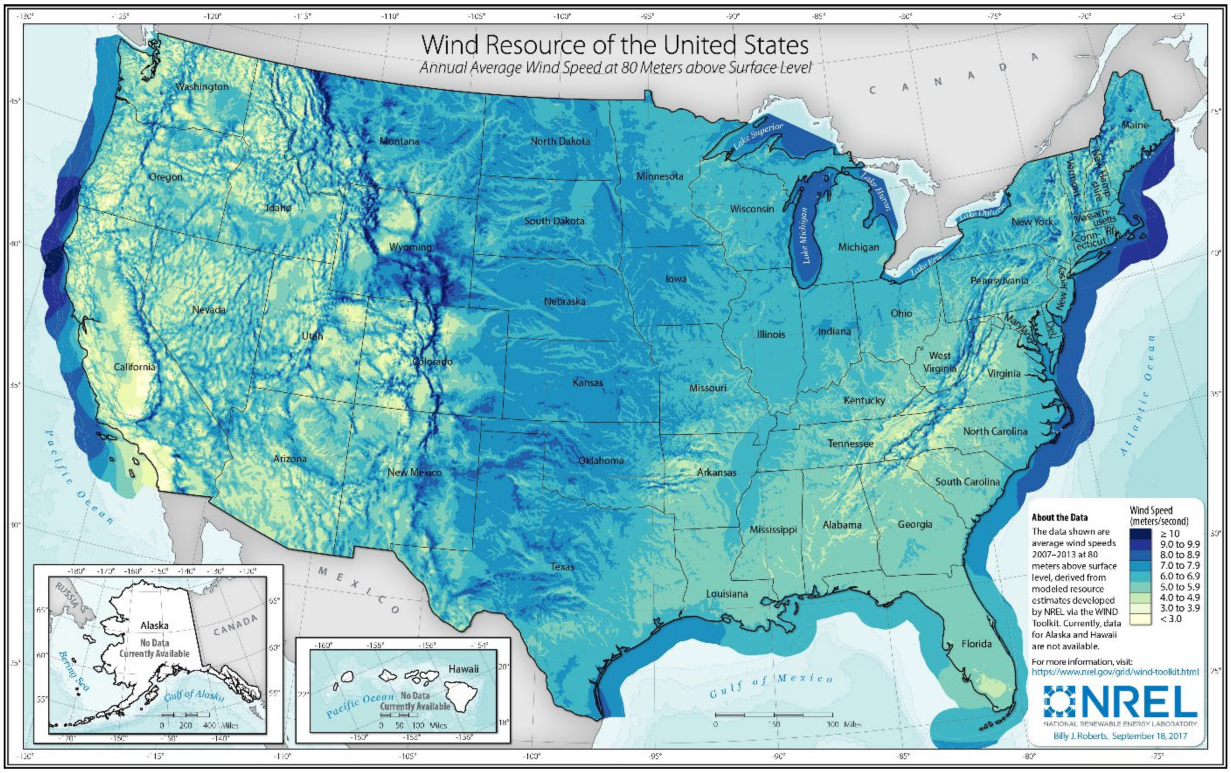
Background

Wind has been an energy source since ancient times, used for boat propulsion as early as 5000 BC. Likely the first practical use of wind as an energy source came in the seventh century, where wind caught by a series of sails was used in food production; the “windmill” converted the captured wind into rotational energy to “mill” grain. This application of rotational energy is also applied to mechanically pumping water, a technique popularized by the Dutch where windpumps siphoned water from lakes and marshes for use as arable farmland. By the late nineteenth and early twentieth century, wind-powered electric generators were developed to produce electricity from the same rotational energy used for centuries. The first electricity-generating turbine was invented in 1887, and it saw widespread adoption in rural areas where centralized power grids were beyond reach. While some of the earliest wind turbines were very small, anywhere from 5 to 25 kilowatts (kW) in 1908, their ease of construction and viability as an individual application almost anywhere on the planet meant they remained popular.

For a wind turbine to be effective, it must receive a large amount of wind. Modern wind turbines generate energy by converting rotational kinetic energy into electricity. The degree of rotation is affected by the amount of wind received, which, in turn, is affected by the location’s geographical propensity for wind. **Figure 1** illustrates the average daily wind speed across the United States.

The highest wind speeds in the United States occurring over land are close to the peaks of mountain ranges, most notably in the Rocky Mountains. The Great Plains states of Nebraska, Kansas, and Oklahoma also provide excellent yields. Wind can also vary over bodies of water, and in many locations offshore wind farms are very effective. For the United States, the Pacific Ocean near Oregon and the Atlantic Ocean near Cape Cod, Massachusetts, are the areas over water with the highest windspeeds. Wind turbines produce the most energy in areas with higher wind speeds, but they remain viable in any environment.

Figure 1. US Wind Resource Availability Map



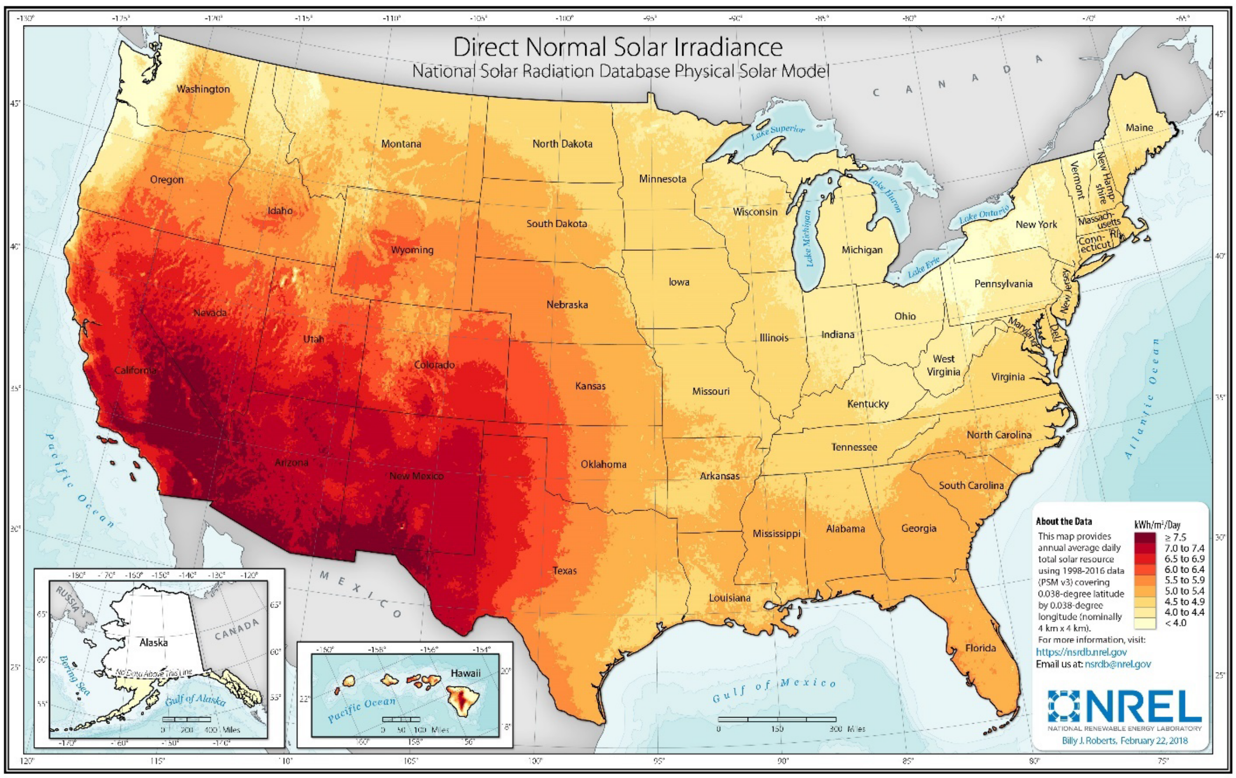
Source: National Renewable Energy Laboratory (NREL), September 8, 2017.

