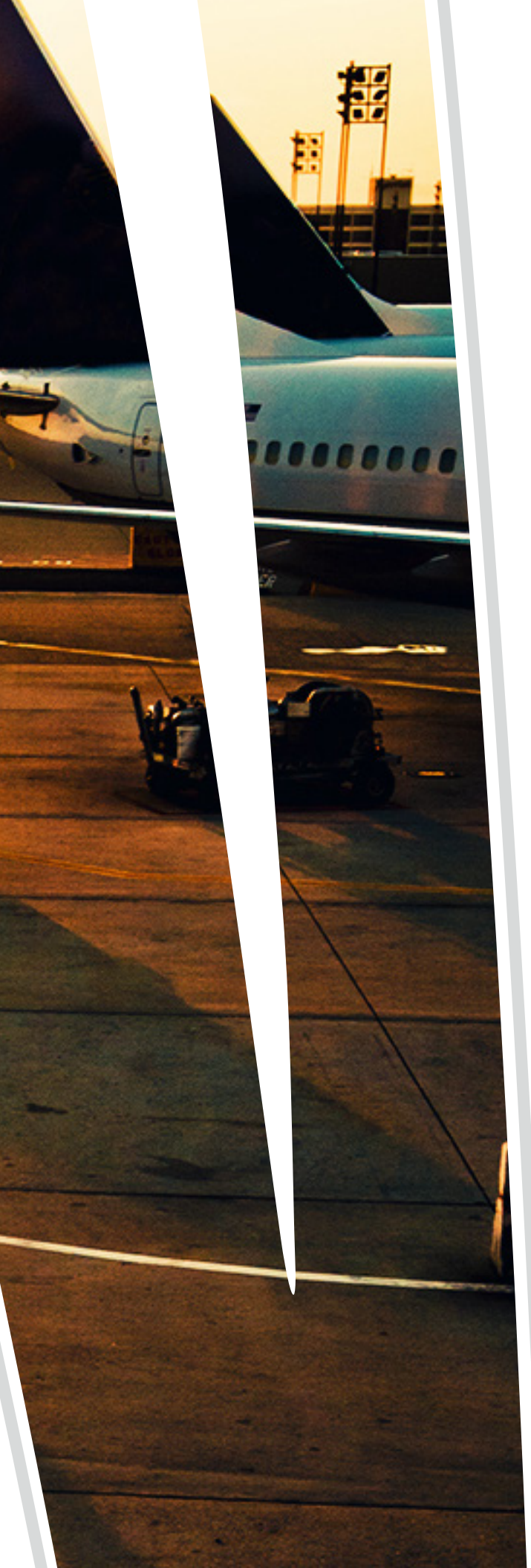

8

Aviation Office Initiatives

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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