The efficiency of a wind turbine is measured by how effectively it can convert wind into energy. High wind speeds yield more power, as this creates many rotations to spin the generator. Wind may be collected from any height, but wind speeds generally increase with altitude. Taller turbines with larger rotor blades produce more electricity, as the larger surface area of the blades captures more wind. Wind is generally faster at greater altitudes, so placing blades higher up further improves a turbine's effectiveness. Increasing rotor size has come to prominence in recent years to greatly improve the energy generation capabilities of turbines. In 1990, the average wind turbine globally had a rotor diameter of 130 feet and generated 50 kW of power. By 2016, these numbers had risen to an average rotor diameter of 420 feet with 2,848 kW of output.

Modern solar technology, by contrast to wind, is the more recent result of a century-long process of iteration. The first solar panels were created in the mid-nineteenth century as results of scientific experiments discovering how light may be converted into electrical energy. Such solar panels would continue to be developed into the twentieth century, but the capacity and energy production capabilities of these early solar cells remained miniscule. The first viable Photovoltaic (PV) cells for energy generation arose in the mid-twentieth century, but they found limited success. The price of the highest-capacity PV cell of the era was created by Hoffman Electronics-Semiconductor Division, a 1955 PV offering 2 percent efficiency at a cost of $1,785 per watt. Photovoltaic solar panels only reached mainstream relevance into the twenty-first century as energy efficiency increased and, crucially, as the cost of PV cells plummeted. The average solar panel in 2022 has an efficiency of roughly 15 percent, while the cost per watt has dropped to $2.94.

As with wind turbines and wind, a solar panel must receive a large amount of sunlight to be effective. The PV array converts sunlight it receives into electricity. The best measurement of a solar cell's input is through Direct Normal Irradiance (DNI), the amount of solar radiation received by a surface perpendicular to the sun's current position in the sky. DNI varies significantly by geographic location and time of year, as climatological factors such as weather and season duration greatly impact solar irradiance. **Figure 2** illustrates the average daily DNI across the United States.

Figure 2. Direct Normal Solar Irradiance



Source: National Renewable Energy Laboratory (NREL), February 22, 2018.

A higher DNI typically correlates with a higher number of average sunlight hours per day, but this is not the only factor. DNI varies greatly by time of year, as the angle of the Earth's hemispheres changes by season. Summer occurs when one of the Earth's hemispheres is tilted towards the sun, creating a favorable angle for solar radiation to reach the Earth's surface. Winter, by contrast, sees one of the hemispheres tilted away from the sun, meaning more solar radiation is reflected off into space.

DNI is an effective tool for analyzing the effectiveness of solar PV arrays, as higher DNIs will provide higher inputs for solar paneling to convert into energy. Areas with the highest DNIs in the United States are concentrated in the southwest, particularly in California, Arizona, and New Mexico. These locations are considered prime locations for PV arrays, as high DNIs allow PV panels to produce more energy. While locations with higher DNIs are often seen as the most advantageous locations to install solar arrays, solar panels remain viable in all environments.

Many US federal agencies have begun integrating their own renewable energy projects to reduce carbon emissions and find a renewable source of energy to meet ever-growing demand. In the Federal Aviation Administration (FAA) Order JO 7400.2, *Procedures for Handling Airspace Matters*, Appendix 12 establishes an evaluation system of any wind turbine farm proposals that may pose a risk to air traffic. The most recent change to the order was published in November 2022. FAA Form 7460-1, *Notice of Proposed Construction or Alteration* may also be submitted to ensure proper notice and approval of any wind projects.

The FAA issued a final policy on airport solar projects in May of 2021 to establish best practices for airport solar projects. The *Review of Solar Energy System Projects on Federally Obligated Airports* requires airports to measure the visual impact of solar projects on pilots and air traffic control personnel. As more airports begin to implement solar projects, the FAA wishes to ensure these projects are installed with safety in mind. The solar projects should demonstrate they operate in a manner that will not cause solar glare, because it may prove unsafe for airport users and operators. The 2021 policy is the final policy and supersedes an interim policy from 2013.

Next Steps and Challenges

With the increasing success of renewable energy sources, the aviation industry is considering the next steps and challenges in mainstream industry implementation of these systems. The immediate benefit of wind and solar energy is that they are renewable energy sources free of carbon emissions. Any singular form of renewable energy is often installed in conjunction with other renewable energy sources and passive energy-efficient design to achieve “net zero” greenhouse emissions, fully offsetting greenhouse gas emissions with sustainable alternatives to reduce all emissions to zero.

The effectiveness of renewable energy sources is contingent upon the geographic availability of the resource, in this case wind and solar energy; a higher wind speed or DNI indicates a higher availability and greater potential energy output. The overland wind speeds received by Florida are generally average for the continental United States. This means wind turbines are viable in Florida but are not inherently the best sources of renewable energy. Florida does, however, receive significantly higher DNIs overall than other states, in part due to Florida’s tendency to receive clement weather throughout the year. This makes Florida an ideal state to construct solar panels. While high DNIs are not a prerequisite for solar arrays, areas with higher DNIs provide the optimal energy generation efficiency of PV cells. For both wind and solar the position and orientation of each unit is paramount to ensure maximum efficiency, so a site must be carefully chosen to deliver the highest yields.

Another notable challenge facing wind turbines and PV solar arrays is the technology itself. Not all energy from wind and solar radiation can be transformed into electricity, as no system can be 100 percent efficient. As an example, the Betz limit is the theoretical maximum efficiency of a wind turbine, where at most 59.3 percent of the kinetic energy from wind can be used to spin a turbine at sufficient speed to generate electricity. Most of today's wind turbines operate at 20 to 40 percent efficiency, last roughly 20 years once constructed, and require routine maintenance every six months. PV cells operate at a lower average efficiency of 15 to 20 percent, but they last longer at 25 years and require very little maintenance throughout their lifespans.

Wind turbines and PV cells have dropped in price considerably over the past several decades, but these systems can remain expensive to construct initially. The cost burden of installation also often falls solely on the property owner or, in this case, the airport itself, to construct. This creates a barrier to entry for many, as the upfront cost of installing a solar array may not prove beneficial in the short term. In the long term, however, the cost savings of wind turbines and PV arrays become more apparent. The FAA also offers many funding opportunities for airports seeking to lower their carbon emissions. The Voluntary Airport Low Emissions (VALE) grant is one such program, and it can cover much of an airport's costs associated with PV system installation. The VALE program was used by the Manchester-Boston Regional Airport (MHT) in Manchester, New Hampshire, to cover 95 percent of the cost to install its on-airport PV array.

While the cost of renewable energy has declined dramatically since the 1950s, some renewable energy sources cannot produce enough energy by themselves and require a series of units to achieve a high energy yield. This is especially true for solar panels, as a collection of PV cells using a significant amount of real estate is required to produce large quantities of energy. Energy generated by renewables is usually used to offset electricity produced from fossil fuels, as renewable energy systems cannot be selectively called upon when demand is needed; they function only as the wind or sun allows. Further, the amount of input (wind or sunlight) received by each unit must be substantial, as these systems rely entirely upon regular abundance.

The most significant challenge to the implementation of wind turbines, particularly at airports, is the size of modern wind turbines. Since they require many moving parts, most notably the rotating blades, wind turbines are significant structures that easily become obstacles. Such a system in use at an airport would pose a clear and present danger to any aircraft using the airspace, and wind turbines would require a very specific site away from aircraft traffic to function effectively on airport property. A modern high-yield wind turbine, which has an average height of 420 feet, would likely be too tall to meet most airfield design criteria required by the FAA in Advisory Circular (AC) 150/5300-13B, *Airport Design*.

By contrast, solar systems require very little maintenance, generate no noise, and can operate independently of any moving parts that may create obstructions. Because of this, PV arrays can be mounted almost anywhere with a flat surface: on rooftops, in fields, or suspended on poles. Solar installations are also modular, meaning shipments of solar paneling, wiring, and other equipment can be easily delivered to the installation site. In addition, many solar panels are remarkably resilient. Most solar panels can withstand winds of up to 140 miles per hour, making them capable of withstanding winds from a Category 4 hurricane.