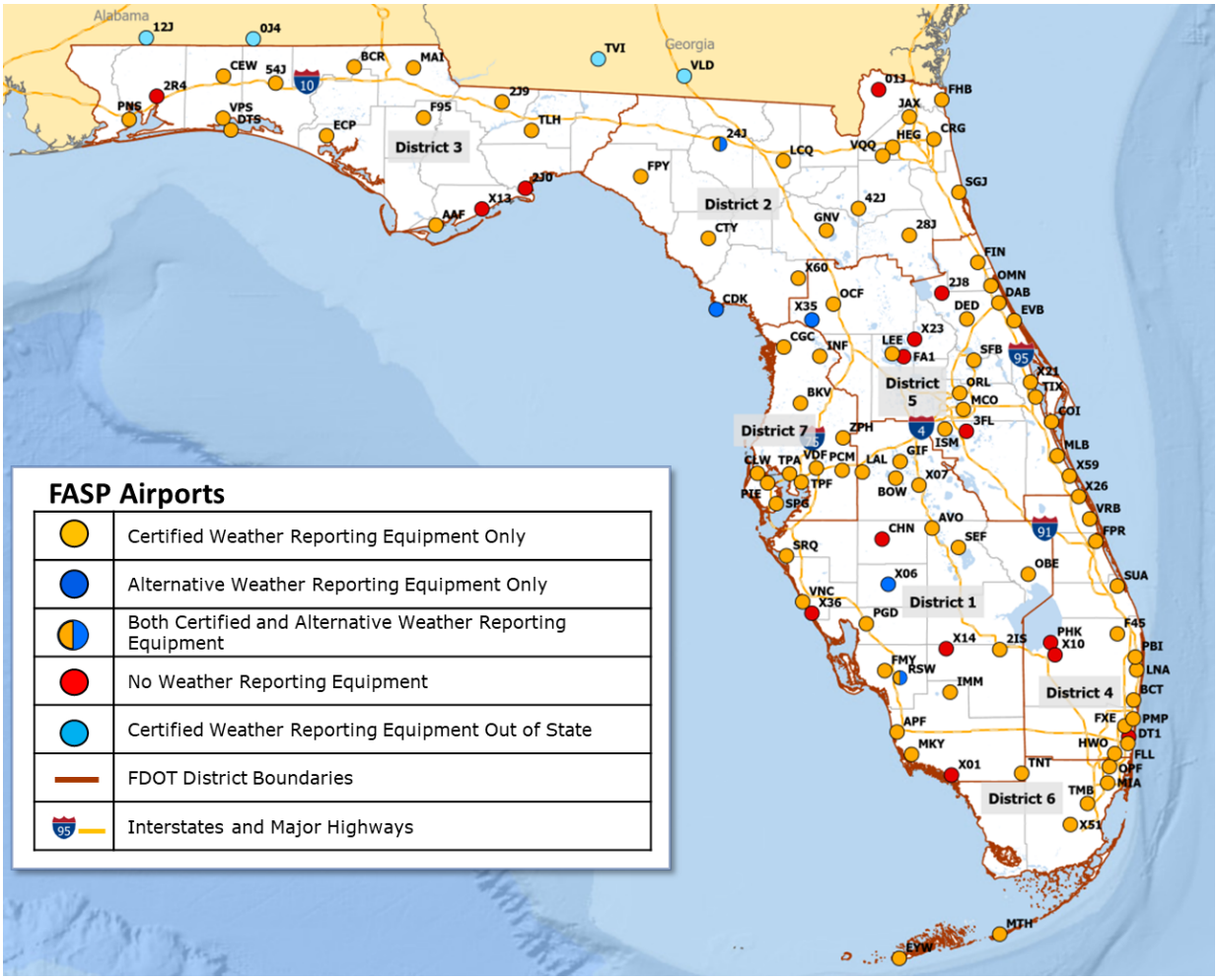
equipment. Certified systems are either automated weather observing systems (AWOS) or automated surface observing systems (ASOS).