Lengthy planning periods and review by the FAA for any renewable energy projects are also potential challenges. A specific review for solar installations in FAA's *Review of Solar Energy System Projects on Federally-Obligated Airports* mandates airport solar projects perform a visual impact study to confirm the installation would have little to no impact on pilots or air traffic control personnel. The policy only applies to federally obligated airports (those accepting federal funds buying land or developing airport property) with Air Traffic Control Towers (ATCTs). However, the standards for measuring ocular impact set forth in the policy add further complexity to the installation process of PV systems. Strategically siting PV arrays can mitigate or outright eliminate solar glare, but coatings and texturing options are also available for paneling to minimize glare without compromising performance. These impacts on optical glare are in addition to the design standards set for the locations of all airfield facilities in AC 150/5300-13B. FAA Order JO 7400.2, Appendix 12 presents additional regulatory approvals for wind projects constructed on airport property.

How Does This Affect Florida Airports?

Florida has one of the largest, busiest, and most dynamic state aviation systems in the country. It is home to 129 public use commercial service and general aviation airports. The many natural features of Florida create a unique environment to generate renewable energy. Florida airports may benefit greatly from renewable energy sources as the bourgeoning aviation system of Florida places strain on the system's energy capacity.

Some airports in Florida have already installed their own renewable energy projects, most notably with solar projects at Lakeland Linder International Airport (LAL), Orlando International Airport (MCO), and Tallahassee International Airport (TLH). The following summarizes the potential effects this emerging trend might have on airports across Florida:

- **Logistical Challenges** – Supply chain issues remain a significant concern following the COVID-19 pandemic, where production in many industries is limited and distribution logistics remain strained. As a result, supply challenges may persist into the immediate future. This could create challenges for airports in acquiring the wind turbines or PV cells necessary for energy generation to be possible.

- **Physical Airport Infrastructure** – Wind turbines or PV installations would ideally be installed on airport property in an area free of obstructions, such as on vacant land. PV arrays could also be located on the rooftops of airport buildings. The intent is that energy generated from wind turbines or PV arrays would reduce the airport's need for external power sources, thereby replacing energy generated off-airport from non-renewable sources. Any PV infrastructure must conform with ocular glare standards, and all renewable energy sources must conform with AC 150/5300-13B.

- **Geographical Considerations** – Florida's geographical location lends itself well to providing many sunny days for optimized solar energy production and, to a lesser extent, a ready supply of wind for wind energy production. A drawback of this climate is an abundance of marshlands in much of the state that makes building any type of structure, much less a large and complicated wind turbine or PV array, exceedingly difficult. In addition to construction issues, local marshlands may be home to any number of protected species of flora and fauna, potentially requiring Environmental Impact Statements and permitting for construction within these areas. As an attractive alternative to building over the top of potentially sensitive marshland, the floating PV array installed at MCO helps to power the airport terminal while constituting a much smaller impact to the Airport's natural geography.

- **Cost and Technological Advancement** – The technology surrounding wind turbines and PV systems is ever changing, and they only become more advanced over time. The cost of renewable energy sources has declined over the past few decades, and their ability to generate energy has dramatically increased. Systems that were installed two years previously are immediately surpassed in terms of cost, efficiency, and energy generation. For this reason, wind turbines and PV systems are quickly becoming some of the cheapest long-term sources of energy. In 2022, the average price per kilowatt-hour of fossil fuels was between $0.05 and $0.17, while the cost of wind was only $0.02 to $0.06 and solar was $0.03 to $0.06.

- **Hesitation to Change** – Finally, renewable energy, particularly wind and solar power, is a power source that many view with skepticism. To many its renewable energy status belies its usefulness as a consistent energy source, as solar panels can only be effective if there is sunlight, and wind turbines can only be effective if there is wind. The initial investment in renewable systems is also often seen as unachievably high, and the rapid advancement of renewable energy technology can lead some to believe newly installed renewables will be obsolete after only a few years. Additionally, renewable energy remains an emerging trend at airports, as only a few have recently begun installing their own systems. Without a firm set of case studies or guidelines, installation of these systems on airport property with airport funds can prove daunting.

Ways that the FDOT AO Can Assist

The FDOT AO can facilitate communication among different stakeholders to resolve the implementation challenges associated with renewable energy systems. The following recommendations offer methods to assist airports in the installation of renewable energy sources. They are categorized into items that can be addressed through implementation of the Florida Aviation System Plan (FASP) 2043 and other broader actions that the FDOT AO can promote.

FASP 2043 Recommendations

- **Provide Funding for Installation of Renewable Energy Systems** – The FDOT AO can assist airports in providing funding for the installation of renewable energy systems. This could be from the establishment of a dedicated funding source or through prioritizing the installation of these systems when distributing funds from existing funding sources. This would be beneficial to airports especially if the installation of such infrastructure is not eligible for funding from federal sources like the Airport Improvement Program (AIP) or VALE grant.

- **Include Measurement of Sustainable Energy Generation as a Part of FASP 2043 Performance Metrics** – Inclusion of how airports across Florida implement sustainable energy can help airports and the FDOT AO understand where gaps may lie with installing such systems. This includes the development of performance metrics and the continual evaluation of these metrics to measure this emerging, ever-evolving trend each time the state aviation system is evaluated. This can help focus the development of infrastructure to promote renewable energy systems as well as future financial planning efforts for both airports and the FDOT AO in accommodating this emerging trend.

Other Recommendations

- **Encourage Airports to Install Renewable Energy Systems** – The FDOT AO can encourage Florida airports to coordinate with local wind and solar companies to install renewable energy systems. Likewise, the FDOT AO can serve as an advocate for state airports in communicating with manufacturers, distributors, and installers so that Florida airports may call upon a robust network of renewable energy resources. Financial incentives such as tax breaks and rebates could also be used to encourage airport operators to install their own renewable energy sources.

- **Promote Benefits and Reliability of Renewable Energy** – The FDOT AO can introduce an educational campaign about the benefits and reliability of renewable energy. Airports benefit from wind and solar energy in several ways, including a reduction in carbon emissions and long-term energy generation cost savings. Some uncertainty concerning the reliability of renewable energy is likely, as wind energy relies entirely on the availability of wind, and solar energy relies on sunlight. The FDOT AO can use e-mail, publications, social media, and other communication channels to share information such as the benefits and growing efficiency of renewable energy. The FDOT AO can also provide links to the communication campaigns of wind and solar companies to learn more about these products, and they can also invite these companies to conferences and other events to discuss renewable energy with attendees.

- **Promote Funding Opportunities for Airport Renewable Energy Projects** – It is very important that the FDOT AO regularly promote funding opportunities available to airports for renewable energy projects. Many programs, such as FAA's VALE program, could be used to cover almost entirely the costs of a renewable energy system's installation.

- **Encourage Use of Local Producers, Distributors, and Installers of Renewable Energy Inputs** – Florida has one of the busiest state aviation systems in the country; thus, demand for all aspects of aviation, including energy, is generally higher than in other states. Given this elevated level of activity, the FDOT AO can encourage airports interested in renewable energy projects to use local wind and solar companies in Florida to minimize the carbon footprint of any inputs for new projects. As an example, this could include the local production of PV cells. It could also include transport of the cells to the site, and final installation of the array.

- **Coordinate with Environmental Regulators** – As renewable energy projects increase in prominence at airports, the FDOT AO can advocate with federal and state environmental regulators to transition a portion of an airport's energy supply to sustainable alternatives. Additional concerns surrounding environmental conditions, such as construction impacts to native flora and fauna, remain relevant to implementation. Other concerns, however, such as optical glare from solar paneling, may be unfamiliar to regulators. This unfamiliarity could result in new regulations that limit the implementation of airport renewable energy projects. By communicating with regulators, the FDOT AO can help prevent potential environmental regulations that negatively affect airport renewable energy projects.

Conclusion

The implementation of renewable energy airport projects in Florida is an important stepping-stone in meeting the energy needs of the future while promoting sustainable goals. As with any emerging trend and its transition to mainstream industry acceptance, the implementation of renewable energy projects at airports will take time before it can reach mainstream relevance at Florida airports and within its aviation system. The FDOT AO serves an important role in helping to facilitate this industry change by leading communication efforts about its benefits to the operators and users of its system. Likewise, the FDOT AO also serves an important role assisting its airports in transitioning to renewable energy, including providing a robust network of resources for interested airports. By implementing the recommendations for the FDOT AO to promote and provide access to wind and solar resources, Florida can continue to be a world-class leader in supporting the needs of its airports and aviation community.

M

Resource Management Emerging Trends

FDOT 2043 FASP FLORIDA AVIATION SYSTEM PLAN

Appendix M

Resource Management Emerging Trends

Resource management has held a range of meanings over the years in aviation, as the focus of airports often follows emerging environmental trends. The emerging trends around airport resources can be organized into several categories:

- Resource use reduction: the ability to reduce the amount of resources used at an airport, resulting in reduced environmental impacts and generally lower costs at an airport.
- Adaptation: the ability to respond to changing conditions successfully.
- Living resources: addressing human and wildlife considerations.

Background

When discussing emerging trends of resource use, understanding the context of national and global targets to reduce carbon emissions is important, as the targets directly relate to many of the resources (energy, aviation fuel, large scale construction projects) and day-to-day use of materials at an airport, such as use of goods and services, waste management, and water quality. All these elements are also connected to the financial resilience of organizations, which is vital as airports in the region continue to grow and need to accommodate growth in a sustainable manner.

Resource Use

The aviation industry has been making efforts to reduce emissions and become more sustainable over the past two decades. In 2018, the U.S. aviation sector carried about 32 percent more passengers than in the year 2000, yet due to increasingly more efficient fuel, emissions and fuel use has remained constant.

In November 2021, U.S. Transportation Secretary, Pete Buttigieg, released the United States Aviation Climate Action Plan. This plan outlines guidelines aimed at achieving net zero greenhouse gas emissions from the U.S. aviation sector by 2050. The plan aims to decrease emissions through various actions, including developing new and more efficient aircraft and engine technology, producing and using sustainable aviation fuels (SAF), and carbon offsetting.

Associated with the U.S. Department of Transportation (DOT) move, the Federal Aviation Administration (FAA) released its Aviation Climate Action Plan to set the aviation industry on a path to achieve net zero greenhouse gas emissions by 2050. Airports Council International (ACI) also signed a net zero goal for 2050 for airports. The establishment of these net zero goals means that airports have a significant role to play in helping the aviation industry achieve these goals. While 2050 seems far in the future, to meet this goal, there is a trend toward airports preparing net zero plans to help mitigate the effects of climate change. Emerging trends relative to climate change are detailed in sections below.

Greenhouse Gas Emissions (GHG) Emissions Inventories and Climate Action Planning

Inventories of GHG emissions create the basis for understanding the amount of emissions at an airport and the relative control (also referred to as “scope”) of the GHG emissions. Understanding the baseline emissions at an airport is important in order to target reductions and develop a climate action plan.

Once an airport understands its baseline emissions, the Airport Carbon Accreditation program (ACA) through the ACI provides a certified framework to target and reduce emissions that an airport owns and controls.

Sometimes airports do not want to utilize the ACA certification process, so they create separate climate action plans to identify reductions (climate change mitigation) and methods to adapt to an already changing climate. Others conduct climate action plans as part of a broader effort.

Reductions tend to focus first on those emissions entirely within an airport's total control (such as airport-owned fleet vehicles) or partially within their control (such as energy used from the grid). Emissions that are not directly within an airport’s control include the actual aircraft emissions. Aircraft emission reductions, while associated with airports, are controlled more directly by the airlines. Programs to target aircraft emissions are typically focused on the introduction of more efficient technology, electrification of ground power and preconditioned air to support reduced aircraft idling, the introduction of SAF, and offsetting programs.

Reductions – Energy Efficiency, Renewables, Electrification

In 2014, about 22 percent of global energy production was creating and using renewable resources. Of this 22 percent, hydropower contributed 74 percent, wind contributed 13 percent, bioenergy contributed 8 percent, solar contributed 3 percent, and geothermal contributed 1 percent. According to the International Civil Aviation Organization (ICAO), the renewable energy options available to airports depends on how airports use energy, and which renewable alternatives are feasible solutions. Typically, airports purchase power from the national grid, which typically generates power using fossil fuels; however, airports can develop on-site power generation sources, which in rare instances produce more energy than needed to run the airport. In those instances, the airport authority generally would be able to sell the excess power back to the grid, generating income and supplying clean energy off-site.

Solar photovoltaic (PV) panels are the most popular source of clean energy produced by U.S. airports. Aside from solar glare, which can be mitigated through strategic placement of solar panels, solar is compatible with airports because the modular system allows for more flexibility when designing solar installations. Solar can be easily deployed at most sites, provided there is a stable base and optimal sunlight. Some solar PV systems can also self-adjust by tilting to optimize sun exposure. However, unlike other clean energy sources, solar can only produce energy during daylight hours.

Wind power is typically located in areas that receive stronger winds, such as flat plains, ridgetops, coastal locations, and other areas where wind flows uninterrupted. While successful wind farms generate large amounts of electricity, wind power is most efficient when the wind is strong and consistent, so wind power is only a feasible option in specific locations.

Geothermal Power: Solar and wind power are cost effective alternatives to traditional fossil fuel produced energy; however, they are limited by their ability to generate power only when the wind is blowing or during daylight hours. For this reason, geothermal power can be a beneficial alternative. Geothermal power uses heat from the earth to generate power. Ground source heat pumps, a heat pump that uses geothermal technology to heat and cool buildings, is a popular way airports are beginning to incorporate geothermal power into their designs.

On-site energy production can be cost-effective in the long run but often requires upfront capital costs. In addition to considering alternative power generation sources, airport authorities should also design infrastructure in ways and with materials that promote energy efficiency. The incorporation of LED area lights and conversion of vehicle fleets to electric or hybrid vehicles can make parking garages and parking lots more efficient. A recent study by ARUP Laboratories, a national non-profit and academic reference laboratory, shows that operating buildings more efficiently can save up to 6 percent annually on electricity bills.

Electric aircraft are the upcoming clean alternative to traditional aircraft. While there are sustainable alternatives to fuel, and fuel has become more efficient in recent years, traditional aircraft use a lot of fuel and contribute substantial emissions. Electric aircraft, however, will use electricity in place of fuel and result in zero emissions. The electric motors in electric aircraft are 95 percent efficient compared to combustion engines used in traditional aviation, which are 18 to 23 percent efficient.

An electric motor loses less energy to heat than a combustion engine, which also makes electric motors more reliable, easier to maintain, and less expensive to operate. Due to a decreased risk of mechanical failure, electric aircraft are safer than traditional aircraft as well. The improved efficiency of the motor also means electric planes are much quieter, which people residing near an airport might appreciate, and because of the lower operating costs, tickets on electric planes will likely be less expensive.

Despite these advantages, electric motors use a much heavier battery than traditional planes do. The batteries used in electric aviation can potentially be toxic, rupture easily, short-circuit, or catch fire. In addition to the batteries, electric planes currently only have a range of less than 250 miles and a maximum capacity of up to 6 passengers, making electric planes impractical for a large percentage of passengers.

Low Carbon Pavements

Traditional Portland cement has a large carbon footprint. As the industry moves toward reducing carbon footprints, the embodied carbon relative to construction projects is an important piece of the carbon reduction puzzle. FAA's research arm, the Airport Technology Research & Development Branch (ATR), helps advance innovative technologies and best practices that improve the resilience and sustainability of airports. Recently, the FAA identified low carbon pavement as one of their areas of research priority. ATR is working with research partners to address the impact of recycled materials in pavement, which can lower energy and emissions by approximately 20 percent.

Additionally, the FAA has released a draft Engineering Brief in 2022 to address sustainability in cement, including blended cements that reduce the carbon footprint when compared to the traditional Portland cements.[1] The brief provides interim guidance for the specifications of cement with consideration to lower carbon options. Blended cements are generally acceptable to use in place of Portland cement and can be more economical and can increase strength. Some low carbon options can use the captured carbon dioxide, effectively sequestering it in the cement and these options are starting to show up in airport projects. In 2022, construction of the first low carbon cement runway in the United States began at Indianapolis International Airport.