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

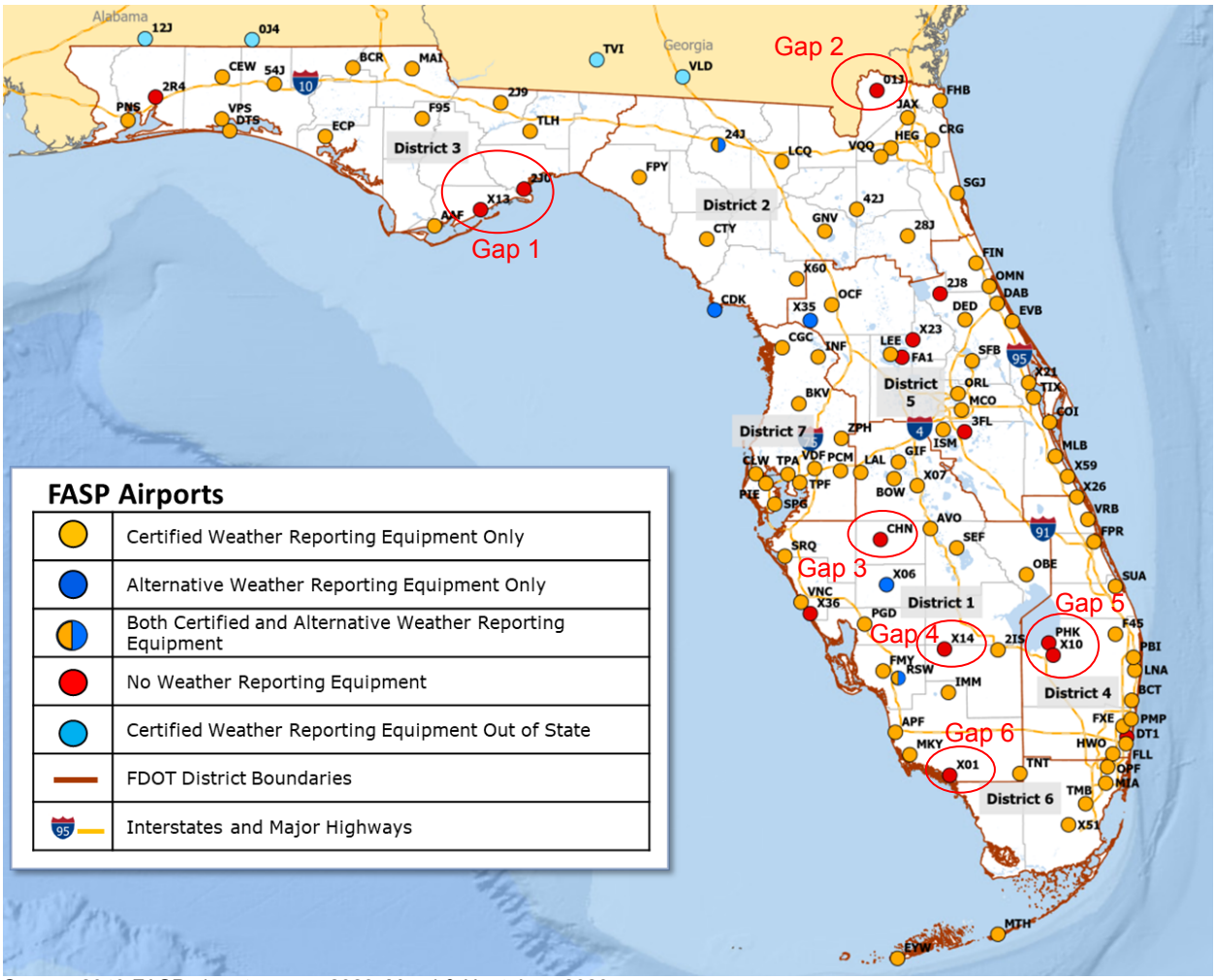
*Airport is in process of obtaining a weather reporting system.
Source: 2043 FASP airport survey, 2023