Carbon Offsetting and Carbon Removal

Carbon reductions, such as energy efficiency and renewable energy transition are vital to meeting the aviation industry's goals. However, while direct carbon reductions are still a critical piece of the overall net-zero strategy, large-scale reductions will need to be supplemented with active carbon offsets or carbon removal from the atmosphere. Carbon offsets refer to a fee paid to offset GHG emissions, where the fees are typically directed to programs that reduce GHG emissions. Programs such as the Good Traveler provide carbon offsets for the miles that individuals fly, and some airports choose to offset their employee travel or other carbon footprints through this or similar programs.

Carbon removal is the direct removal of carbon from the atmosphere, storing (sequestering) it for some period of time. There are two types of carbon removal, technological, such as direct air capture, and nature-based pathways, such as soil carbon sequestration. The various carbon removal pathways are rapidly evolving and will play a vital part in the overall climate mitigation strategy for the aviation industry. The most recent version of the Intergovernmental Panel on Climate Change (IPCC) report highlights the need for carbon removal to limit the rise in global

[1] https://www.faa.gov/sites/faa.gov/files/2022-09/draft_EB_XXX_Cement_Specs.pdf

temperatures. However, carbon removal at airports could be an important piece of airports' net zero goals. Currently, the Airport Cooperative Research Program (ACRP) is funding a study on carbon removal at airports that will likely be released in 2024.

Waste Reduction / Diversion

Many airport authorities are taking action to achieve zero waste in the coming years. To accomplish this, the aim is to reduce waste generation and increase waste diversion from landfills through reuse, composting, and recycling.

The U.S. Environmental Protection Agency (EPA) estimates that the largest contributor to landfills is food waste, contributing to 24 percent of all landfilled material and 22 percent of the amount of combusted energy. Of the 63 million tons of food waste produced by commercial, institutional, and residential sectors, only 32 percent was diverted from waste. Food waste can be repurposed or diverted by producing animal feed and bio-based materials, biochemical processing, or anaerobic digestion. Food waste can also be composted, donated, used in land application, sewer, and wastewater treatment. The Florida Department of Agriculture and Consumer Services released the Florida Food Recovery Resource Guide, which outlines ways to assist and lists organizations that have indicated interest in participating in Florida's Food Recovery Program.

Many institutions are combatting waste by limiting their reliance on plastic and other non-recyclable and non-compostable materials by introducing alternative packaging and recycling solutions. For example, Delta Airlines has made efforts to remove single-use plastic items from their aircraft and lounges, eliminating an expected 30,000 pounds of plastic waste annually. Similarly, Ryanair plans to rely solely on biodegradable cups, wooden cutlery, and paper packaging by 2023. Many airports have also seen success with the implementation of liquid waste receptacles near the security checkpoint, which allows passengers to keep their empty bottles through the terminal and in turn reduces the amount of plastic waste.

In addition to material changes, recycling programs within organizations can be upgraded in ways that minimize, divert, or reuse waste. The recycling rate at Geneva Airport increased from 49 percent to 53 percent between 2016 and 2017 when the airport introduced a new waste sorting center. Vancouver International Airport was able to achieve 51 percent diversion in 2017 through an improved airport supplemented recycling program, which included the installment of a centralized sorting center as well. Portland International Jetport, in collaboration with Inland Technologies, developed a recycling program that recaptures and reuses aircraft de-icing fluid, making it the first airport in the United States to use 100 percent recycled aircraft de-icing fluid.

On average, 85 to 90 percent of aircraft can be recycled or repurposed at the end of their useful life. The Aircraft Fleet Recycling Association (AFRA), in coordination with 72 companies, established best practices for aircraft disposal and recycling. AFRA recycles over 150 aircraft annually (amounting to 30,000 tons of aluminum from aircraft).

Water Quality

Per and poly-fluoroalkyl substances (PFAS) are an emerging concern for airports relative to groundwater contamination. PFAS are a family of thousands of compounds used in a variety of materials and industrial processes around the globe since the 1940s. PFAS are considered emerging contaminants that are stable and break down slowly in the environment. Because they do not break down easily, PFAS can accumulate in the environment over time and become concentrated in the food chain, entering humans through the ingestion of food and water containing PFAS. There is evidence that exposure to certain PFAS chemicals can lead to significant adverse human health effects.

PFAS have water-repellant, stain-resistant, non-stick and surfactant properties and can be found at airports, most notably from the use of Aqueous Film Forming Foam (AFFF). Examples of products and processes at airports in which PFAS can be found include: AFFF; aircraft hydraulic fluids; paper tableware products such as paper cups, paper plates, and coffee cups; food packaging such as microwavable popcorn bags and fast-food wrappers; stain- and water-repellent fabrics; nonstick products; polishes; waxes; paints; sealants; varnishes; and cleaning products.

For decades, AFFF containing PFAS has been used at airports for extinguishing fires, fire and emergency response training, and fire equipment calibration purposes. The use of AFFF containing PFAS has been required by FAA extinguishing agent regulations to meet Part 139 certification requirements. Airports face several challenges in addressing the presence of PFAS. First, airports need to identify and appropriately respond to the legacy presence that may exist due to historical activities. Second, airports need to reduce the use of PFAS chemicals currently required by the FAA. The Department of Defense is expected to authorize a non-fluorinated foam in early 2023, at which point airports will be able to use that to replace AFFF. The EPA is currently reviewing comments on a proposed rule that would designate PFAS as a hazardous material under the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA), which is also known as Superfund. If this designation passes, there would be implications for the analysis of impacts during the National Environmental Policy Act (NEPA) process, as well as additional requirements around the release and cleanup of these contaminants.

Supply Chain Considerations

Since the COVID-19 pandemic, there have been supply chain issues across the nation and worldwide. While this challenge varies by location and needs, the trend has been requiring airports to build in additional lead time for orders of parts needed for operations, particularly those limited to airport operations that may have limited options from distributors. Challenges include:

- Increased lead time to obtain parts necessary for operations.
- Increasing costs relative to inflation and the constrained supply chain.
- Requirement to order more than needed earlier than needed to account for the supply chain issues, resulting in additional upfront costs and storage space requirements.

Adaptation

As the industry has seen, particularly with the COVID-19 pandemic, adaptation, or the ability to respond to changing conditions successfully, is vital. Risks can touch any aspect of an airport; financial, social, or environmental. Many often touch several of these categories. Several emerging components of risk evaluation include:

- Emergence of Environmental, Social, Governance (ESG) reporting to identify, track and mitigate actions to decrease risk.
- Adaptation planning including:
    - Climate Change.
    - Design.
    - Durability.
- Certifications to assist with resource management and adaptation.

Environmental Social Governance (ESG)

Medium to large hub airports have been receiving requests for additional information around ESG actions prior to receiving a bond rating. Bond agencies are requiring documentation around airports' environmental and social programs, and commitment to these programs from a structural/governance standpoint to prove to bond rating agencies that the airports are appropriately identifying and mitigating risks.

Many airports have large capital improvement programs, and while ESG reporting is not required, the trends around needing to document these risks appropriately for bond ratings is pushing airports to complete formalized ESG reports. While a certain format is not required currently, many are aligning with the Global Reporting Initiative (GRI) structure to help identify and address those areas that are the greatest risk to an airport.

The ESG reports are similar to, but not necessarily the same as, sustainability management plans, as ESG reports use sustainability categories, but are focused with the additional lens of risk mitigation. Climate change is part of the ESG focus (i.e., sea level risk, inundation, heat, extreme weather events, etc.), as are social considerations, such as having a sustainable work force and appropriate stakeholder engagement programs.

Climate Change Planning

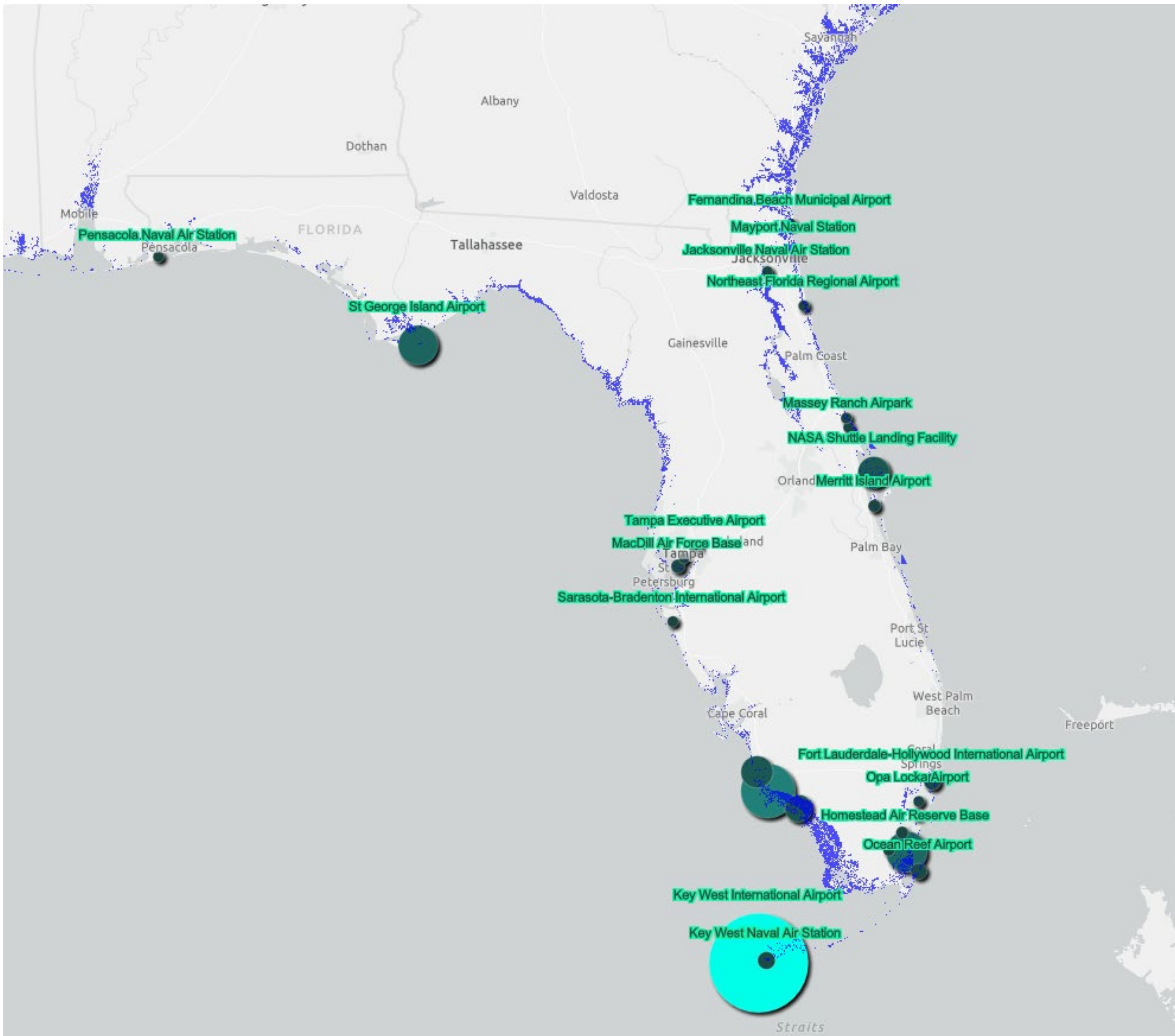
One of the aspects that ESG reports focus on is quantifying the risks and opportunities around climate change. The world is already experiencing shifts associated with a changing climate. Climate modelers expect additional impacts relative to increased extreme events, temperatures, and sea level rise, among others. Data around climate change is evolving rapidly, and it has become vital that airports address, plan for, and adapt to these changes. There are several tools that combine multiple data sources to help evaluate risks to airports. The Climate Mapping for Resilience and Adaptation (CMRA) Tool provides information on past, present, and future climate conditions, to better understand the risks associated with certain areas. Using this tool, airports can screen for climate hazards such as extreme heat, drought, wildfire, flooding, and coastal inundation for existing conditions, projected conditions in 2050, and projected conditions in 2090.

Sea Level Rise: Using the CMRA Tool, all airports in Florida were mapped relative to coastal inundation, which identifies the percent of each airport area that is projected to be impacted by global sea level rise. The information is included in **Figures 1, 2, and 3** for all Florida airports for the 2050 projected timeframe. The blue shading and dots near each airport representative sea level rise impacts as well as the area expected to be inundated by water in the future (2050) timeframe.

Durability: Preparing for sea level rise, increasingly intense storms, changes in average temperatures, and changes in biodiversity have become a priority for large institutions around the world. Transportation authorities should consider these potential impacts when beginning the master planning process, although some authorities choose to develop separate resilience management plans. ACI recommends that airport sponsors specifically:

- Conduct risk assessments of aircraft operations and infrastructure based on potential climate impacts.
- Develop and incorporate actions according to the risk assessment early on.
- Develop effective communication channels with all airport stakeholders and local emergency management officials as part of their adaption planning process.

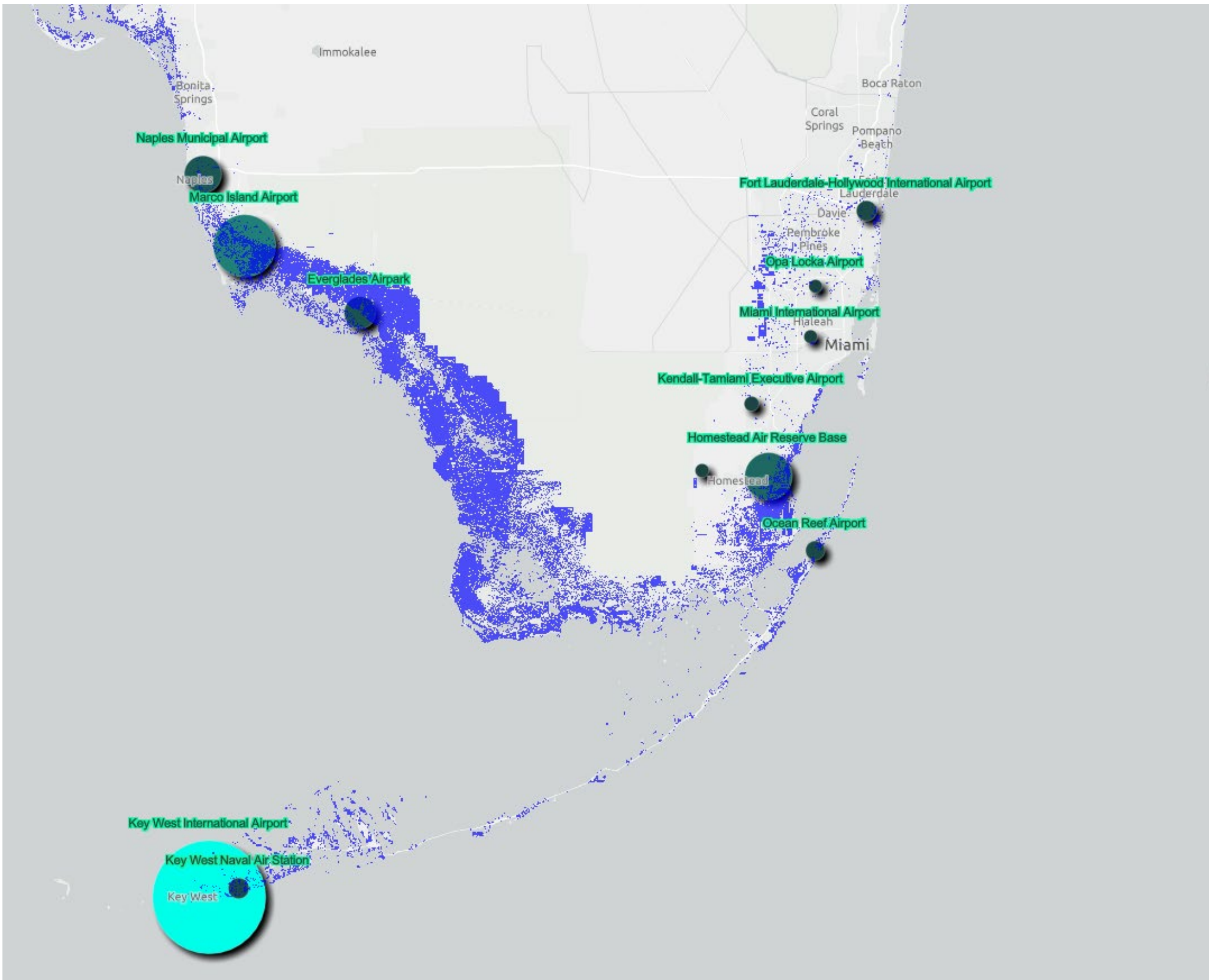
Figure 1. Statewide Future Inundation Levels (2050)



Note: Blue shading represents sea level rise. The size of the dot near each airport is representative of the amount of area an airport is expected to be inundated by water in the future (2050) timeframe – i.e., a larger dot represents higher area of impact. Source: Climate Mapping for Resilience and Adaptation, https://resilience.climate.gov/, accessed 2022.