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

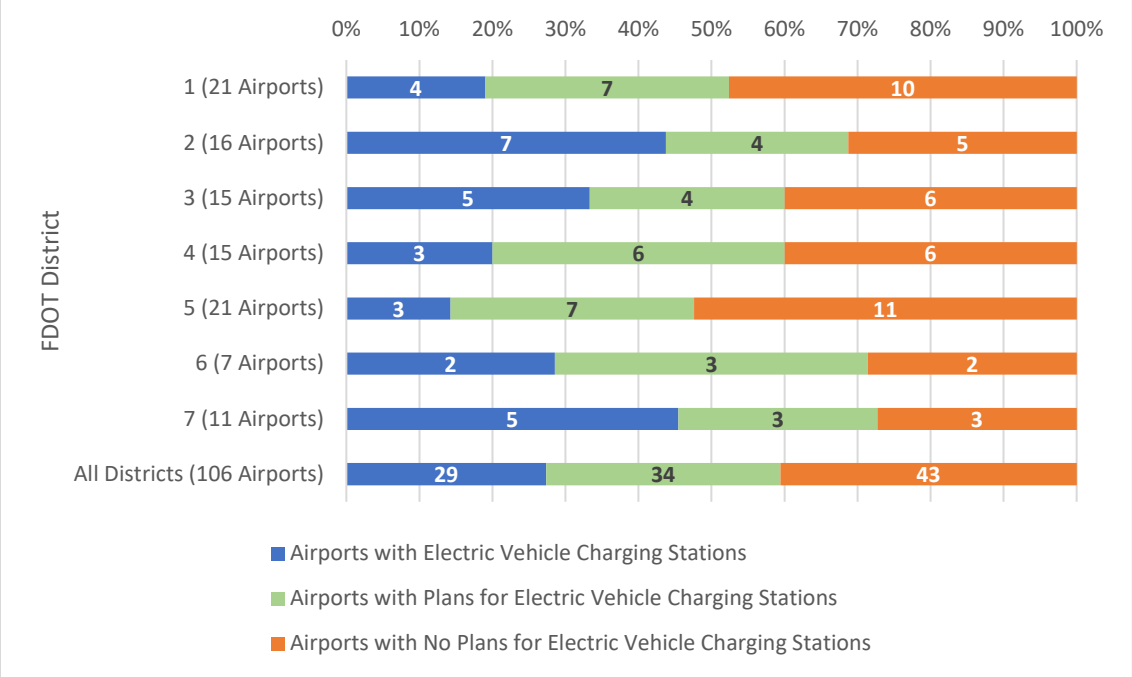
FDOT District	Number of Airports	Charging for Electric Passenger Vehicles		Charging for Electric Aircraft		Charging for Electric Ground Service Equipment	
		Implemented	Planning	Implemented	Planning	Implemented	Planning
1	21	4	7	0	4	7	3
2	16	7	4	0	4	7	1
3	15	5	4	0	8	2	5
4	15	3	6	0	7	3	2
5	21	3	7	0	9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

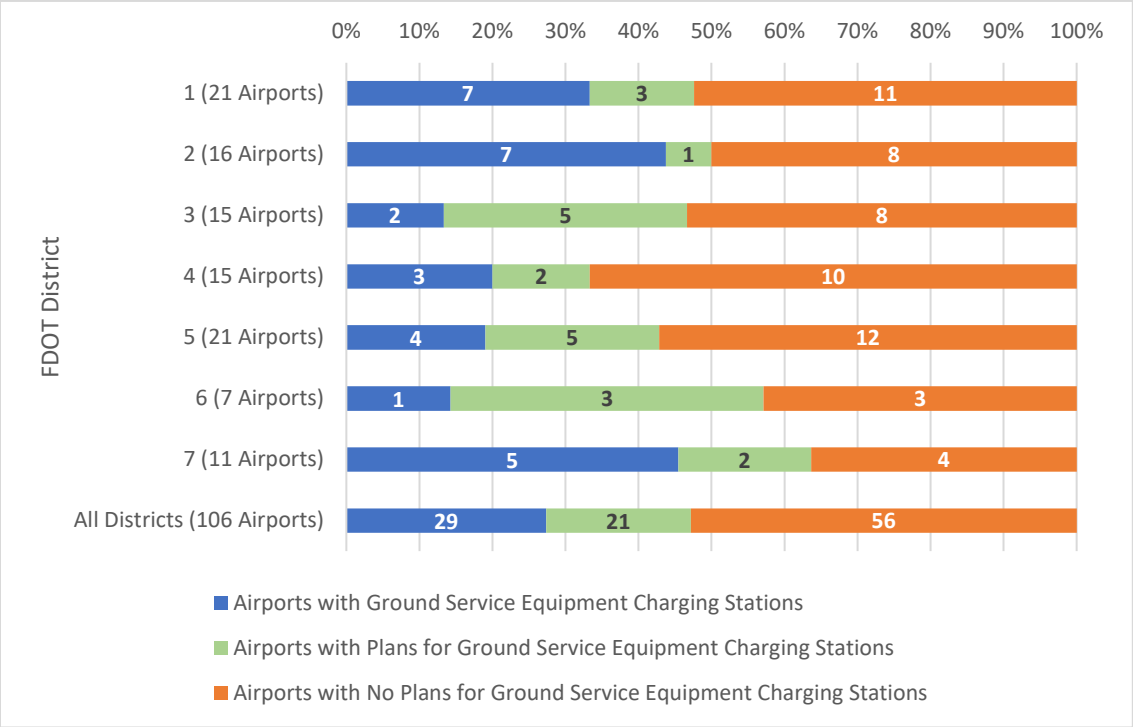
are planning to or already provide charging stations (in the case of GSE). For GSE, other forms of propulsion, such as propane powered tugs, may be diverting attention from electrification. For electric aircraft, airports may be waiting for FAA certification before implementing charging stations.