Resiliency planning begins by identifying risks to operations and infrastructure. Many institutions have taken steps to proactively plan for natural events such as hurricanes and floods. Large airports, for example, can be equipped with resources to act as an Emergency Operations Center (EOC). Toronto Lester B. Pearson International Airport learned a lesson from an extremely cold three-day period in January 2014 that caused delays and cancellations.

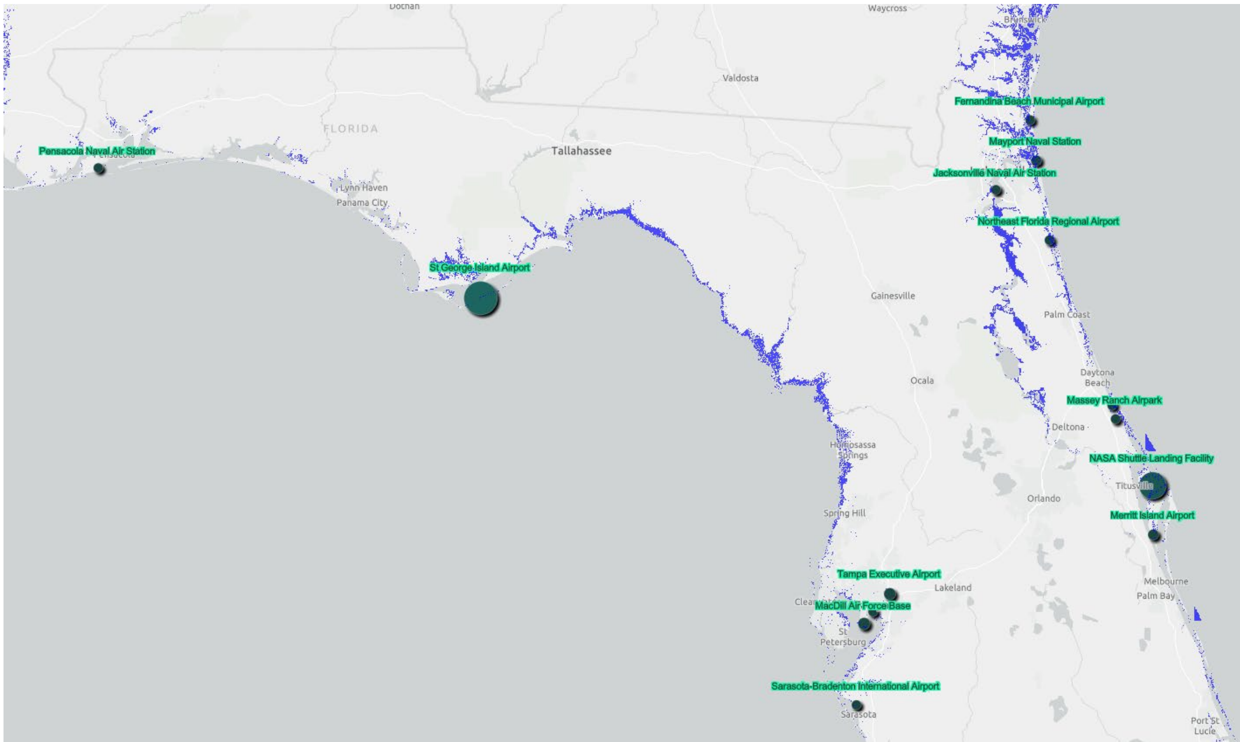
Figure 2. Southern Florida – Future Inundation Levels (2050)



Note: Blue shading represents sea level rise. The size of the dot near each airport is representative of the amount of area an airport is expected to be inundated by water in the future (2050) timeframe – i.e., a larger dot represents higher area of impact.
Source: Climate Mapping for Resilience and Adaptation, https://resilience.climate.gov/, accessed 2022.

As a response, the Greater Toronto Airports Authority (GTAA) created a list of recommendations, including improving communication within the airport authority and designing a passenger facing app and website to communicate necessary protocols for passengers. New Mexico City International Airport, on the other hand, is planning ahead. The airport is located on a drained lakebed and is prone to droughts, earthquakes, and flash flooding. When designing their new terminal building, engineers used a 2- to 3-meter-thick layer of tezontle, a volcanic material common in Mexico, that can provide ground water replenishment in addition to the storm water drainage facilities.

Figure 3. Central/Northern Florida – Future Inundation Levels (2050)



Note: Blue shading represents sea level rise. The size of the dot near each airport is representative of the amount of area an airport is expected to be inundated by water in the future (2050) timeframe – i.e., a larger dot represents higher area of impact.
Source: Climate Mapping for Resilience and Adaptation, https://resilience.climate.gov/, accessed 2022.

The United Nations Environment Program (UNEP) has issued a report, *A Practical Guide to Climate-resilient Buildings and Communities*, which recommends ways in which buildings and community spaces can be constructed to withstand and adapt to anticipated future environmental changes. Specific recommendations in this guide include using structural designs which can help reduce heat during a heatwave by using heavy materials which capture solar heat.

Certifications: Sustainability certifications are important for the implementation of sustainability. Because third parties verified them, certifications are a way to close the loop between the planning of a project and the implementation. Additionally, certification can help address the idea of continuous improvement in many ways, as many certifications require annual checks or additional information to keep the certification.

Several example certifications include:

- LEED – a framework for building energy efficient, healthy, and cost-saving buildings.
- Envision – a sustainability framework developed for Infrastructure.
- Fitwel – building certification based on health
- TRUE – a framework based on progress toward zero waste.
- ACA – the airport certification for GHG emission reductions.

These certifications focus on creating an adaptable environment, both the build environment and human aspects, such as health. Both aspects are important from the resource management side, with lower associated costs of energy use, materials, as well as a focus on human health and wellness, which has had particular attention since the start of the COVID-19 pandemic.

Living Resources

There are two topic areas that generally fall under the umbrella of living resources: 1) diversity, equity, and inclusion and 2) wildlife management. Each are discussed here for consideration.

Diversity, Equity, and Inclusion

Diversity, equity, and inclusion has become a spotlight for airports in recent years. Environmental justice is defined as the right to a safe, healthy, productive, and sustainable environment for all, where environment includes the ecological, physical, social, political, aesthetic, and economic environment.

Historically, planning for commercial and transportation development focused on the costs to develop and the convenience of the location instead of the impacts to the people and resources of the community. In the past, decisions were made to locate infrastructure in areas where disadvantaged individuals lived. This lack of racial equity has become a major concern.

While environmental justice has long been evaluated in NEPA documents, recently the trend has identified the need to go beyond traditional analysis to make sure fair treatment of people of all races, cultures, and income levels, and ensure that no group of people shoulders a disproportionate share of the impacts relative to a project or the airport in general.

Additionally, airports contribute to the economy, environment, and physical health of individuals in their local communities. Airports have the potential to impact the conditions of surrounding communities, both positively and negatively. Positive impacts may include job creation, partnerships with community organizations, and educational opportunities. Support of a sustainable workforce is a recent addition to most ESG reports, as sustainable workforce is a vital part of risk management in a post COVID-19 world with limits in available labor. Negative impacts could include decreases in air quality, water quality, noise disturbances, increased surface traffic, and displacement of residences. The recent understanding of PFAS contamination described earlier in this document is another emerging trend relative to equity.

An airport is responsible for being a good steward of its local community. Airports can use environmental justice screening to identify areas that may require additional consideration, analysis, or outreach. Planning for future development projects and changes in operations requires a review of environmental justice to ensure that no negative impacts are anticipated to further exacerbate any socioeconomic issues in disadvantaged communities. Recently, tools have been developed to further analysis of environmental justice. The EPA offers the Environmental Justice Screening and Mapping Tool (EJScreen) that gives access to census data. The EJScreen tool identifies population indicators, including people of color, low-income, linguistically isolated, less than high school education, under the age of 5 and over the age of 64. EJScreen also examines environmental factors, including air quality standards, cancer risks, and the proximity to National Scale Air Toxics Assessment factors such as hazardous waste, wastewater, traffic, Superfunds, and Risk Management Plans.

Wildlife Management

Establishing a wildlife management plan is essential in airport planning. Bird and mammal strikes have the potential to cause severe accidents. The associated costs from wildlife strikes in the U.S. aviation industry average $550 million and contribute to over 500,000 hours of aircraft down time annually. While improper landscaping can attract these animals to airports, a wildlife management plan can prevent or significantly reduce the occurrence of these hazards.

Recognizing attractants near airports as well as limiting the creation of new attractants near airports is essential to wildlife strike mitigation. The FAA has found that the largest contributors to wildlife strikes are gulls, waterfowl, raptors, and deer. Putrescible-waste operations, wastewater treatment facilities, wetlands, and dredge spoil containment areas are commonly located near airports and tend to attract these species. Additionally, animals are attracted to areas that are similar to their natural habitats and can support their essential needs to survive – for this reason, proper landscaping in and around airports is important in preventing animal strikes. Many airport authorities have been successful in reducing the number of reported animal strikes through habitat mitigation: avoiding plants that provide food and shelter to regional wildlife species and instead creating an environment that is unappealing to local wildlife.

The FAA has several resources to assist in wildlife mitigation including:

- Advisory Circular (AC) 150/5200-32, *Reporting Wildlife Aircraft Strikes*.
- AC150/5200-34, *Construction of Establishment of Landfills near Public Access Airports.*
- AC 150/5200-36, *Qualifications for Wildlife Biologist Conducting Wildlife Hazard Assessments and Training Curriculums for Airport Personnel Involved in Controlling Wildlife Hazards on Airports.*

- AC 150/5200-38, *Protocol for the Conduct and Review of Wildlife Hazard Assessments, and Wildlife Hazard Management Plans.*
- AC 150/5220-25, *Airport Avian Radar Systems.*
- 14 CFR 139 Section 139,337.
- National Wildlife Strike Database.

Funding and Financing

In 2022, funding became available for additional areas of resource management and sustainability elements.

Bipartisan Infrastructure Law (BIL): The recent Bipartisan Infrastructure Law placed additional focus and funding on sustainability related elements. As part of the funding application, both carbon reduction/energy efficiency and equity elements were included as prioritization for proposed projects to compete for funding.

Inflation Reduction Act (IRA): The Inflation Reduction act includes sustainability and climate mitigation funding associated with SAF. SAF provides emissions reductions from aircraft emissions. However, due to the current cost differential between conventional jet fuel and SAF, as well as low availability, the IRA provides a tax credit to help boost production and use of SAF, along with grant funding to assist with the development of fuels and low emissions technology.

Additional Sustainability Funding: BIL and IRA are important emerging pieces of the funding availability for resource management. The implementation of sustainability measures is also eligible for federal funding in several additional grant programs and is anticipated to be used for the FAA Airport Climate Challenge going forward. These programs include VALE, Zero Emissions Vehicle and Infrastructure Program, and Section 512, briefly described below. Grant funding opportunities and availability change often and, with an increased focus on climate change, additional focus on electrification, emissions reduction projects, and resilience-based projects is anticipated.

Funding sources that have been available for a longer time and have been used by various airports include:

> **Voluntary Low Emissions Program (VALE):** VALE is an FAA-sponsored program that improves air quality and requires air quality credits for future airport development by funding projects such as low- emission vehicles, refueling and recharging stations, and gate electrification. These grants help airports meet state air quality responsibilities under the Clean Air Act. Only commercial service airports located within a maintenance or non-attainment area relative to the National Ambient Air Quality Standards (NAAQS) are eligible for this funding.
>
> **Airport Zero Emissions Vehicle and Infrastructure Program (ZEV):** The ZEV program targets improved air quality by use of zero emissions technologies at airports. The program

allows airports to use AIP funds to purchase ZEVs or construct/modify infrastructure to support ZEVs. FAA gives priority for projects that have the most air quality benefits and high cost-effectiveness.

Section 512 (FAA's Energy Efficiency of Airport Power Sources): This program is an AIP-discretionary program where an airport is eligible for a grant up to a certain percentage of a project that focuses on energy efficiency. These funds are awarded by region and scored against other discretionary projects.

How does this affect Florida Airports?

As seen in the information above, Florida airports are at risk for infrastructure and resilience concerns. For example, many airports are at risk relative to future inundation. Since most projects have a lifespan between 25 and 50 years, modeling data for 2050 is appropriate for planning for an adapting to climate change. Buildings and other infrastructure should be taking into account these types of future modeling now, so that current capital projects are not at risk in the future. As transition to electrification occurs, with substantial need to increase electric use and hookups to support buildings, electric vehicles, aircraft, electric ground service equipment (eGSE), etc., consider airport wide electrification planning and coordination with utilities and potential links to renewable sources and on-site storage options. This helps to reduce single point failure and increases resilience to the system. Consider evaluating on a project-by-project basis or combining several of the associated risk and resource management concerns detailed above by conducting a comprehensive ESG report to assess risk and vulnerability of Florida airports.

Additionally, there are human factors to consider. Airports serve their communities, providing connection to the broader world and economic benefits to their communities. As a result, they need to be cognizant of both the potential negative impacts on communities, and the positive ones. As projects proceed, airports should consider using more proactive stakeholder engagement and tools to identify equity challenges, and work to address them. As an employer, look for ways to enhance equity within FDOT through employee resources and training. Creating a sustainable workforce is vital to airports continuing to thrive. These challenges could also be addressed in sustainability or ESG planning and report development.

Ways that the FDOT AO Can Assist

The FDOT AO cannot directly assist airports in conducting risk assessments, equity screening, or communication with each airports' stakeholders. However, the FDOT AO office can support airports through the facilitation of evolving data, resources, and communication. Below are several recommendations to assist the Florida airports in analyzing their risks, mitigating them, and moving forward to be a more resilient system as a whole.

- **Communication:** For risk and resilience, as well as social equity, the field is evolving rapidly, and airports can and should learn from each other. The FDOT AO may provide an avenue to help facilitate and further some of these discussions. Additionally, for topics such as PFAS where the regulatory context is also changing rapidly, the FDOT AO can assist airports in staying on top of these changing regulations.

- **Resource Sharing:** As stated above, many resources now exist to help assess risks around climate change and social equity. The modeling is increasingly easy to use by the layperson, and many airports could conduct similar risk assessments to what is included from a system perspective in this document. As additional tools are developed, the FDOT AO can help facilitate the dissemination of that type of information.

- **Funding:** While several of the federal funding sources were identified above, the FDOT AO can assist airports in providing funding for the planning for and mitigation of risks such as climate change, electrification and energy transition, infrastructure improvements, PFAS strategy, and equity analysis. This would be beneficial to airports especially when the installation of such infrastructure is not eligible for funding from other traditional sources like the FAA AIP.

Conclusion

In conclusion, there are several trends around risk evaluation – social, environmental, and financial, that could affect the long-term resilience of airports in the Florida system. Each of these trends (equity, climate change, PFAS), provide an opportunity for airports to decrease their footprint, mitigate impacts on the environment and their communities, and support nationwide (and in some cases, international) goals around these issues. Recent funding sources on the federal level have raised many of these challenges to the forefront of airports nationwide. The Florida state aviation system can benefit from the FDOT AO looking for innovative ways of addressing these challenges to increase the adaptability and resilience of the entire system of airports in the State of Florida.

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