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



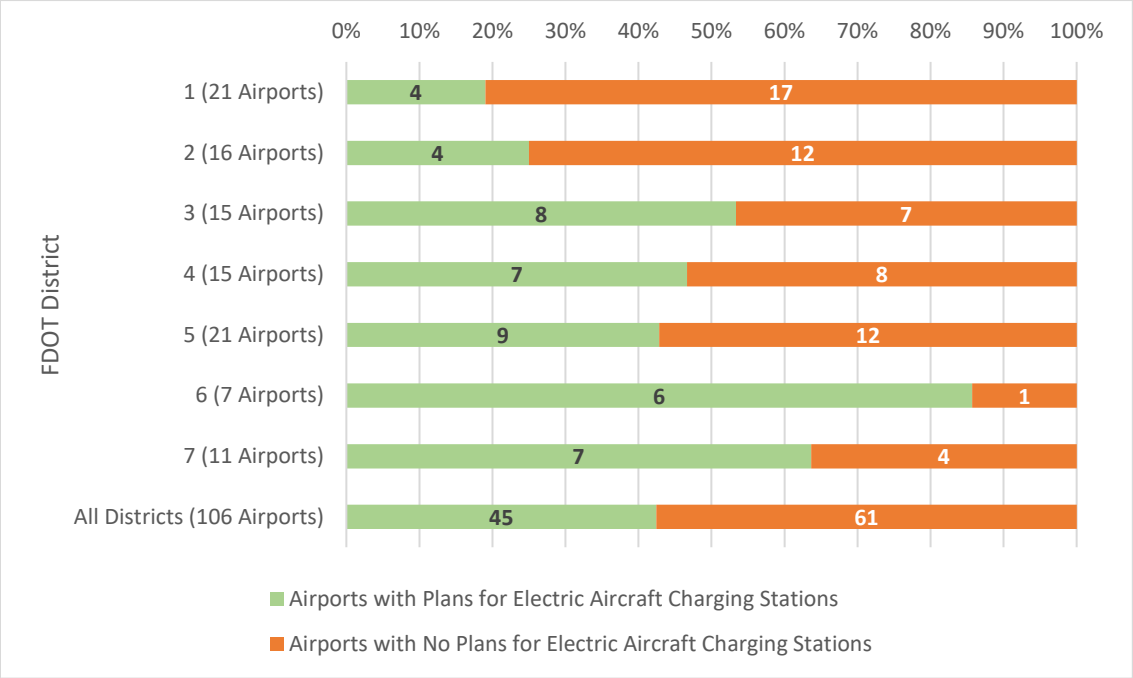
Source: Mead & Hunt, 2023

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

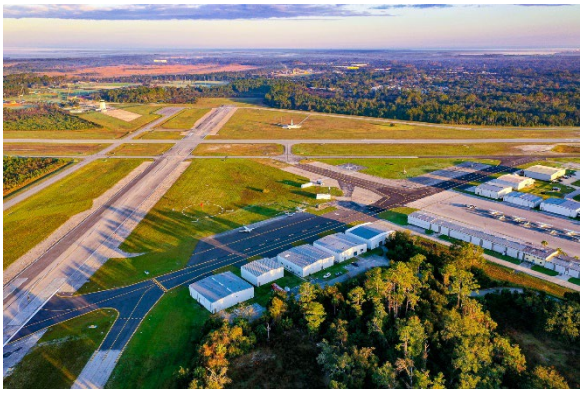
An inventory of the number of T-hangars and box hangars at the 106 publicly owned facilities included in the FASP (103 airports, two seaplane bases, and one heliport) was conducted as part of the survey efforts. The inventory also identified each facility's current T-hangars and box hangar occupancy,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